European Space Agency
Research and Science Support Department
Planetary Missions Division

ROSETTA - CONSERT

To Planetary Science Archive Interface Control Document

RO-OCN-IF-3800

Issue 4.1

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Distribution List

Recipient	Organisation	Recipient

Change Log

Date	Sections Changed	Reasons for Change
21/12/2010		Delivery of Issue 1.0 to PSA after peer review
26/05/2015	*Updated:* *2.4.3 In-Flight data products* *2.4.5 Ancillary Data Usage* *4.2 Datasets, Definition and Content* *Added:* *3.2.2.2.5 Spacecraft Clock Count in PDS Labels* *Deleted:* *3.4.3.4.2 Geometric Index File*	Delivery of Issue 1.1 updated for the comet phase
04/01/2016	*Added:* *4.3.2 Data Product Design (Level3) - Preliminary*	Delivery of Issue 1.2 for CONSERT L3 preliminary description
16/12/2016	*Modified:* *[All] Structure of the document to keep consistency with level 3 description* *[All] CONSERT team review for L2* *Added:* *App7 on raw data conversion functions*	Delivery of Issue 2.0 for CONSERT L2 final delivery and L3 preparation. Switch to v2.0 of the document due to the change in structure.
16/01/2017	Compression code put into the DOCUMENT folder instead of DATA	Delivery 2.1 for CONSERT L2.
11/07/2017	*Modified:* *2.4.3 In flight operation products*	added quick description of lander search operations during LTS
28/07/2017	Added CONSERT auxiliary data format in: *3.1.4 File naming Convention* *4.2.3.6 Label Directory* *4.4.1.4 Data Object Definition*	
31/08/2017	Added : *5 Level 3 Specifications and Design*	Delivery of L3 archives
07/11/2017	5.4.4.5 Geometry Directory 5.4.4.6 Label Directory 5.4.4.7 Document Directory	From PSA review RIDs Oct. 2017
21/02/2018	4.4 – Modified for ground calib. desc. 4.4.2 – Added L2 ground bench 5.2 – Modified for ground calib. desc.	Ground calibration datasets delivery to PSA.

	Appendix 8 - added	
14/03/2018	4.2.3.7 Document Directory 4.3 Data Sets Definition 5.4.4.7 Document Directory	Homogenization of the document directories contents between all levels. Comet phase L2 dataset names changed to V2-0
04/07/2018	6. Level 4 Specifications and Design	Delivery of Level 4 datasets
07/11/2018	3.1.4 File naming Convention 4.4.1 Data Product Design 5.6.1 Data Product Design 6.1.3 Signal repositioning 6.5.1 Data Product Design	Geometry naming additions Remark on signal position during FSS Improved description of data products

TBD ITEMS

Section	Description

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1 Introduction

1.1 Purpose and Scope

The purpose of this EAICD (Experimenter to Planetary Science Archive Interface Control Document) is twofold. First it provides users of the CONSERT instrument with detailed description of the product and a description of how it was generated, including data sources and destinations. Secondly, the EAICD describes the interface to the Planetary Science Archive (PSA) of ESA and is the official document between each experimenter team and the PSA.

This version of EAICD present the Level 2, Level 3 and Level 4 CONSERT archive products. It will be updated with upper level deliveries.

1.2 Archiving Authorities

The Planetary Data System Standard is used as archiving standard by

- NASA for U.S. planetary missions, implemented by PDS

  ESA for European planetary missions, implemented by the Research and Scientific Support Department (RSSD) of ESA

1.3 Contents

This document describes the data flow of the CONSERT instrument on ROSETTA from the S/C until the insertion into the PSA. It includes information on how data were processed, formatted, labeled and uniquely identified. The document discusses general naming schemes for data volumes, data sets, data and label files. Standards used to generate the product are explained. Software that may be used to access the product is explained.

The design of the data set structure and the data product is given. Examples of these are given in the appendix.

1.4 Intended Readership

The staff of the Planetary Science Archive design team and any potential user of the CONSERT data.

1.5 Applicable Documents

AD 1. Planetary Data System Data Preparation Workbook, February 17, 1995, Version 3.1, JPL, D-7669, Part1
AD 2. Planetary Data System Standards Reference, August 1, 2003, Version 3.6, JPL, D-7669, Part 2
AD 3. Consert User Manual Orbiter RO-OCN-TN-3044 (replaced by [AD 16])
AD 4. Consert User Manual Lander RO-LCN-TN-3048 (replaced by [AD 16])
AD 5. Mission Calender RO-ESC-TN-5026
AD 6. Consert experiment ; description and performances in view of the new targets. Rosetta. The new Rosetta targets. W. Kofman, A. Herique, J-P. Goutail, and Consert team. Edited by L. Colangeli et al., Kluwer Academic Publishers, 2004
AD 7. ROSETTA MISSION: Surface Science Instruments for Champollion and Roland, Comet Nucleus Sounding Experiment by Radio wave Transmission CONSERT, volume I, Investigation and Technical Plan
AD 8. ROSETTA Archive Conventions RO-EST-TN-3372 Issue 9, Rev. 0, 20 Oct 2015
AD 9. CDMS Command and Data Management System - Subsystem Specification RO-LCD-SP-3101 29/08/2001, Issue 3, Rev. 5
AD 10. Rosetta Time handling RO-EST-TN-3165, issue 1 rev 0, February 9, 2004
AD 11. CDMS Command and Data Management System - Operation Manual RO-LCD-SW-3402 12/02/2001, Issue 1, Rev. 2
AD 12. DDID- Data Delivery Interface Document RO-ESC-IF-5003 Issue B6 23/10/2003
AD 13. ROSETTA Archive Generation, Validation and Transfer Plan, January 10, 2006, Issue 2, Rev. 3, RO-EST-PL-5011
AD 14. The CONSERT instrument for the ROSETTA mission, Advances in Space Research, Volume 24, Issue 9, 1999, pages 1115-1126, Y. Barbin et al.
AD 15. The CONSERT operations planning process for the Rosetta mission, Y Rogez & al., Acta Astronautica, Volume 125, August–September 2016, Pages 212-233, ISSN 0094-5765, http://dx.doi.org/10.1016/j.actaastro.2016.03.010.
AD 16. RO-OCN-TN-3825 CONSERT User Manual (merge, complete and replaces [AD 3] and [AD 4])
AD 17. RO-OCN-TR-3801.PDF : Consert FMO Flight Model Orbiter Integration and calibration V4-0
AD 18. RO-OCN-TR-3802.PDF : Consert FSL integration Calibration V9-0
AD 19. RO-OCN-TR-3805.PDF : FMO-FSL calibration at Kourou V1-1
AD 20. PHILAE localization from CONSERT/ROSETTA measurement, Planet. Space Sci., 117, 475-484, 2015, http://dx.doi.org/10.1093/mnras/stx040.

1.6 Reference Documents

RD 1. O. P. Pasquero, A. Hérique and W. Kofman, "Oversampled Pulse Compression Based on Signal Modeling: Application to CONSERT/Rosetta Radar," in *IEEE Transactions on Geoscience and Remote Sensing*, vol. 55, no. 4, pp. 2225-2238, April 2017.
doi: 10.1109/TGRS.2016.2639449

1.7 Relationships to Other Interfaces

N/A

1.8 Acronyms and Abbreviations

AD	Applicable Document
APID	Application Process IDentifier.
CDMS	Command and Data Management System
CIVA	Cometary Infrared and Visible Analyser
CNES	Centre National d'Etudes Spatiales
CONSERT	Comet Nucleus Sounding Experiment by Radiowave Transmission
DN	Digital Number
DDS	Data Delivery System (ESOC server)
DECW	Data Error Control Word
EAICD	Experiment Archive Interface Control Document
ESA	European Space Agency
ESOC	European Space Operation Center
ESS	Electrical Support System
ESTEC	European Space Research and Technology Center
GRM	Ground Reference Model
HK	Housekeeping
IPAG	*Institut de Planétologie et d'Astrophysique de Grenoble*
LPG	Former Laboratoire de Planétologie de Grenoble (now IPAG)
MJT	Modified Julian Time
OBDH	On Board Data Handling
OBT	On Board Time
NAIF	Navigation Ancillary Information Facility
PDS	Planetary Data System
PECW	Packet Error Control Word
PI	Principal Investigator
PID	Process Identifier
PSA	Planetary Science Archive
PVV	PSA Volume Verifier
RF	Radio Frequency
S/C	Spacecraft
SCET	Spacecraft Elapsed Time
SFDU	Standard Formatted Data Unit
SONC	Science Operations and Navigation Center (CNES Toulouse)

1.9 Contact Names and Addresses

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2 Overview of Instrument Design, Data Handling Process and Product Generation

2.1 Scientific Objectives

The scientific objectives of the CONSERT experiment on the ROSETTA mission are described in the original proposal (see AD 7) and in a paper (see AD 14). The purpose of the experiment is to determine the main dielectric properties from the propagation delay and, through modelling, to set constraints on the cometary composition (materials, porosity…) to detect large-size structures (several tens of meters) and stratification, to detect and characterize small-scale irregularities within the nucleus. A detailed analysis of the radio-waves which have passed through all or parts of the nucleus puts real constraints on the materials and on inhomogeneities and helps to identify blocks, gaps or voids. From this information we attempt to answer some fundamental questions of cometary physics: How is the nucleus built up? Is it homogeneous, layered or composed of accreted blocks (cometesimals, boulders)? What is the nature of the refractory component? Is it chondritic as generally expected or does it contain inclusions of unexpected electromagnetic properties? With the answer to these questions, it should also be possible to provide answers to the basic question of the formation of the comet. Did it form directly from unprocessed interstellar grain-mantle particles or from grains condensed in the presolar nebular? Did the accretion take place in a multi step process leading first to the formation of cometesimals which then collided to form a kilometre size body?

2.2 Instrument Design

Our experiment concerns the rough tomography of the comet nucleus performed by the CONSERT instrument (COmet Nucleus Sounding Experiment by Radiowave Transmission). This tomography is not a full tomography because it will be performed on a limited number of slices with only one mobile and one fixed sensor. It works as a time domain transponder between one module which lands on the comet surface (Lander) and another which flies around the comet (Orbiter). *Figure 1* gives a schematic diagram of the experiment which is detailed in AD 14. Basically, a 90 MHz sinusoidal waveform is phase modulated by a pseudorandom code or PSK (Phase Shift Keying) Coding. Such frequency, in the radio range, is expected to minimize the losses during the propagation inside the comet material and the generated pulse code maximizes the signal to noise ratio. In these experimental conditions great attempt is made on the good measurement of the mean dielectric properties and on the detection of large size embedded structures or small irregularities within the comet nucleus.

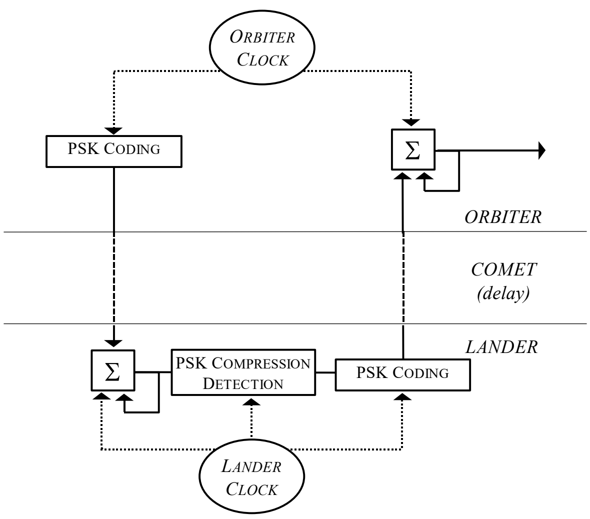


Figure 1 : Block diagram of the CONSERT experiment. The coded signal is emitted from the Orbiter. The Lander makes a coherent addition and a detection of the correlation principal peak. A clean coded signal is finally emitted with the found delay. The Orbiter accumulates the signal and send it to the earth (via the satellite interface).

The complete CONSERT experiment is composed of:

- One Orbiter part (Electronics, antenna, harness)
- One Lander part (Electronics, antennas, harness)

Each scientific measurement sequence (called scanning sequence) involves the orbiter and the lander parts, by transmitting radio waves through the comet nucleus.
The duration of a scanning sequence is typically of the order of one revolution around the nucleus. It should correspond to the time when the Lander and the orbiter are separated by the comet.

Each measurement sequence have to begin in visibility orbiter-lander to perform the synchronization between the two units. This is the tuning phase. Between visibility and occultation, CONSERT instrument is waiting, not taking measurements. Some minutes before the occultation occurs, CONSERT starts its scientific measurement, acquiring the signal passing through the comet nucleus. This is the “ping-pong” phase of the CONSERT measurement sequence.

In a first order approach, one can consider that the number of samples taken around a spherical comet for a full rotation is given by the following formula:

2 * PI * Radius of comet / (lambda/2)

Where lambda is wavelength

During the scanning sequence, for a circular comet with a 750m radius, about 3000 individual measurements, called soundings are taken. The individual duration of this sounding is less than one second.

The general structure of the CONSERT operational scenario does not depend on the comet type that is explored during the Rosetta mission. But a certain amount of the parameters depend on the shape and size of the comet nucleus and of the orbit of the spacecraft and nucleus rotation.

When the comet nucleus was still unknown, we had to make assumptions on the CONSERT operation scenarios. When the information about the comet shape and dynamical parameters where available, we had a more complete approach described in [AD 15].

The initial first order assumptions used to derive the numerical parameters are in this document:

- Radius of the comet nucleus: 500 to 1500 m; **Nominal radius = 750 m**
- Spacecraft orbit period around the comet: Minimum 3 hours
  Nominal: 10 hours
  Maximum: 30 hours
- Number of CONSERT soundings during one orbit: 3000

Parameters:

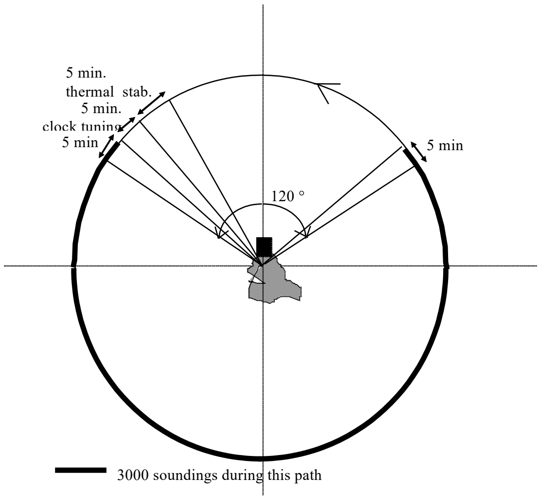
- T ON $_O$: CONSERT /Orbiter switch-on time (in UT)
- T ON $_L$: CONSERT /Lander switch-on time (in UT)
- TUNESTART $_O$: Start time for CONSERT/Orbiter Clock Tuning mode (in UT)
- TUNESTART $_L$: Start time for CONSERT/Lander Clock Tuning mode (in UT)
- SOUND START: CONSERT/Orbiter & CONSERT/Lander sounding start time (in UT)
- NB SOUND: total number of soundings performed by CONSERT/Orbiter & CONSERT/Lander
- DELTA SOUND: period between each sounding

The Rosetta Orbiter Spacecraft should be able to initiate the CONSERT Orbiter instrument Switch-on, Switch-off and Clock tuning time-tagged procedures with a time accuracy of 10 seconds with respect to ground UT.

The Rosetta Lander Spacecraft should be able to initiate the CONSERT Lander instrument Switch-on, Switch-off and Clock tuning time-tagged procedures with a time accuracy of 10 seconds with respect to ground UT.

Typical values of these numbers:

We suppose here that the soundings are made during the two third orbit 'behind' the comet and 5 minutes before and after this 2/3 turn.



T ON o: calculated on ground, based on orbit

T ON $_L$: calculated on ground, based on orbit

TUNESTART $_O$ = T ON o + 5 minutes

TUNESTART $_L$ = T ON $_L$ + 5 minutes

And: TUNESTART $_O$ = TUNESTART $_{L+}$ 30 seconds (+/- 20 seconds)

SOUNDSTART = TUNESTART + 5minutes

The time accuracy that the experiment requires defines the necessary clock stability. This accuracy is given by the time-transponder structure of CONSERT. The simplest explanation of this technique is to imagine Philae as a simple reflector of the signal coming from Rosetta. The signal is thus measured in the time reference of Rosetta and this enables one to relax the constraints on the stability of clocks. It is technically impossible to use Philae as a simple reflector; but it is possible to use it as a delayed active reflector.

In practice, both the orbiter and Philae have their own clocks. Both clocks are tuned and they drift during the experiment. This small frequency shift induces a drift of Philae internal time relative to the orbiter one. This drift is by-passed by the in-time transponder structure of the experiment.

- During a single measurement sequence the orbiter transmits a long signal lasting 200 ms but Philae receive the signal for only 26 ms. This localisation of Philae's receiving window within the orbiter transmitting window has to be preserved during the whole of the CONSERT measurement cycle (up to 10h). This is the first constraint on the clock accuracy.

- The transmitted signal is periodic and consists of the repetition of a 25.5µs-long Binary Phase Shift Keying (hereafter BPSK) code. At Philae, this signal is coherently accumulated with this period of 25.5µs. To have a coherent summation during the 26ms receive window, the lander carrier phase used for the signal demodulation has to remain coherent with the orbiter one. This is the second clock accuracy constraint, improving the signal to noise ratio.

- At Philae, the received signal is convolved with the BPSK code and the arrival time of the main propagation path is measured. This epoch is the time reference for the second wave transmission: a known delay after this epoch, Philae transmits the BPSK signal lasting 200 ms which is received during 26 ms and accumulated by the orbiter. This signal is processed on ground. The arrival time of the main propagation path corresponds to twice the main propagation delay (one for each propagation way) plus the known delay added by the lander. This is because the lander was synchronized on the main path (shortest one) and due to the fact that on the time scale of measurements the orbiter is almost stationary, the paths between Philae and the orbiter and the orbiter and Philae are the same. This transponder processing delay has to be known with accuracy compliant with the scientific requirements on the propagation delay accuracy (third clock constraint).

To summarize, the propagation from the orbiter to Philae synchronizes both time systems while the scientific measurement is in the propagation from Philae to the orbiter. These constraints on the clocks stability allow a relaxation to $\Delta f/f = 10^{-7}$ during a 10-hour period. The time diagram for the synchronization principle is shown *Figure 2*.

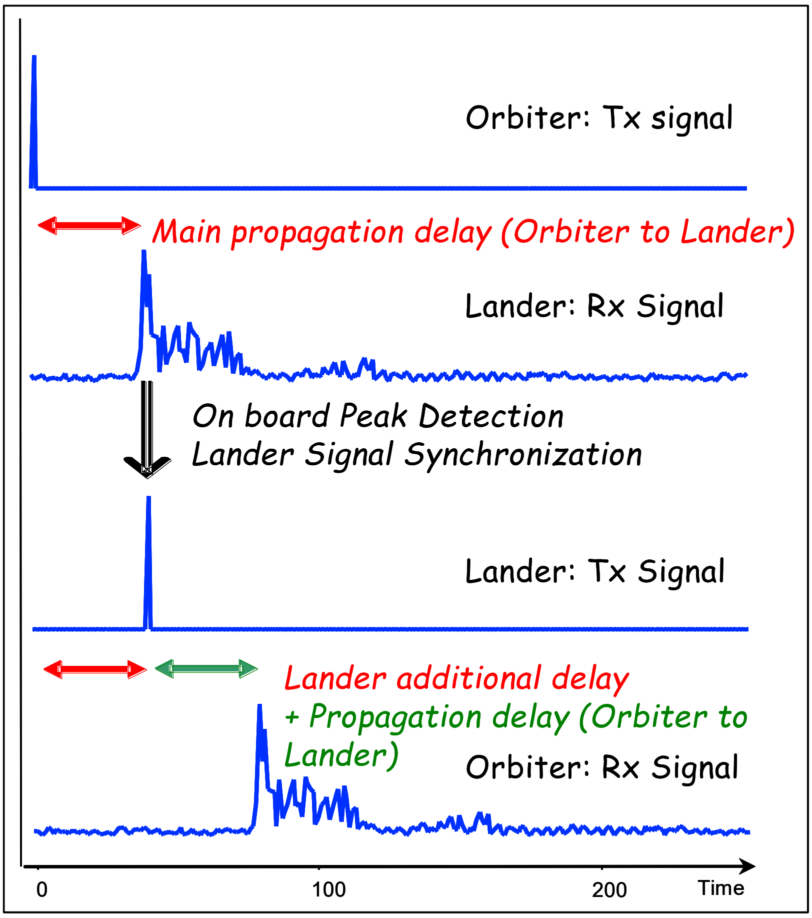


Figure 2 : In-Time transponder

The description of the instrument is done in AD 3, AD 4, AD 6, AD 15 and AD 16.

CONSERT acquired signals are collected from both orbiter unit and lander units. By regards to data rate constraints on Philae, the main source of data is given on CONSERT orbiter data with 255 samples signal on I and Q channels. CONSERT lander data provides information on the transponder peak detection with a shortened and compressed signal (21 samples). In addition, periodically typically every 25 soundings, CONSERT lander provides also a long 255 samples signal. The 255 samples signal in the Level 2 archive data are not compressed and should be processed with inter-correlation of the code (also provided in the archive).

2.3 Data Handling Process

The SONC and the IPAG are responsible for PDS CONSERT (Orbiter and Lander) data sets generation and delivery to the PSA. The SONC for the L2 format, the IPAG for all the other levels.

The CONSERT telemetry data are provided by the ESA DDS (Data Distribution Server). Following the operations plan the SONC/IPAG pulls out archived packets (Science, HK, ACK, EVENT) by direct request to the DDS via FTP.

SONC Process:

As soon as they are received, the raw data packets are passed through data processing software. The SONC data processing system takes as input raw telemetry data (packets) and reconstructs the scanning sequence. Each record of the resulting data contains information from one sounding (housekeeping, I and Q signals, correlation peak …). There are two processors, one for the Lander and one for the Orbiter.

The following data are immediately available through W3-SONC server (http://soncv2-rosetta.cnes.fr) and the authorized[1] users can get them for a selected time interval:

- Raw telemetry packets (SC, HK, EVENT, ACK) as binary files
- SONC level 0 data as binary files arranged in chronological order containing one all information (SC and HK) from one sounding per record).

Moreover, the W3-SONC provides interactive plots of CONSERT science and housekeeping data.

The delivery format in Level 2 is described in this document.

IPAG Process:

Based on the raw telemetry data and Level 2 products, IPAG processes the CONSERT signal and produces higher level products:

- Level 3 : Calibrated data and geometry files
- Level 4 : Post-processed and derived scientific measurements (signal time of flight)

No software is delivered to process the data.
For any questions refer to contacts in section 1.9.

2.4 Overview of Data Products

2.4.1 Pre-Flight Data Products

The IPAG provided pre-flight data obtained during on ground tests and calibrations during Kourou Tests in September 2003. They are improved with lab tests sequences which constitutes separated data sets. Those datasets are only useful for calibration purposes. The on-ground calibration measurements were performed between the CONSERT Flight Model Orbiter (FMO), the Flight Spare Lander (FSL) and the CONSERT lab bench. All these datasets are referred to the “GROUND” phase with target “CALIBRATION”. Full data volumes and documentation are provided as CODMAC Level 2 for FMO, FSL and bench. The Level 3 are only for FMO and FSL data.

[1] The authorization is controlled by PI. At his request, SONC delivers a login/password to the authorized user.

2.4.2 Instrument Calibrations

Due to the design of the instrument, there is no systematic internal on-board calibration data. The calibration of the instrument is a post-process performed to produce Level 3 data by using mostly the on-ground data sets and thermal information provided in ancillary data for Level 3.

2.4.3 In-Flight Data Products

The science data are the propagation channel of the comet nucleus as a function of time:

- The propagation time is the main data to be inverted and its accuracy is guaranteed by the CONSERT clock absolute accuracy and stability.
- The signal amplitude can also provide information about the nucleus structure but there is no internal calibration channel to increase the link budget accuracy.

These information is derived in high level products (L4). For lower level products, the raw (L2) and calibrated (L3) signals are provided. These signal data come along with instrumental parameters for each sounding (e.g. sounding number, instrument internal time stamps, temperatures, oscillator tuning result…). The details are described in Level related chapters.

CONSERT doesn’t use a cross-instrument calibration and cross-instrument scientific analysis.

The in-flight data correspond to all the on board data. They can be produced during following mission phases:

Table 1 Mission phases

MISSION_PHASE_NAME	Abbreviation	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	CONSERT data (1)	
				C. Lander	**C. Orbiter**
Commissioning (part 1)	CVP1	05/03/2004	06/06/2004	**X**	
Cruise 1	CR1	07/06/2004	05/09/2004		
Commissioning (part 2)	CVP2	06/09/2004	16/10/2004	**X**	
Earth Swing-by 1 (including PC#0)	EAR1	17/10/2004	04/04/2005	**X**	**X** (HK)
Cruise 2 (including PC#1,2)	CR2	05/04/2005	28/07/2006	**X**	
Mars Swing-by (including PC#3,4,5)	MARS	29/07/2006	28/05/2007	**X**	
Cruise 3	CR3	29/05/2007	12/09/2007		
Earth Swing-by 2 (including PC#6,7)	EAR2	13/09/2007	27/01/2008	**X**	
Cruise 4-1 (including PC#8)	CR4A	28/01/2008	03/08/2008	**X**	
Steins Flyby	AST1	04/08/2008	05/10/2008		
Cruise 4-2 (including PC#9)	CR4B	06/10/2008	13/09/2009	**X**	
Earth Swing-by 3 (including PC#10)	EAR3	14/09/2009	13/12/2009	**X**	
Cruise 5 (including PC#12)	CR5	14/12/2009	16/05/2010	**X**	
Lutetia Flyby	AST2	17/05/2010	03/09/2010		
RV Manoeuver 1 (including PC#13)	RMV1	04/09/2010	07/06/2011	**X**	
Cruise 6	CR6	08/06/2011	20/01/2014		
RV Manoeuver 2	RMV2	21/01/2014	09/09/2014	**X**	
Post Hibernation Commissionning	PHC	09/04/2014	23/04/2014	**X**	
Pre-delivery calibration Science	PDCS	13/07/2014	17/10/2014	**X**	

(1) The last column indicates if CONSERT data are available

After the release of the Lander, we distinguish four phases, characterized by:

- The Start and Stop dates need to be expressed in seconds
- The Lander has its own Auxiliary data

Separation/Descent/Landing	SDL	2014/11/12 08:30:00	2014/11/12 15:34:04	**X**
Rebounds	RBD	2014/11/12 15:34:05	2014/11/12 17:30:20	**no data**
First Science Sequence	FSS	2014/11/12 17:30:21	2014/11/15 01:00:00	**X**
Long Term Science	LTS	2014/11/15 01:00:00	2016/01/01 07:00:00	**X (OCN only)**

During the LTS phase, CONSERT was commanded in the scope of the lander search campaign. Upon these operations, only the one on 09/07/2015 returned LCN telemetry data (without signal). OCN operated nominally for all these operations.

The CONSERT data products are edited raw data organized according to soundings. Each record in the file contains all information related to a sounding (including tuning data).

2.4.4 Ancillary Data Usage

CONSERT archive uses ancillary data to provide different additional information to the signal itself and associated sounding parameters. Typically for CONSERT currents, temperature sensors and OCXO tuning frequency. In level 2 archive, the temperature and frequency values are given in ADC raw units ("ADC_COUNTS", as stated in the FMT description file). Currents are given in mA. In the level 3 archive, they are converted into physical units. The conversion formulas are given in Appendix 0.

Information is provided on Rosetta high-gain antenna parameters and solar panel positions in CONSERT archive data (AOCS files in DATA directory). They are extracted from the S/C database. Below table gives the signification of extracted parameters:

Table 2: Rosetta S/C AOCS parameter full description

AOCS Param. Lbl	AOCS short description	Full description for parameters of interest
NACW1102	APME Cur Onbrd Cmd Elv	
NACW1103	APME Cur Onbrd Cmd Az	
NACW1104	APME Ground Cmd Elev	
NACW1105	APME Ground Cmd Az	
NACW1106	APME Encdr Measured Elev	Measured elevation angle of the high gain antenna in raw units (L2) or degrees (L3 and up)
NACW1107	APME Encdr Measured Azi	Measured azimuth angle of HGA in raw units (L2) or degrees (L3 and up)
NACW1300	SADE Grd Cmd Ang Pos YP	
NACW1301	SADE Grd Cmd Ang Pos YM	
NACW1304	SADE Cmd Ang Position YP	
NACW1305	SADE Cmd Ang Position YM	
NACW1306	SADE Measured Ang Pos YP	Measured angular position of the +Y axis solar panel in raw units (L2) or degrees (L3 and up)
NACW1307	SADE Measured Ang Pos YM	Measured angular position of the –Y axis solar panel in raw units (L2) or degrees (L3 and up)

CONSERT needs the following geometric orbitography data in a Comet Fixed Frame:

- The Orbiter and Lander positions with 1 m resolution.
- A model of the comet surface with 1 m resolution

For Level 3 and above, the orbitography is provided as data tables giving position vectors, velocity vectors and attitude quaternions for each sounding. These values have been processed using the NAIF Spice toolkit and Rosetta relevant kernels provided by ESA. The Spice toolkit provide routines and techniques in several programming languages to compute geometry information for space-based instruments and robotic exploration (http://naif.jpl.nasa.gov/naif/).

The shape model is not provided in CONSERT archive, as it is produced by Rosetta OSIRIS team.

In Philae archive, the Lander Auxiliary Data on the comet (Position/Orientation/Illumination at any time + Comet models + Ancillary Data from the instruments) will be available in an ANCDR (Ancillary Data Record) whose definition is in progress, pending the Lander auxiliary data reconstruction.

3 Archive Format and Content

3.1 Format and Conventions

Data processing level number used in CONSERT naming scheme conforms to CODMAC norm. Level 2 (SONC level 0), Level 3 and Level 4 data are provided.

Level 2 is defined as follows: Edited Data Corrected for telemetry errors and split or de-commuted into a data set for a given instrument. Sometimes called Experimental Data Record. Data are also tagged with time and location of acquisition. It corresponds to NASA Level 0 data. The signal is not compressed (matched filter is not applied), please refer to Appendix 0 for more details. (cf. section 4)

Level 3 is defined as calibrated data. It includes: calibrated and compressed data (after matched filter), calibrated time of measurement on the orbit, position on the orbit. (cf. section 5)

Level 4 data is defined as re-interpolated data. They include signals with finer resolution generated through a specific interpolation method. They also include precise time of arrival measurements. Those measurements have been calibrated in the radar propagation time domain. (cf. section 6)

3.1.1 Deliveries and Archive Volume Format

A data set is delivered for each **simple mission phase** (see Table 2-1 and AD 8 for simple mision phase definition)**.** Each data set contains **only one level data processing**. The formats, naming and conventions are common for all levels, but some of the data are only relevant for some Levels. For details, please refer to Levels specific description chapters.

The list of mission phases is given in AD 8.

3.1.2 Data Set ID Formation

DATA_SET_ID = <INSTRUMENT_HOST_ID>-<target id>-<INSTRUMENT_ID>-<data processing level number>-<mission phase abbreviation>-<description>-<version>

DATA_SET_NAME = <INSTRUMENT_HOST_NAME> <target name> <INSTRUMENT_ID> <data processing level number> <mission phase abbreviation> <description> <version>

See AD 8.

Examples of DATA_SET_ID and DATA_SET_NAME for CONSERT data obtained in-flight during CVP :

DATA_SET_ID = "RO/RL-CAL-CONSERT-2-CVP-V1.0"
DATA_SET_NAME = "ROSETTA-ORBITER/ROSETTA-LANDER CVP CONSERT 2 V1.0"

3.1.3 Data Directory Naming Convention

See §4.2.3

3.1.4 File naming Convention

3.1.4.1 Data files

The file naming for the DATA files is produced as follows:

{**exp**}_{**inst**}_{**level**}_{**begin of observation**}.{**ext**}

- **exp** (2 characters) = CN (fixed)
- **inst** = instrument origin :
    - O for Orbiter
    - L for Lander
    - A for auxiliary data AOCS

  <u>L2 only :</u>
    - T for auxiliary data, CONSERT Orbiter e-box and antenna temperatures
    - C for auxiliary data, CONSERT Orbiter e-box current
    - X for auxiliary data, CONSERT Lander e-box temperature (main and redondant)
    - Y for auxiliary data, CONSERT Lander e-box current

  <u>L4 only:</u>
    - L_LONG for long signal data (Lander)

- **level** (1 character) = data processing level number norm CODMAC
  (CONSERT archives only level 2, level 3 and level 4 data)
  begin of observation (13 characters) = time of measurement in UTC yymmddThhmmss (e.g 020415T100013) :
    - yy = year
    - mm = month
    - dd = day
    - hh=hour
    - mm = minute
    - ss = secondes
- **ext** = extension of file. For CONSERT possible extensions are:
    - LBL for label file associated to data file .TAB or .DAT
    - TAB for ASCII tables (low volume and low precision data)
    - DAT for binary tables (high volume and/or high precision data)

Five file types will be generated in the data directory. Two with the same format: one for Lander instrument and one for the Orbiter instrument. Both files are located in the same directory. They contain complete information (science and housekeeping) related to all the soundings of a measurement sequence. The other three files concern the auxiliary data: solar panel (AOCS), the platform current (e-box) and temperature (e-box and antenna).

For the Level 2, each file corresponds to a slot:

- A slot is a consecutive sequence of operation with a maximum gap of 10 days between two successive operations. In practice, during cruise, a payload checkout test is a slot.
- This gap of 10 day is reduced at 4 days during the comet phase.

Ex. : CN_O_2_100221T122501.DAT
The file contains the CONSERT Orbiter slot beginning at 2010/02/21 12:25:01 (level 2)

3.1.4.2 Geometry files

The file naming for the GEOMETRY files is produced as follows:

{**exp**}_{**G**}_{**inst**}_{**mission phase and sub-phase**}.{**ext**}

- **exp** (2 characters) = CN (fixed)
- **G** = G for Geometry file (fixed)
- **inst** = instrument origin :
  - O for Orbiter
  - L for Lander

- **Mission phase and sub-phase** = mission phase and sub-phase during which the CONSERT data were acquired.
  - FSS Philae's First Science Sequence, during which the CONSERT science measurements were performed.
  - FSSRNG_{**X**} Philae's First Science Sequence, during which the CONSERT ranging measurements for Philae localization were performed.
    - **X** = The Philae's operation block during which the ranging measurements were performed.
      - **61** Philae operation FSS block 6.1
      - **62** Philae operation FSS block 6.2
      - **F** Philae operation FSS block Final

The naming of phases and sub-phase have been chosen as reference to the Philae localization work [PHILAE localization from CONSERT/ROSETTA measurement, Planet. Space Sci., 117, 475-484, 2015, http://dx.doi.org/10.1093/mnras/stx040.AD 20]. These phase have the following time spans (concerning CONSERT acquisitions):

Phase / sub-phase	Start UTC time	Stop UTC time
FSS	2014-11-12T18:56:40.258	2014-11-13T05:41:10.841
FSSRNG_61	2014-11-13T22:04:26.788	2014-11-13T22:08:29.117
FSSRNG_62	2014-11-14T10:20:50.492	2014-11-14T10:42:22.911
FSSRNG_F	2014-11-14T23:42:00.235	2014-11-14T23:46:00.124

3.2 Standards Used in Data Product Generation

3.2.1 PDS Standards

The archive structure given in this document complies with PDS standard version 3.6.

3.2.2 Time Standards

3.2.2.1 Generalities

This paragraph gives a summary of the different existing formats in the Rosetta Ground segment, from their generation by the instruments to their availability at SONC :

- The Lander CDMS requires the scientific instruments to transmit the data by bursts of 8 or 64 bytes (4 or 32 16-bit words)

- When sufficient data are received, the CDMS builds packets containing 256 bytes of instrument data. The CDMS adds 18 bytes header (unit PID, sequence count, OOBT : Orbiter OBT, data type) and a 2 bytes checksum (DECW) and creates packets with a fixed length of 276 bytes[2]. For transmission between Lander and Orbiter, a 4 bytes synchro header and a 2 bytes trailing checksum (PECW) are added, increasing the packet size to 282 bytes. The extra bytes are removed by the ESS.

  To comply with ESA requirements, the time registered in the CDMS packets is the **OOBT**. It is reconstituted from the LOBT, as shown in Figure 3 :

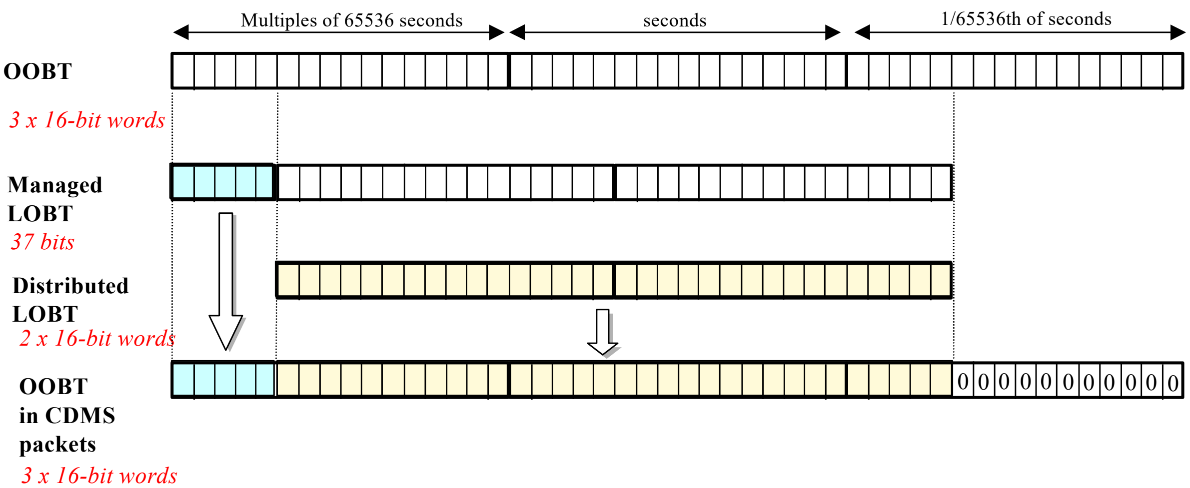


Figure 3 Reconstruction of on board time in CDMS packets

- The ESS groups together several packets and passes them to the Orbiter OBDH, which transmits them according to the Space/Ground interface. This part is transparent for the Lander ground segment.

[2] The Lander CDMS header and the headers of the telemetry source packets from the Orbiter instruments are quite similar. There is a difference in the data field header. The byte containing PUS version, checksum flag and spare fields is set to zero in the CDMS header. Besides the last byte of the OOBT is set to zero in the CDMS header. The CDMS header has an additional word (2 bytes) after the data field header named "FORMAT ID". This word is mainly used for HK data and it contains the HK scanning period and the SID (structure identification).

- The data are delivered by the Rosetta Data Distribution System (DDS) to the SONC in SFDU format. A SFDU file is basically a collection of 276-byte packets interspersed with auxiliary information records. An 18 bytes SFDU header is added to the CDMS 276-byte packets. This header contains information added at the ground station (time correlated OBT, ground station id, virtual channel id, service channel, type of data, time quality)

- SONC processes the SFDU files to retrieve the 276-byte packets. This format is available in the SONC database. After archive formatting, this leads to the Level 2 CONSERT data products.

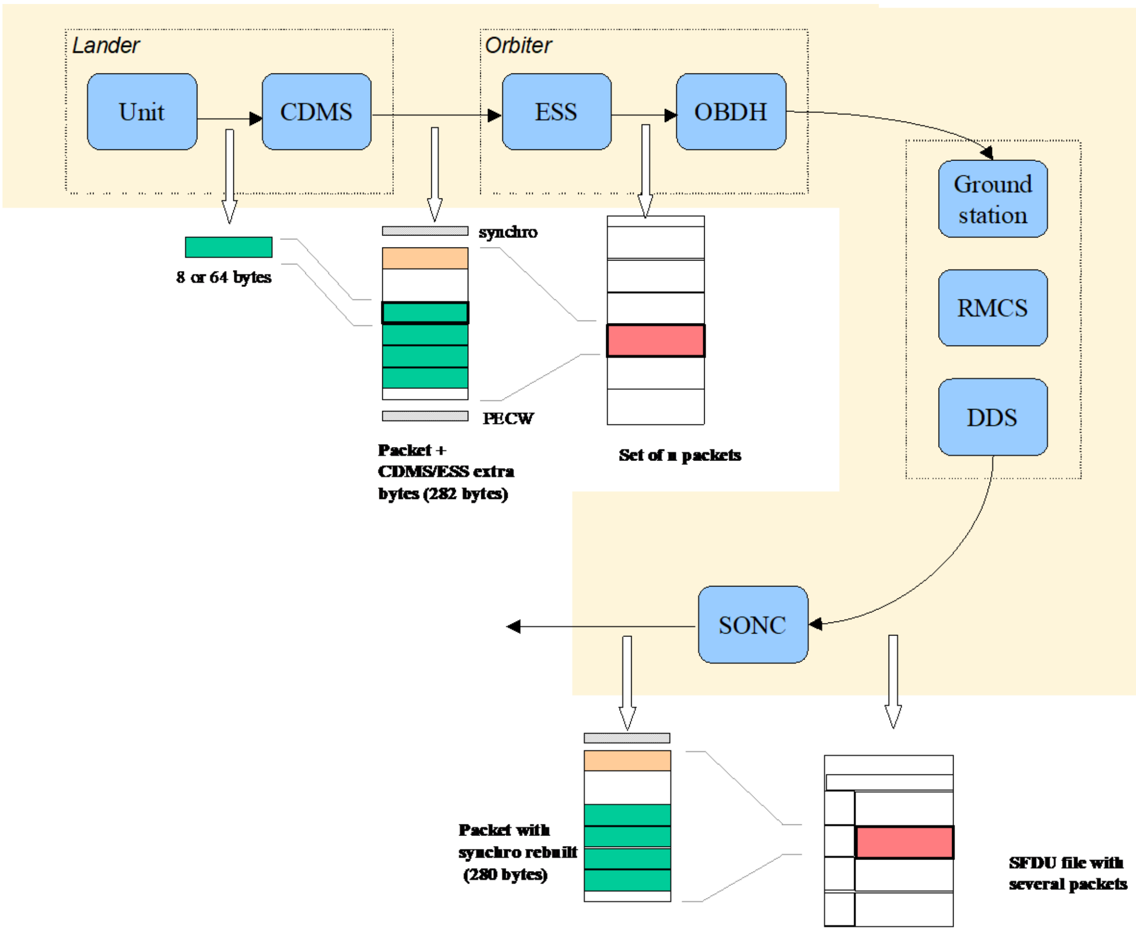


Figure 4 On board data flow

- Then IPAG processes the raw data for calibration (Level 3 data products) and derived scientific values (Level 4 data products).

Figure 4 gives an overview of this data flow.

Only the following principles are applied:

- the packet wrapping is removed, and science frames that had to be split into several raw data packets are rebuilt. Basic error detection controls are applied, to recover from possible problems in the transmission chain.

- the Lander On-Board time (LOBT) (synchronised with OOBT) extracted from the packet, and corresponding UTC time coming from the SFDU header, are added.

- UTC time is calculated from the On-Board time taking into account the On-Board clock drift as following :
UTC (seconds since 01/01/1970) = LOBT(seconds) * Gradient + Offset (these coefficients are extracted from TCP packets delivered by DDS).
LOBT is either the LOBT extracted from CDMS header or the Experiment internal clock when it exists (CIVA, COSAC, PTOLEMY, ROMAP, ROLIS, SESAME). In the last case, it must be taken into account that the Internal clock (32 bits) resets all 4 years, 4 months, 3 days (first reset : 03/04/2007 10 :42 :07).

- in few cases, bit fields are expanded : flags that were stored as bits in the telemetry (to save bandwidth) are stored as integer values instead ; the aim is to ease further processing.

UTC time-stamped Science and HK data are available in the SONC database and used to generate PDS format for level 2 products.

3.2.2.2 CONSERT time standards

3.2.2.2.1 The CONSERT internal Time

There are three different times for CONSERT:

- Rebuilt Time on ground : SCET Time (in SFDU Header)
- On-Board Set Time : OBT time
- CONSERT own Time: counter in TIC sets to zero when CONSERT is turned on and resets to zero after tuning phase, allows the precise synchronization between CONSERT Orbiter and CONSERT. Lander

All the CONSERT operation are synchronized on the CONSERT own Time. This times are given in TIC:
1 TIC = $2^{14} / 10^{7}$ = 1.6384 millisecond

3.2.2.2.2 The Lander On-Board Time (LOBT)

The instruments on board the spacecraft (Orbiter) generate telemetry source packets with an OOBT (orbiter on board time) time stamp in the header.
The OOBT written into the packet header specifies the time, when CDMS can complete a packet.

In terms of HK packets this is the time of the last HK word. Using the HK scanning rate, which is given in word #9 of the packet, one can calculate the OBT of every individual word in this packet. Note that this is only valid if packets with SID (word #9) 1 or 2 are generated. Packets with SID 4 and 5 are “snapshots”, which means you can apply the packet OOBT for every word in this packet. SID 3 packets have to be analysed case by case.

In terms of SC packets this is the reception of the last 32 word block by CDMS, which also completes the SC packet. How often 32 word blocks are created (and sent) by the unit, and corresponding to this the delta time between each block, might be different for each unit. So, re-calculation of OOBT for SC words depends on this unit feature.

The Orbiter On-Board Time (OOBT) is a linear binary counter having a resolution of 1/65536 sec stored in 3 16-bit words.

The <u>Lander On-Board Time</u> (LOBT) is a linear binary counter having a resolution of 1/32 sec, kept in 37 bits. Only the 32 least significant bits are distributed to the instruments, in 2 16-bit words. The 5 most significant bits are supposed constant during most of the mission, they are available through a specific service.
The LOBT is derived from the Orbiter On-Board Time (OOBT) : the 11 least significant bits of the OOBT are discarded to obtain the LOBT, hence the reduced resolution. A re-synchronization between OOBT and LOBT is performed regularly (see AD 9).
The Lander is synchronized prior to Separation and during every RF link after landing. So, during descent

and the First Science Sequence this should not be a problem, since LOBT is kept synchronized as long as the Lander is powered.

Technical details about Synchronisation of Lander On-board Time can be found in § 2.3.2.6 AD 9.

For a description of time handling in the Rosetta project see AD 10.
For a description of Lander on board time handling see AD 9 :
§ 2.3.2.6 Synchronisation and Adjustment of Lander On-board Time
§ 2.3.2.6.1 Absolute vs. relative time references
§ 2.3.2.6.2 On-board Time Failure Modes and Recovery Procedures
and AD 11 § 6. About Lander On-board Time.

3.2.2.2.3 The DDS header time correlated

The OOBT is converted to UTC (Coordinated Universal Time) by means of time correlation and included in the additional DDS packet header when the packets are distributed via the DDS server.
The **DDS header time correlated** (SCET field in the DDS header) is the UTC of the start of measurement derived from the OOBT by time correlation.

Its format is the Sun Modified Julian Time (MJT) i.e. two 32 bit integers. The first (MSB) contains the number of seconds since 00:00:00 on 1st January 1970 and the second (LSB) integer the number of micro-seconds from seconds in the first field.

Time correlation is described in AD 12 § 18.1.2.1.

3.2.2.2.4 The UTC

The **UTC** used as time stamp for CONSERT data products (level 2) is obtained from the OOBT and LOBT.
The start of LOBT = 01/01/2003 0h.

This UTC time is of the main interest for geometry.

For level 3 and higher, CONSERT sounding times are given in a UTC time calibrated on the wave propagation mid-time. The details of the time calibration will be described along with level 3 product archive.

3.2.2.2.5 Spacecraft Clock Count in PDS Labels

The PDS keywords SPACECRAFT_CLOCK_START_COUNT and SPACECRAFT_CLOCK_STOP_COUNT refer to LOBT.
The LOBT is represented in the following format:
SPACECRAFT_CLOCK_START/STOP_COUNT = “<reset number>/<unit seconds>.<fractional seconds>”
The unit seconds and the fractional seconds are separated by the full stop character. **Note that this is not a decimal point.** The fractional seconds are expressed as multiples of 2^{-5} = 0.03125 seconds and count from 0 to 2^5-1 = 31. E.g. in SPACECRAFT_CLOCK_START_COUNT = “3/356281394.21” the 21 fractional seconds correspond to 21 × 2^{-5}= 0.65625 decimal seconds.
The reset number is an integer starting at 1, i.e. “1/” means LOBT = 0 at 2003-01-01T00:00:00 UTC.

3.2.3 Reference Systems

CONSERT uses the Comet Fixed Frame reference system in which Philae is fixed when landed at the surface of the comet nucleus. All reference systems used to produce geometry ancillary data are based on the NAIF SPICE system (cf. 2.4.4).

4 Level 2 Specifications and Design

This part will describe the L2 design and specifications.

4.1 Data Validation

The CONSERT data products are delivered to PSA by SONC. All the data produced by SONC are validated by CONSERT PI. These data are also distributed via the W3-SONC server and used by all the experiment team.

All the data are published in the archive.

4.1.1 Data Quality ID

Data quality ID is equal to:

- 0 when there is a good quality (less than 30% of loss)
- 1 when there is a bad quality (more than 30% of loss)

.

4.2 Content

4.2.1 Volume Set

One volume corresponds to one data set. The possible values of VOLUME keywords can be found in AD 8. The volume keyword values for the CR4A mission phase are given in the following example.

```
VOLUME_NAME                 = "CONSERT RAW DATA FOR THE
                                 CR4A PHASE"
 VOLUME_SERIES_NAME          = "ROSETTA SCIENCE ARCHIVE"
 VOLUME_SET_ID               = "FR_CNRSUG_IPAG_RORLCN_10XX"
 VOLUME_SET_NAME             = "ROSETTA COSAC DATA"
 VOLUME_ID                   = "RLCOS2_1007"
 VOLUME_VERSION_ID           = "VERSION 1"
 VOLUME_FORMAT               = "ISO-9660"
 MEDIUM_TYPE                 = "ELECTRONIC"
 VOLUMES                     =  15
 PUBLICATION_DATE            = 2006-11-13
 DESCRIPTION                 = " This volume contains data
                                  and supporting documentation
                                  from the Rosetta CR4A
                                  mission phase "
```

4.2.2 Data Set

The CONSERT data are archived in as many Data Sets as simple mission phase (Table 2-1 and AD 8) and level data processing. The descriptions of the fields of the keywords DATA_SET_ID and DATA_SET_NAME are given in the following table.

Field of DATASET_ID or DATA_SET_NAME	**DATA_SET_ID**	**DATA_SET_NAME**

INSTRUMENT_HOST_ID / INSTRUMENT_HOST_NAME	RO/RL	ROSETTA-ORBITER/ROSETTA-LANDER
Target id / target name	See AD 8	See AD 8
INSTRUMENT_ID	CONSERT	
Data processing level number	CODMAC level 2 (contains level 2 science and housekeeping data)	
mission phase abbreviation	See AD 8	
description	Field not used in DATA_SET_ID	Field not used in DATA_SET_NAME
version	The first version of a data set is V1.0	

4.2.3 Directories

The organisation (directories) of a level 2 dataset is shown below.

```
                        |-AAREADME.TXT
                        |-CATALOG-
                        |         |--2004-
                        |-DATA------|
                        |           |--2005-
                        |           |--2006-
                        |           |-- …
|-root directory------ |           |--2016-
                        |-DOCUMENT-
                        |-INDEX-
                        |-LABEL-
                        |-VOLDESC.CAT
```

4.2.3.1 Root Directory

File Name	**Contents**
AAREADME.TXT	Volume content and format information
VOLDESC.CAT	A description of the contents of this volume in PDS format readable by both humans and computers

The name of the root directory is the data set ID.

4.2.3.2 Calibration Directory

There are no calibration data connected to the measurement.

4.2.3.3 Catalog Directory

The catalog directory provides a top level understanding of the mission, spacecraft, instruments and data sets.The catalog directory contains the following files:

File Name	**Contents**
CATINFO.TXT	A description of the contents of the catalog directory
DATASET.CAT	Data set information
INST.CAT	Instrument information

INSTHOST.CAT	Instrument host (spacecraft) information
MISSION.CAT	Mission information
REF.CAT	Full citations for references mentioned in any and all of the catalog files, or in any associated label files.
PERSON.CAT	PDS personnel catalog information about the instrument team responsible for generating the data products. There is one file for each instrument team providing data to this data set.
SOFTWARE.CAT	Information about the software included in the SOFTWARE directory

4.2.3.4 Index Directory

The index directory contains the indices for all data products on the volume. The following files are included in the index directory:

4.2.3.4.1 Dataset Index File, INDEX.LBL and INDEX.TAB

File Name	Contents
INDEX.LBL	PDS label for the volume index file, INDEX.TAB
INDEX.TAB	Volume index in tabular format
INDXINFO.TXT	A description of the contents of the Index Directory

4.2.3.5 Geometry Directory

The geometry (Rosetta and Philae positions and attitudes) for CONSERT instrument acquisition points is available only for Level 3 and Level 4. This is due to the calibration and processing needed to set exact sounding times, which is not available in Level 1 and Level 2 data.

4.2.3.6 Label Directory

The label directory contains include files (FMT files with label definitions) referenced by data files on the data set. The following files are included in the index directory:

File Name	Contents
LABINFO.TXT	A description of the contents of this directory (.FMT files)
AOCS.FMT	Edited auxiliary (AOCS) data
CN_AUX.FMT	Edited auxiliary data (e-box current and e-box and antenna temperatures)
L0_PARAMETER_DEF.FMT	Edited SC and HK data for Orbiter and Lander

4.2.3.7 Document Directory

This directory contains all original documents necessary to understand the data.
The following files are included in the document directory:

File Name	**Contents**
DOCINFO.TXT	Identifies and describes the function of each file in the DOCUMENT subdirectory.
EAICD_CONSERT.LBL	PDS label of EAICD_CONSERT.PDF
EAICD_CONSERT.PDF	CONSERT EAICD (this document)
CONSERT_COMPRESSION_CODE.LBL	PDS label of file CONSERT_COMPRESSION_CODE.TAB
CONSERT_COMPRESSION_CODE.TAB	File containing the compression code
RORL_CN_LOGBOOK_*ph*.LBL	PDS label of file RORL_CN_LOGBOOK_*ph*.ASC
RORL_CN_LOGBOOK_*ph*.ASC	Logbook of CONSERT operations during mission phase *ph*
RO-OCN-TR-3801.LBL	PDS label of file RO-OCN-TR-3801.PDF
RO-OCN-TN-3067.LBL	PDS label of file RO-OCN-TN-3067.PDF
RO-OCN-TN-3067.PDF	CONSERT commissionning report
RO-OCN-TN-3802.LBL	PDS label of file RO-OCN-TN-3802.PDF
RO-OCN-TN-3802.PDF	CONSERT In-flight operation test report
RO-OCN-TN-3825.LBL	PDS label of file RO-OCN-TN-3825.PDF
RO-OCN-TN-3825.PDF	CONSERT User Manual Orbiter & Lander
RO-OCN-TN-3850.LBL	PDS label of file RO-OCN-TN-3850.PDF
RO-OCN-TN-3850.PDF	CONSERT stop&start procedure description
RO-OCN-TN-3851.LBL	PDS label of file RO-OCN-TN-3851.PDF
RO-OCN-TN-3851.PDF	CONSERT operation requests
RO-OCN-TN-3852.LBL	PDS label of file RO-OCN-TN-3852.PDF
RO-OCN-TN-3852.PDF	CONSERT post hibernation commissionning test report
RO-OCN-TN-3866.LBL	PDS label of file RO-OCN-TN-3866.PDF
RO-OCN-TN-3866.PDF	CONSERT operation report : Close Observation (PDCS), SDL, FSS
RO-OCN-TN-3868.LBL	PDS label of file RO-OCN-TN-3868.PDF
RO-OCN-TN-3868.PDF	CONSERT operation report : Long Term Science
RO-OCN-TR-3801.PDF	Consert FMO Flight Model Orbiter Integration and calibration
RO-OCN-TR-3802.LBL	PDS label of file RO-OCN-TR-3802.PDF
RO-OCN-TR-3802.PDF	Consert FSL integration Calibration
RO-OCN-TR-3805.LBL	PDS label of file RO-OCN-TR-3805.PDF
RO-OCN-TR-3805.PDF	FMO-FSL calibration at Kourou
TIMELINE_*ph*.TXT	Timeline ASCII file with the PDS attached label for phase *ph*
TIMELINE_*ph*_DESC.TXT	Description of the timeline file for phase *ph* (PDS attached label)
TIMELINE_*ph*.PNG	Timeline Image file for phase *ph*
TIMELINE_*ph*.LBL	PDS label for image TIMELINE_*ph*_PNG

The phase name (*ph*) is “SDL_RBD_FSS” for comet phase timeline files and “PHC_PDCS” for post hibernation (before separation) files.

4.2.3.8 Data Directory

The structure and naming scheme of the data directory is described in chapter 4.2.3.

The DATA directory also contain AOCS data.

During the Cruise phase (Lander attached on the Orbiter), the Solar Array attitude and the High Gain Antenna attitude impact on the propagation paths between CONSERT Orbiter and Lander antennas. These parameters determine the shape of the calibration signals.

During the Science Phase (Landed Lander) the SA attitude and the HGA attitude impact on the antenna pattern of CONSERT Orbiter (gain, position of the measurement).
The SA attitude and the HGA attitude are given in the files that are one to one mapping of the corresponding SC files. The file naming is the same as for SC data: {**exp**}_{**inst**}_{**level**}_{**begin of observation**}.{**TAB**} with inst = A (for AOCS data).

Finally, the data directory includes the CONSERT BPSK code to be used to apply the matched filter to the signal (cf. Appendix 0 for details).

4.3 Data Sets Definition

The following table gives the definition of the name and id of the CONSERT data sets :

Data Set ID	Data Set Name
RO/RL-CAL-CONSERT-2-GRND-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER GRND CONSERT 2 V2.0
RO/RL-CAL-CONSERT-2-GRNDBENCH-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER GRNDBENCH CONSERT 2 V1.0
RO/RL-CAL-CONSERT-2-CVP1-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CVP1 V2.0
RO/RL-CAL-CONSERT-2-CVP2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CVP2 V2.0
RO/RL-CAL-CONSERT-2-EAR1-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 EAR1 V2.0
RO/RL-CAL-CONSERT-2-EAR2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 EAR2 V2.0
RO/RL-CAL-CONSERT-2-EAR3-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 EAR3 V2.0
RO/RL-CAL-CONSERT-2-MARS-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 MARS V2.0
RO/RL-CAL-CONSERT-2-CR2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CR2 V2.0
RO/RL-CAL-CONSERT-2-CR4A-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CR4A V2.0
RO/RL-CAL-CONSERT-2-CR4B-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CR4B V2.0
RO/RL-CAL-CONSERT-2-CR5-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 CR5 V2.0
RO/RL-CAL-CONSERT-2-RVM1-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 RVM1 V2.0
RO/RL-CAL-CONSERT-2-RVM2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 RVM2 V2.0
RO/RL-CAL-CONSERT-2-PHC-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 PHC V2.0
RO/RL-CAL-CONSERT-2-PDCS-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 2 PDCS V2.0
RO/RL-C-CONSERT-2-SDL-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER 67P CONSERT 2 SDL V2.0
RO/RL-C-CONSERT-2-FSS-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER 67P CONSERT 2 FSS V2.0
RO/RL-C-CONSERT-2-LTS-V2-0	ROSETTA-ORBITER/ROSETTA-LANDER 67P CONSERT 2 LTS V2.0

4.4 Data Product Design

The CONSERT data products delivered to PSA are edited data (CODMAC level 2) in ADC units containing sounding information (from tuning phase to the I and Q signals and correlation peak)

All CONSERT data products have PDS detached labels.

The following data product design applies to data produced by the CONSERT instruments in-flight. The calibration data acquired on ground during the integration phase are described in the specific section 4.4.2.

4.4.1 Data Product Design

The Level 2 CONSERT data products are composed two DAT data files with their two associated LBL label filles. One is for the CONSERT lander (LCN) data with ‘CN_L’ prefix in file naming, while the other is for the CONSERT orbiter (OCN) data ‘CN_O’ prefix in file naming.

The LCN unit outputs two types of signals. One short and compressed signal composed of 21 samples in I and Q and available for each sounding. One long and uncompressed signal composed of 255 samples in I and Q, available for every N-th sounding, with N = FIOW parameter (cf. 2.2 for details).

The OCN DAT file is composed of 3 tables:
- 2 tables with I/Q raw signals: I_TABLE and Q_TABLE. The rows correspond to the CONSERT sounding axis (radar “slow times”) while the items correspond to the signal samples (radar “short times”).
- 1 table with all signal acquisition parameters: L0_TABLE. The columns are detailed in 4.4.1.4.

The LCN DAT file is composed of 3 tables:

- 2 tables for the long raw signals: I_TABLE and Q_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times"). For the sounding where the long signal is not output by LCN, MISSING_VALUES are set.
- 1 table with all signal acquisition parameters: L0_TABLE. The columns are detailed in 4.4.1.4. This table includes the short signals.

In practice, the DAT files taken as raw binary files include the interleaved data of the file's tables. The corresponding data product is organized as TABLE objects using ROW_PREFIX_BYTES and ROW_SUFFIX_BYTES for defining the 3 parts (cf. in label files definitions):

I signal	Q signal…	CARAC Table	➔ Record # 1
I signal	Q signal…	CARAC Table	➔ Record # 2
	…		

The record structure is shown in annex

4.4.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for CONSERT edited science data (level 2 Lander and Orbiter) are:

```
RECORD_TYPE   = FIXED_LENGTH
RECORD_BYTES  = 1530
FILE_RECORDS
LABEL_RECORDS
```

The PDS file characteristic data elements for AOCS edited auxiliary data (level 2) are:

```
RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 156
FILE_RECORDS         =
```

4.4.1.2 Data Object Pointers Identification Data Elements

The CONSERT edited data are organized as binary tables. The data object pointers (^TABLE) reference TAB files.

4.4.1.3 Instrument and Detector Descriptive Data Elements

```
INSTRUMENT_HOST_NAME       = {"ROSETTA-ORBITER","ROSETTA-LANDER"}
INSTRUMENT_HOST_ID         = {"RO","RL"}
INSTRUMENT_ID              = CONSERT
INSTRUMENT_NAME            = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                           TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONSERT IN SOUNDING MODE"
```

4.4.1.4 Data Object Definition

For the Lander and Orbiter data:

```
OBJECT               = L0_TABLE
  NAME                       = L0_TABLE
  INTERCHANGE_FORMAT         = BINARY
  ROWS                       = FILE_RECORDS
  COLUMNS                    = 115
  ROW_BYTES                  = 510
```

```
  ROW_SUFFIX_BYTES         = 1020
  ^STRUCTURE               = "L0_PARAMETER_DEF.FMT"
END_OBJECT          = L0_TABLE
```

```
OBJECT              = I_TABLE
  NAME                     = I_TABLE
  INTERCHANGE_FORMAT       = BINARY
  ROWS                     = FILE_RECORDS
  ROW_BYTES                = 510
  ROW_PREFIX_BYTES         = 510
  ROW_SUFFIX_BYTES         = 510
  COLUMNS                  = 1

  OBJECT                   = COLUMN
       NAME                = "I SIGNAL"
       DATA_TYPE           = LSB _INTEGER
       START_BYTE          = 1
       BYTES               = 510
       ITEMS               = 255
       ITEM_BYTES          = 2
       ITEM_OFFSET         = 2
       DESCRIPTION          = "THIS TABLE REPRESENTS THE I VALUES OF THE CONSERT RADIO
                         SOUNDING"
  END_OBJECT = COLUMN

END_OBJECT                 = I_TABLE
```

```
OBJECT              = Q_TABLE
  NAME                     = Q_TABLE
  INTERCHANGE_FORMAT       = BINARY
  ROWS                     = FILE_RECORDS
  ROW_PREFIX_BYTES         = 1020
  COLUMNS                  = 1
  ROW_BYTES                = 510
  OBJECT                   = COLUMN

       NAME                = "Q SIGNAL"
       DATA_TYPE           = LSB _INTEGER
       START_BYTE          = 1
       BYTES               = 510
       ITEMS               = 255
       ITEM_BYTES          = 2
       ITEM_OFFSET         = 2
       DESCRIPTION          = "THIS TABLE REPRESENTS THE Q VALUES OF THE CONSERT
                         RADIO SOUNDING"
  END_OBJECT = COLUMN

END_OBJECT                 = Q_TABLE
```

The structure of the TABLE object is described in the file L0_PARAMETER_DEF.FMT (LABEL directory) as follows:

```
OBJECT                        = COLUMN
    NAME                      = "PROCESSING LEVEL"
    UNIT                      = "N/A"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 1
    BYTES                     = 2
    COLUMN_NUMBER             = 1
```

```
    DESCRIPTION             = "0 for decommutated raw data (internally
                               named level 0), Data level takes only the
                               value 0"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "FORMAT VERSION"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 3
    BYTES                   = 2
    COLUMN_NUMBER           = 2
    DESCRIPTION             = "Version of the format used by the spacecraft
                               to transmit data (the table data structure).
                               Valid value: 00"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "DATA SOURCE"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 5
    BYTES                   = 2
    COLUMN_NUMBER           = 3
    DESCRIPTION             = "This column indicates the format of the raw
                               data set. There are 5 formats to store data
                               with different headers and ends These formats
                               differ only in the headers and ends which is
                               deleting when we stored data in PDS format.
                               The indication of format allows us to know
                               where data come from.
                               The possible values are:
                                     0-OBDH format from CCS
                                     1-SISH KFKI orbiter interface simulator
                                     2-ROLBIN Lander data format (CCS and
                                       fly),
                                     3-CDMS KFKI lander interface simulator,
                                     4-SFDU (Standard Formatted Data Units)"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "INSTRUMENT HOST"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 7
    BYTES                   = 2
    COLUMN_NUMBER           = 4
    DESCRIPTION             = " 1 for Orbiter
                                2 for Lander"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "SIGNAL FORMAT"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 9
    BYTES                   = 2
    COLUMN_NUMBER           = 5
    DESCRIPTION             = "Onboard Software version for lander short
```

```
                               signal formatting
                               1=SWL12 data= I2+Q2 on 16 bits for long signal
                               2=SWL15 data= I&Q on 8 bits for short signal
                               SWL stands for Software lander"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "BLOCK NUMBER"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 11
    BYTES                     = 2
    COLUMN_NUMBER             = 6
    DESCRIPTION               = "Incremental number of record a block contains
                                 data and an header"
END_OBJECT = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "YEAR ACQUISITION DATA"
    UNIT                      = "YEAR"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 13
    BYTES                     = 2
    COLUMN_NUMBER             = 7
    DESCRIPTION               = "Year of the date for the raw data file
                                 (when the spacecraft acquire data)"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "MONTH ACQUISITION DATA"
    UNIT                      = "MONTH"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 15
    BYTES                     = 2
    COLUMN_NUMBER             = 8
    DESCRIPTION               = "Month of the date for the raw data file
                                (when the spacecraft acquires data)"
END_OBJECT = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
   NAME                       = "DAY ACQUISITION DATA"
   UNIT                       = "DAY"
   DATA_TYPE                  = MSB_UNSIGNED_INTEGER
   START_BYTE                 = 17
   BYTES                      = 2
   COLUMN_NUMBER              = 9
   DESCRIPTION                = "Day of the date for the raw data file
                                 (when the spacecraft acquires data)"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "HOUR ACQUISITION DATA"
    UNIT                      = "HOUR"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
```

```
    START_BYTE              = 19
    BYTES                   = 2
    COLUMN_NUMBER           = 10
    DESCRIPTION             = "Hour of the date for the raw data file
                               (when the spacecraft acquires data)"
END_OBJECT                  = COLUMN

/* ---------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "MINUTE ACQUISITION DATA"
    UNIT                    = "MINUTE"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 21
    BYTES                   = 2
    COLUMN_NUMBER           = 11
    DESCRIPTION             = "Minutes of the date for the raw data
                               file (when the spacecraft acquires data)"
END_OBJECT                  = COLUMN

/* ---------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "SECONDS ACQUISITION DATA"
    UNIT                    = "SECOND"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 23
    BYTES                   = 2
    COLUMN_NUMBER           = 12
    DESCRIPTION             = "Seconds of the date for the raw data
                               file (when the spacecraft acquires data)"
END_OBJECT                  = COLUMN

/* ---------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "YEAR L0 DATA"
    UNIT                    = "YEAR"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 25
    BYTES                   = 2
    COLUMN_NUMBER           = 13
    DESCRIPTION             = "Year of the created date for the L0 file"
END_OBJECT                  = COLUMN

/* ---------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "MONTH L0 DATA"
    UNIT                    = "MONTH"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 27
    BYTES                   = 2
    COLUMN_NUMBER           = 14
    DESCRIPTION             = "Month of the created date for the L0 file"
END_OBJECT                  = COLUMN

/* ---------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "DAY L0 DATA"
    UNIT                    = "DAY"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
```

```
    START_BYTE                 = 29
    BYTES                      = 2
    COLUMN_NUMBER              = 15
    DESCRIPTION                = "Day of the created date for the L0 file"
END_OBJECT                     = COLUMN

/* ----------------------------------------------------- */

OBJECT                         = COLUMN
    NAME                       = "HOUR L0 DATA"
    UNIT                       = "HOUR"
    DATA_TYPE                  = MSB_UNSIGNED_INTEGER
    START_BYTE                 = 31
    BYTES                      = 2
    COLUMN_NUMBER              = 16
    DESCRIPTION                = "Hour of the created date for the L0 file"
END_OBJECT                     = COLUMN

/* ----------------------------------------------------- */

OBJECT                         = COLUMN
    NAME                       = "MINUTE L0 DATA"
    UNIT                       = "MINUTE"
    DATA_TYPE                  = MSB_UNSIGNED_INTEGER
    START_BYTE                 = 33
    BYTES                      = 2
    COLUMN_NUMBER              = 17
    DESCRIPTION                = "Minutes of the created date for the L0 file"
END_OBJECT                     = COLUMN

/* ----------------------------------------------------- */

OBJECT                         = COLUMN
    NAME                       = "SECONDS L0 DATA"
    UNIT                       = "SECOND"
    DATA_TYPE                  = MSB_UNSIGNED_INTEGER
    START_BYTE                 = 35
    BYTES                      = 2
    COLUMN_NUMBER              = 18
    DESCRIPTION                = "Seconds of the created date for the L0 file"
END_OBJECT                     = COLUMN

/* ----------------------------------------------------- */

OBJECT                         = COLUMN
    NAME                       = "EMPTY_19"
    DATA_TYPE                  = MSB_UNSIGNED_INTEGER
    START_BYTE                 = 37
    BYTES                      = 2
    COLUMN_NUMBER              = 19
    DESCRIPTION                = "=0 Nothing in this column"
END_OBJECT                     = COLUMN

/* ----------------------------------------------------- */

OBJECT                         = COLUMN
    NAME                       = "EMPTY_20"
    DATA_TYPE                  = MSB_UNSIGNED_INTEGER
    START_BYTE                 = 39
    BYTES                      = 2
    COLUMN_NUMBER              = 20
    DESCRIPTION                = "=0 Nothing in this column"
END_OBJECT                     = COLUMN
```

```
/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_21"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 41
    BYTES                       = 2
    COLUMN_NUMBER               = 21
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_22"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 43
    BYTES                       = 2
    COLUMN_NUMBER               = 22
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_23"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 45
    BYTES                       = 2
    COLUMN_NUMBER               = 23
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_24"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 47
    BYTES                       = 2
    COLUMN_NUMBER               = 24
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_25"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 49
    BYTES                       = 2
    COLUMN_NUMBER               = 25
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ---------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_26"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 51
    BYTES                       = 2
```

```
    COLUMN_NUMBER               = 26
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_27"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 53
    BYTES                       = 2
    COLUMN_NUMBER               = 27
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_28"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 55
    BYTES                       = 2
    COLUMN_NUMBER               = 28
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_29"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 57
    BYTES                       = 2
    COLUMN_NUMBER               = 29
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_30"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 59
    BYTES                       = 2
    COLUMN_NUMBER               = 30
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_31"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 61
    BYTES                       = 2
    COLUMN_NUMBER               = 31
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ------------------------------------------------------ */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_32"
```

```
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 63
    BYTES                    = 2
    COLUMN_NUMBER            = 32
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_33"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 65
    BYTES                    = 2
    COLUMN_NUMBER            = 33
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "TUNING STATUS"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 67
    BYTES                    = 2
    COLUMN_NUMBER            = 34
    DESCRIPTION              = "- Orbiter:
                                + ETM00501-NCNA0EID = (41002=Tuning OK) or
                                + ETM00502-NCNA0EID = (41020 = Timeout Pb)
                                (ETM00501 is a telemetry packet name a
                                progress report and NCNA0EID is a CONSERT
                                telemetry parameter name) [AD 3]
                                - Lander: N/A"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "TUNING OCXO FREQUENCY"
    UNIT                     = "ADC_COUNTS"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 69
    BYTES                    = 2
    COLUMN_NUMBER            = 35
    DESCRIPTION              = "- Orbiter: OCXO after tuning
                                + NCND0511-ETM00501 (field 9 MSB):
                                  Clock frequency OCXO_freq at end of
                                  tuning phase (ETM00501 is a telemetry packet
                                  name: CONSERT PROGRESS REPORT and NCND0511
                                  is a CONSERT telemetry parameter name)
                                  [AD 3]
                                + Lander: OCXO for tuning - TM_Type_standard
                                  (field 6 MSB): OCXO Frequency
                                  (TM_Type_standard is a telemetry packet
                                  name) [AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "TUNING INTERCARTILE"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 71
```

```
    BYTES                       = 2
    COLUMN_NUMBER               = 36
    DESCRIPTION                 = "- Orbiter: Interquartile after tuning
                                   + NCND0512 - ETM00501 (field 9 LSB)
                                     Confidence indicator of tuning phase
                                     or 1: good confidence
                                     The interquartile range is a measure of
                                     dispersion (ETM00501: is a telemetry packet
                                     name: CONSERT PROGRESS REPORT and NCND0512
                                     is a CONSERT telemetry parameter name)
                                     [AD 3]
                                   - Lander: N/A"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "TUNING GCW"
    UNIT                        = "DECIBEL"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 73
    BYTES                       = 2
    COLUMN_NUMBER               = 37
    DESCRIPTION                 = "GCW: Gain control word of this sounding
                                   - Orbiter: GCW after tuning
                                   + NCND0513-ETM00501 (field 10 MSB)
                                    Tuning Phase GCW (ETM00501: is a telemetry
                                    packet name: CONSERT PROGRESS REPORT and
                                    NCND0513 is a CONSERT telemetry parameter
                                    name) [AD 3]
                                   - Lander: N/A"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "TUNING NBL GCW"
    UNIT                        = "DECIBEL"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 75
    BYTES                       = 2
    COLUMN_NUMBER               = 38
    DESCRIPTION                 = "- Orbiter: NBLL tuning
                                   + NCND0514 - ETM00501 (field 10 LSB)
                                     Level GCW: ADC level achieved on NBL signal
                                     at end of tuning phase AGC
                                     NBLL: Narrow Band Line Level
                                     (ETM00501: is a telemetry packet name:
                                     CONSERT PROGRESS REPORT and NCND0514 is a
                                     CONSERT telemetry parameter name) [AD 3]
                                   + Lander: N/A"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "TUNING NBLL ZERO"
    UNIT                        = "DECIBEL"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 77
    BYTES                       = 2
    COLUMN_NUMBER               = 39
    DESCRIPTION                 = "- Orbiter: NBLL after tuning
```

```
                                  ETM00501-NCND0515- (field 11 MSB)
                                  level zero: ADC level achieved on NBLL
                                  signal at end of tuning phase, zero
                                  detection
                                  NBLL: Narrow Band Line Level
                                  (ETM00501 is a telemetry packet name:
                                  CONSERT PROGRESS REPORT and NCND0515 is a
                                  CONSERT telemetry parameter name) [AD 3]
                                - Lander: N/A"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "OCXO TEMPERATURE"
    UNIT                     = "ADC_COUNTS"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 79
    BYTES                    = 2
    COLUMN_NUMBER            = 40
    DESCRIPTION              = "- Obiter: OCXO Temperature
                                  ETM00325 - NCND0339 - (field 11 LSB)
                                  (ETM00325 is a telemetry packet name:
                                  CONSERT PROGRESS REPORT and NCND00339 is a
                                  CONSERT telemetry parameter name: CONSERT
                                  HOUSEKEEPING REPORT) [AD 3]
                                - Lander: OCXO Temperature
                                  TM type 1- (field 4 MSB)
                                  (TM type 1 is a LANDER telemetry packet
                                  name) [AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_41"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 81
    BYTES                    = 2
    COLUMN_NUMBER            = 41
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_42"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 83
    BYTES                    = 2
    COLUMN_NUMBER            = 42
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_43"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 85
    BYTES                    = 2
    COLUMN_NUMBER            = 43
    DESCRIPTION              = "=0 Nothing in this column"
```

```
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_44"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 87
    BYTES                    = 2
    COLUMN_NUMBER            = 44
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN


/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_45"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 89
    BYTES                    = 2
    COLUMN_NUMBER            = 45
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN


/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_46"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 91
    BYTES                    = 2
    COLUMN_NUMBER            = 46
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_47"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 93
    BYTES                    = 2
    COLUMN_NUMBER            = 47
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_48"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 95
    BYTES                    = 2
    COLUMN_NUMBER            = 48
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_49"
```

```
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 97
    BYTES                    = 2
    COLUMN_NUMBER            = 49
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */


OBJECT                       = COLUMN
    NAME                     = "EMPTY_50"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 99
    BYTES                    = 2
    COLUMN_NUMBER            = 50
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "OBDH PACKET NUMBER"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 101
    BYTES                    = 2
    COLUMN_NUMBER            = 51
    DESCRIPTION              = "Source sequence count
                                - Orbiter: ETM00325 (field 2-14bits LSB)
                                  (ETM00325 is a telemetry packet name:
                                  CONSERT HOUSEKEEPING REPORT) [AD 3]
                                - Lander: APID 112,12
                                  (field 2-14bits LSB)
                                  (APID :  Application Process ID)[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "OBT SECOND MSW"
    UNIT                     = "SECOND"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 103
    BYTES                    = 2
    COLUMN_NUMBER            = 52
    DESCRIPTION              = "On Board Time second MSW
                                - Orbiter: ETM00325 (field 3)
                                  (ETM00325 is a telemetry packet name:
                                   CONSERT HOUSEKEEPING REPORT) [AD 3]
                                - Lander: APID 112,12 (field 3)
                                  (APID :  Application Process ID)[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "OBT SECOND LSW"
    UNIT                     = "SECOND"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 105
    BYTES                    = 2
    COLUMN_NUMBER            = 53
    DESCRIPTION              = "On Board Time - second LSW
```

```
                              - Orbiter: ETM00325 (field 4)
                                (ETM00325 is a telemetry packet name:
                                CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: APID 112,12 (field 4)
                                (APID :  Application Process ID)[AD 4]"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "OBT FRACTION MSW"
    UNIT                      = "MILLISECOND"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 107
    BYTES                     = 2
    COLUMN_NUMBER             = 54
    DESCRIPTION               = "This column contains the MSW part of
                               the On Board Time fraction (milliseconds)
                              - Orbiter: ETM00325 (field 5)
                               (ETM00325 is a telemetry packet name:
                                CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: APID 112,12 (field 5)
                                (APID :  Application Process ID)[AD 4]"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "CONSERT TIC MSW"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 109
    BYTES                     = 2
    COLUMN_NUMBER             = 55
    DESCRIPTION               = "CONSERT internal time in TICs - MSW
                              - Orbiter: ETM00325 (field 9)
                                (ETM00325 is a telemetry packet name:
                                 CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: TM type 1 (field 1)[AD 4]"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "CONSERT TIC LSW"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 111
    BYTES                     = 2
    COLUMN_NUMBER             = 56
    DESCRIPTION               = "CONSERT internal time in TIC - LSW
                              - Orbiter: ETM00325 (field 10)
                                (ETM00325 is a telemetry packet name:
                                 CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: TM type 1 (field 2) [AD 4]"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "CONSERT UTC MINUTES"
    UNIT                      = "MINUTE"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 113
    BYTES                     = 2
```

```
    COLUMN_NUMBER            = 57
    DESCRIPTION              = "decoded CONSERT internal time minutes
                                - From Orbiter: ETM00325 (field 9&10)
                                  (ETM00325 is a telemetry packet name:
                                   CONSERT HOUSEKEEPING REPORT) [AD 3]
                                - From Lander: TM type 1 (field 1&2)[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "CONSERT UTC SECONDS"
    UNIT                     = "SECOND"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 115
    BYTES                    = 2
    COLUMN_NUMBER            = 58
    DESCRIPTION              = "decoded CONSERT internal time second
                                - From Orbiter: ETM00325 (field 9&10)
                                  (ETM00325 is a telemetry packet name:
                                   CONSERT HOUSEKEEPING REPORT)[AD 3]
                                - From Lander: TM type 1(field 1&2)[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "CONSERT UTC MILLISECONDS"
    UNIT                     = "MILLISECOND"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 117
    BYTES                    = 2
    COLUMN_NUMBER            = 59
    DESCRIPTION              = "decoded CONSERT internal time millisecond
                                - From Orbiter: ETM00325 (field 9&10)
                                  (ETM00325 is a telemetry packet name:
                                   CONSERT HOUSEKEEPING REPORT) [AD 3]
                                - From Lander: TM type 1 (field 1&2)[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "DATA TYPE"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 119
    BYTES                    = 2
    COLUMN_NUMBER            = 60
    DESCRIPTION              = "- Orbiter: 0
                                -  Lander:
                                + with long signal: 1;
                                + with short signal only: 2[AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "SCANNING SEQUENCE COUNT"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 121
    BYTES                    = 2
    COLUMN_NUMBER            = 61
    DESCRIPTION              = "Scanning sequence count"
```

```
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "SOUNDING NUMBER"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 123
    BYTES                   = 2
    COLUMN_NUMBER           = 62
    DESCRIPTION             = "Present Sounding number
                               - Orbiter: ETM02003 (field 11)
                               (ETM02003: is a telemetry packet name:
                                CONSERT SCIENCE REPORT) [AD 3]
                               - Lander: TM type 1 (field 8) [AD 4]"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "ACK SOURCE SEQUENCE COUNT"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 125
    BYTES                   = 2
    COLUMN_NUMBER           = 63
    DESCRIPTION             = "Last ACK report number
                               - Orbiter: last ETM00101 or ETM00102
                                 (field 2-14bits LSB)(ETM00101/ETM00102
                                 is a telemetry packet name: CONSERT
                                 ACKNOWLEDGEMENT SUCCESS/FAILURE) [AD 3]
                               - Lander: last TM type 2
                                 (field 0-14bits LSB) [AD 4]"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "ACK TC SEQ CONTROL"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 127
    BYTES                   = 2
    COLUMN_NUMBER           = 64
    DESCRIPTION             = "TC number for the Last ACK
                               - Orbiter: last ETM00101 or ETM00102 field 9
                                 (ETM00101/ETM00102 is a telemetry packet
                                 name : CONSERT ACKNOWLEDGEMENT
                                 SUCCESS/FAILURE) [AD 3]
                               - Lander: =0 Nothing in this column"
END_OBJECT                  = COLUMN

/* ----------------------------------------------------- */

OBJECT                      = COLUMN
    NAME                    = "ACK FAILURE CODE"
    DATA_TYPE               = MSB_UNSIGNED_INTEGER
    START_BYTE              = 129
    BYTES                   = 2
    COLUMN_NUMBER           = 65
    DESCRIPTION             = "Failure code for the Last ACK
                               - Orbiter: zero for an ETM00101 No failure
                                 Or field 10 for an ETM00102
                                 1: ERR_TC_TIMEOUT: TC packet not complete
                                    after 2 seconds
```

```
                                2: ERR_TYPE_WRONG CRC: Calculated CRC is
                                   not egal to CRC at end of TC packet
                                3: ERR_TYPE_WRONGAPID: TC packet has
                                   wrong APID (ID # 59 or Cat #12)
                                4: ERR_TC_TYPE_UNKNOWN: TC packet has
                                   unknown Type or Subtype
                                5: ERR_TWO_MISS_TAB: TC with mission table
                                   received and other table already received
                                6: ERR_TC_DIRECT_UNKNOWN: Direct TC of
                                   unknown type received
                                (ETM00101/ETM00102 is a telemetry packet
                                 name: CONSERT ACKNOWLEDGEMENT
                                 SUCCESS/FAILURE)[AD 3]
                              - Lander: =0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "PROGRESS REPORT NUMBER"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 131
    BYTES                    = 2
    COLUMN_NUMBER            = 66
    DESCRIPTION              = "Last Progress report number
                               - Orbiter:last ETM00501 or ETM00502 field 2
                                 (ETM00501/ETM00502 is a telemetry packet
                                 name: CONSERT PROGRESS/EVENT REPORT) [AD 3]
                               - Lander: =0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EVENT ID"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 133
    BYTES                    = 2
    COLUMN_NUMBER            = 67
    DESCRIPTION              = "Event id for the Last Progress report
                               - Orbiter:
                               + ETM00501-NCNA0EID=
                               (41003=Sounding started, 41004=Sounding
                               finished)
                               + ETM00502-NCNA0EID=
                               (41008 = Timeout Data, 41007 = Time OUt AGC)
                               (ETM00501/ETM00502 is a telemetry packet name:
                                CONSERT PROGRESS/EVENT REPORT and NCNA0EID is
                                a CONSERT telemetry parameter name) [AD 3]
                               - Lander: TM type 1 (field 7 LSB) [AD 4]"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "LAST HK"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 135
    BYTES                    = 2
    COLUMN_NUMBER            = 68
    DESCRIPTION              = "Last HK number
                                - Orbiter: ETM00325 (field 2-14bits LSB)
                                 (ETM00325 is a telemetry packet name:
```

```
                                 CONSERT HOUSEKEEPING REPORT) [AD 3]
                               - Lander: =0 Nothing in this column"
END_OBJECT                    = COLUMN

/* ------------------------------------------------------ */

OBJECT                        = COLUMN
    NAME                      = "EMPTY_69"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 137
    BYTES                     = 2
    COLUMN_NUMBER             = 69
    DESCRIPTION               = "=0 Nothing in this column"
END_OBJECT                    = COLUMN

/* ------------------------------------------------------ */

OBJECT                        = COLUMN
    NAME                      = "EMPTY_70"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 139
    BYTES                     = 2
    COLUMN_NUMBER             = 70
    DESCRIPTION               = "=0 Nothing in this column"
END_OBJECT                    = COLUMN

/* ------------------------------------------------------ */

OBJECT                        = COLUMN
    NAME                      = "EMPTY_71"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 141
    BYTES                     = 2
    COLUMN_NUMBER             = 71
    DESCRIPTION               = "=0 Nothing in this column"
END_OBJECT                    = COLUMN

/* ------------------------------------------------------ */

OBJECT                        = COLUMN
    NAME                      = "EMPTY_72"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 143
    BYTES                     = 2
    COLUMN_NUMBER             = 72
    DESCRIPTION               = "=0 Nothing in this column"
END_OBJECT                    = COLUMN

/* ------------------------------------------------------ */

OBJECT                        = COLUMN
    NAME                      = "STATUS BIT INIT OK"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 145
    BYTES                     = 2
    COLUMN_NUMBER             = 73
    DESCRIPTION               = "status vector bit 7 - Init OK
                               0=Init not performed, 1=init OK
                               - Orbiter:ETM00325 (field 11-bit 15)
                                 (ETM00325 is a telemetry packet name:
                                  CONSERT HOUSEKEEPING REPORT) [AD 3]
                               - Lander: TM type 1-INSTRUMENT STATUS
                                 (field 3 - bit 7) [AD 4]"
```

```
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                        = COLUMN
    NAME                      = "STATUS BIT MISS TAB OK"
    DATA_TYPE                 = MSB_UNSIGNED_INTEGER
    START_BYTE                = 147
    BYTES                     = 2
    COLUMN_NUMBER             = 74
    DESCRIPTION               = "status vector bit 6 - mission table received
                                   0 = Mission table not received
                                   1 = Mission table received
                                   - Orbiter: ETM00325 (field 11-bit 14)
                                     (ETM00325 is a telemetry packet
                                     name: CONSERT HOUSEKEEPING
                                     REPORT) [AD 3]
                                   - Lander: TM type 1 (field 3-bit 6) [AD 4]"
END_OBJECT                    = COLUMN

/* ----------------------------------------------------- */

OBJECT                    = COLUMN
    NAME                  = "STATUS BIT TUNING OK"
    DATA_TYPE             = MSB_UNSIGNED_INTEGER
    START_BYTE            = 149
    BYTES                 = 2
    COLUMN_NUMBER         = 75
    DESCRIPTION           = "status vector bit 5 - tuning finished
                               0 = Tuning not performed
                               1 = Tuning performed
                               - Orbiter: ETM00325 (field 11-bit 13)
                                 (ETM00325 is a telemetry packet name:
                                  CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: TM type 1 (field 3-bit 5) [AD 4]"
END_OBJECT                = COLUMN

/* ----------------------------------------------------- */

OBJECT                    = COLUMN
    NAME                  = "STATUS BIT SOUNDING"
    DATA_TYPE             = MSB_UNSIGNED_INTEGER
    START_BYTE            = 151
    BYTES                 = 2
    COLUMN_NUMBER         = 76
    DESCRIPTION           = "status vector bit 4-sounding started
                               0 = Not in sounding mode
                               1 = In sounding mode
                               - Orbiter: ETM00325 (field 11-bit 12)
                                 (ETM00325 is a telemetry packet name:
                                  CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: TM type 1 (field 3-bit 4) [AD 4]"
END_OBJECT                = COLUMN

/* ----------------------------------------------------- */

OBJECT                    = COLUMN
    NAME                  = "STATUS BIT END"
    DATA_TYPE             = MSB_UNSIGNED_INTEGER
    START_BYTE            = 153
    BYTES                 = 2
    COLUMN_NUMBER         = 77
    DESCRIPTION           = "status vector bit 3-sounding finished
```

```
                              0 = Sounding not finished yet
                              1 = Sounding finished
                              - Orbiter: ETM00325 (field 11-bit 10)
                                (ETM00325 is a telemetry packet name:
                                 CONSERT HOUSEKEEPING REPORT)  [AD 4]
                              - Lander: TM type 1 (field 3-bit 3) [AD 4]"
END_OBJECT                 = COLUMN

/* ----------------------------------------------------- */

OBJECT                     = COLUMN
    NAME                   = "STATUS BIT HKREP"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 155
    BYTES                  = 2
    COLUMN_NUMBER          = 78
    DESCRIPTION            = "status vector bit 2-HK report enabled
                              0= no HK reporting
                              1= HK reporting enabled (default)
                              - Orbiter: ETM00325 (field 11-bit 9)
                               (ETM00325 is a telemetry packet name:
                                CONSERT HOUSEKEEPING REPORT)  [AD 3]
                              - Lander: =0 Nothing in this column"
END_OBJECT                 = COLUMN

/* ----------------------------------------------------- */

OBJECT                     = COLUMN
    NAME                   = "STATUS BIT SCREP"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 157
    BYTES                  = 2
    COLUMN_NUMBER          = 79
    DESCRIPTION            = "status vector bit 1-science report enabled
                              0= no SCreporting
                              1= SC reporting enabled (default)
                              - Orbiter: ETM00325 (field 11 - bit 8)
                                (ETM00325 is a telemetry packet name:
                                 CONSERT HOUSEKEEPING REPORT)  [AD 3]
                              - Lander: =0 Nothing in this column"
END_OBJECT                 = COLUMN

/* ----------------------------------------------------- */

OBJECT                     = COLUMN
    NAME                   = "STATUS BIT LOBT"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 159
    BYTES                  = 2
    COLUMN_NUMBER          = 80
    DESCRIPTION            = "status vector bit 0-SCET (LOBT) received
                              0 = LOBT updated not received yet
                              1 = LOBT update received
                              - Orbiter: ETM00325 (field 11 - bit 7)
                                (ETM00325 is a telemetry packet name:
                                 CONSERT HOUSEKEEPING REPORT) [AD 3]
                              - Lander: =0 Nothing in this column"
END_OBJECT                 = COLUMN

/* ----------------------------------------------------- */

OBJECT                     = COLUMN
    NAME                   = "EMPTY_81"
```

```
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 161
    BYTES                  = 2
    COLUMN_NUMBER          = 81
    DESCRIPTION            = "=0 Nothing in this column"
END_OBJECT                 = COLUMN

/* ------------------------------------------------------ */

OBJECT                     = COLUMN
    NAME                   = "EMPTY_82"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 163
    BYTES                  = 2
    COLUMN_NUMBER          = 82
    DESCRIPTION            = "=0 Nothing in this column"
END_OBJECT                 = COLUMN

/* ------------------------------------------------------ */

OBJECT                     = COLUMN
    NAME                   = "GCW"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 165
    BYTES                  = 2
    COLUMN_NUMBER          = 83
    DESCRIPTION            = "Gain control word
                               - Orbiter: ETM02003 (field 12 MSB)
                                 (ETM02003: is a telemetry packet name:
                                  CONSERT SCIENCE REPORT) [AD 3]
                               - Lander: Last TM type 1 or
                                 Last TM type 3 (field 9 MSB) [AD 4]"
END_OBJECT                 = COLUMN

/* ------------------------------------------------------ */

OBJECT                     = COLUMN
    NAME                   = "FRAM"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 167
    BYTES                  = 2
    COLUMN_NUMBER          = 84
    DESCRIPTION            = "Lander Framing word
                               - Orbiter: N/A
                               - Lander: Last TM type 1 or Last TM type 3
                                 (field 9 LSB) [AD 4]"
END_OBJECT                 = COLUMN

/* ------------------------------------------------------ */

OBJECT                     = COLUMN
    NAME                   = "PEAK POSITION"
    DATA_TYPE              = MSB_UNSIGNED_INTEGER
    START_BYTE             = 169
    BYTES                  = 2
    COLUMN_NUMBER          = 85
    DESCRIPTION            = "On board calculated peak position
                               - Orbiter: N/A
                               - Lander: Last TM type 1or Last TM type 3
                                 (field 10 MSB) [AD 4]"
END_OBJECT                 = COLUMN

/* ------------------------------------------------------ */
```

```
OBJECT                  = COLUMN
    NAME                = "FREQUENCY OXCO"
    DATA_TYPE           = MSB_UNSIGNED_INTEGER
    START_BYTE          = 171
    BYTES               = 2
    COLUMN_NUMBER       = 86
    DESCRIPTION         = "Present OXCO value
                           - Orbiter: ETM02003 (field 12 LSB)
                             (ETM02003 is a telemetry packet name:
                              CONSERT SCIENCE REPORT) [AD 3]
                           - Lander: Last TM type 1or Last TM type 3
                             (field 6 MSB) [AD 4]"
END_OBJECT              = COLUMN

/* ---------------------------------------------------- */

OBJECT                  = COLUMN
    NAME                = "TEMPERATURE OXCO"
    DATA_TYPE           = MSB_UNSIGNED_INTEGER
    START_BYTE          = 173
    BYTES               = 2
    COLUMN_NUMBER       = 87
    DESCRIPTION         = "OCXO board temperature
                           - Orbiter: ETM02003 (field 10 MSB)
                             (ETM02003 is a telemetry packet name:
                              CONSERT SCIENCE REPORT) [AD 3]
                           - Lander: Last TM type 1 or Last TM type 3
                             (field 4 MSB) [AD 4]"
END_OBJECT              = COLUMN

/* ---------------------------------------------------- */

OBJECT                  = COLUMN
    NAME                = "DIGITAL BOARD TEMPERATURE"
    UNIT                = "ADC_COUNTS"
    DATA_TYPE           = MSB_UNSIGNED_INTEGER
    START_BYTE          = 175
    BYTES               = 2
    COLUMN_NUMBER       = 88
    DESCRIPTION         = "Digital board temperature
                           - Orbiter: ETM02003 (field 10 LSB)
                             (ETM02003 is a telemetry packet name:
                              CONSERT SCIENCE REPORT) [AD 3]
                           - Lander: Last TM type 1 or Last TM type 3
                             (field 4 LSB)   [AD 4]"
END_OBJECT              = COLUMN

/* ---------------------------------------------------- */

OBJECT                  = COLUMN
    NAME                = "NBLS LEVEL"
    UNIT                = "N/A"
    DATA_TYPE           = MSB_UNSIGNED_INTEGER
    START_BYTE          = 177
    BYTES               = 2
    COLUMN_NUMBER       = 89
    DESCRIPTION         = "NBLS level
                           - Orbiter: ETM00325 (field 12 LSB)
                             (ETM00325 is a telemetry packet name:
                              CONSERT HOUSEKEEPING REPORT)  [AD 3]
                           - Lander: Last TM type 1 or Last TM type 3
                             (field 5 MSB) [AD 4]"
```

```
END_OBJECT               = COLUMN

/* ----------------------------------------------------- */

OBJECT                   = COLUMN
    NAME                 = "TMIX LEVEL"
    UNIT                 = "N/A"
    DATA_TYPE            = MSB_UNSIGNED_INTEGER
    START_BYTE           = 179
    BYTES                = 2
    COLUMN_NUMBER        = 90
    DESCRIPTION          = "NBLS level
                            - Orbiter: ETM00325 (field 13 MSB)
                              (ETM00325 is a telemetry packet name:
                               CONSERT HOUSEKEEPING REPORT) [AD 3]
                            - Lander: Last TM type 1 or Last TM type 3
                              (field 5 LSB) [AD 4]"
END_OBJECT               = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_91"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 181
    BYTES                    = 2
    COLUMN_NUMBER            = 91
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_92"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 183
    BYTES                    = 2
    COLUMN_NUMBER            = 92
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_93"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 185
    BYTES                    = 2
    COLUMN_NUMBER            = 93
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ----------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_94"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 187
    BYTES                    = 2
    COLUMN_NUMBER            = 94
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN
```

```
/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_95"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 189
    BYTES                    = 2
    COLUMN_NUMBER            = 95
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_96"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 191
    BYTES                    = 2
    COLUMN_NUMBER            = 96
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_97"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 193
    BYTES                    = 2
    COLUMN_NUMBER            = 97
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_98"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 195
    BYTES                    = 2
    COLUMN_NUMBER            = 98
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_99"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 197
    BYTES                    = 2
    COLUMN_NUMBER            = 99
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ------------------------------------------------------ */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_100"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 199
    BYTES                    = 2
    COLUMN_NUMBER            = 100
```

```
    DESCRIPTION              = "=0 Nothing in this column"
END_OBJECT                   = COLUMN

/* ---------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "L1_DATA"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 201
    BYTES                    = 200
    ITEMS                    = 100
    ITEM_BYTES               = 2
    COLUMN_NUMBER            = 101
    DESCRIPTION              = "Contains L1 DATA: 0 for a L0 TABLE"
END_OBJECT                   = COLUMN

/* ---------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "SHORTS PIC I"
    UNIT                     = "N/A"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 401
    BYTES                    = 42
    ITEMS                    = 21
    ITEM_BYTES               = 2
    COLUMN_NUMBER            = 102
    DESCRIPTION              = "On board calculated correlation
                                21 points around the detected max.
                                - Orbiter: =0 Nothing in these columns
                                - Lander:
                                   + For SWL15 I channel for bytes
                                   + For SWL12 correlation power on word
                                Last TM type 1 or Last TM type 3 [AD 4]"
END_OBJECT                   = COLUMN

/* ---------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "SHORTS PIC Q"
    UNIT                     = "N/A"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 443
    BYTES                    = 42
    ITEMS                    = 21
    ITEM_BYTES               = 2
    COLUMN_NUMBER            = 103
    DESCRIPTION              = "On board calculated correlation
                                21 points around the detected max
                                - Orbiter: =0 Nothing in these columns
                                - Lander:
                                   + For SWL15 Q channel for bytes
                                   + For SWL12 Zero (N/A)
                                Last TM type 1 or Last TM type 3 [AD 4]"
END_OBJECT                   = COLUMN

/* ---------------------------------------------------- */

OBJECT                       = COLUMN
    NAME                     = "EMPTY_244"
    DATA_TYPE                = MSB_UNSIGNED_INTEGER
    START_BYTE               = 485
    BYTES                    = 2
```

```
    COLUMN_NUMBER               = 104
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_245"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 487
    BYTES                       = 2
    COLUMN_NUMBER               = 105
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_246"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 489
    BYTES                       = 2
    COLUMN_NUMBER               = 106
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_247"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 491
    BYTES                       = 2
    COLUMN_NUMBER               = 107
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_248"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 493
    BYTES                       = 2
    COLUMN_NUMBER               = 108
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_249"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 495
    BYTES                       = 2
    COLUMN_NUMBER               = 109
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_250"
```

```
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 497
    BYTES                       = 2
    COLUMN_NUMBER               = 110
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_251"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 499
    BYTES                       = 2
    COLUMN_NUMBER               = 111
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_252"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 501
    BYTES                       = 2
    COLUMN_NUMBER               = 112
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_253"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 503
    BYTES                       = 2
    COLUMN_NUMBER               = 113
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_254"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 505
    BYTES                       = 2
    COLUMN_NUMBER               = 114
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

/* ----------------------------------------------------- */

OBJECT                          = COLUMN
    NAME                        = "EMPTY_255"
    DATA_TYPE                   = MSB_UNSIGNED_INTEGER
    START_BYTE                  = 507
    BYTES                       = 2
    COLUMN_NUMBER               = 115
    DESCRIPTION                 = "=0 Nothing in this column"
END_OBJECT                      = COLUMN

END
```

For the Auxiliary data (AOCS):

```
OBJECT               = AOCS_TABLE
  NAME                 = "AOCS"
  INTERCHANGE_FORMAT = ASCII
  ROWS                 = 81000
  ^STRUCTURE           = "AOCS.FMT"
  COLUMNS              = 8
  ROW_BYTES            = 156
END_OBJECT           = AOCS_TABLE
```

The structure of the TABLE object is described in the file AOCS.FMT (LABEL directory) as follows:

```
OBJECT                 = COLUMN
    NAME                 = "UTC_TIME"
    DATA_TYPE            = TIME
    START_BYTE           = 1
    BYTES                = 23
    DESCRIPTION          = "This column represents the UTC in PDS standard format
                            YYYY-MM-DDThh:mm:ss.sss"
 END_OBJECT              = COLUMN

OBJECT                 = COLUMN
    NAME                 = "OOBT_TIME"
    DATA_TYPE            = CHARACTER
    START_BYTE           = 26
    BYTES                = 17
    DESCRIPTION          = "This column represents On Board Time represented as :
                            Reset number (integer starting at 1) / seconds
                            The time resolution is 1/65536 s"
 END_OBJECT              = COLUMN

OBJECT               = COLUMN
    NAME               = "SID"
    DATA_TYPE          = ASCII_INTEGER
    START_BYTE         = 45
    BYTES              = 3
    UNIT               = "N/A"
    FORMAT             = "I3"
    DESCRIPTION        = "SID reading in CDMS packet header
                          Possible values are :
                          110 or
                          101"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
    NAME               = "AOCS_PARAM_ID"
    DATA_TYPE          = ASCII_INTEGER
    START_BYTE         = 49
    BYTES              = 3
    UNIT               = "N/A"
    FORMAT             = "I3"
    DESCRIPTION        = "AOCS parameter identifier
                          Possible values are:
                          [1,...,12]"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
    NAME               = "AOCS_UNIT"
    DATA_TYPE          = CHARACTER
```

```
    START_BYTE         = 54
    BYTES              = 3
    UNIT               = "N/A"
    DESCRIPTION        = "Unit of AOCS parameter
                          Possible value is:
                          rad (for radian)"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
    NAME               = "AOCS_PARAM_LABEL"
    DATA_TYPE          = CHARACTER
    START_BYTE         = 60
    BYTES              = 20
    FORMAT             = "N/A"
    UNIT               = "N/A"
    DESCRIPTION        = "AOCS parameter label
                          Possible values are:
                          NACW1102,NACW1103,NACW1104,
                          NACW1105,NACW1106,NACW1107
                          NACW1300,NACW1301,NACW1304,
                          NACW1305,NACW1306,NACW1307"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
    NAME               = "AOCS_PARAM_DESC"
    DATA_TYPE          = CHARACTER
    START_BYTE         = 83
    BYTES              = 60
    FORMAT             = "N/A"
    UNIT               = "N/A"
    DESCRIPTION        = "AOCS parameter describtion
                          Possible values are:
                          APME Cur Onbrd Cmd Elv
                          APME Cur Onbrd Cmd Az
                          APME Ground Cmd Elev
                          APME Ground Cmd Az
                          APME Encdr Measured Elev
                          APME Encdr Measured Azi
                          SADE Grd Cmd Ang Pos YP
                          SADE Grd Cmd Ang Pos YM
                          SADE Cmd Ang Position YP
                          SADE Cmd Ang Position YM
                          SADE Measured Ang Pos YP
                          SADE Measured Ang Pos YM"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
    NAME               = "AOCS_VALUE"
    DATA_TYPE          = ASCII_REAL
    START_BYTE         = 145
    BYTES              = 10
    FORMAT             = "F10.7"
    UNIT               = "N/A"
    DESCRIPTION        = "AOCS parameter VALUE,
                          with MIL-STD-1750A, PC(5,2) format describes on
                          the website:
                          http://www.xgc.com/manuals/m1750-ada/m1750/book1.html"
END_OBJECT           = COLUMN
```

For the Auxiliary data (CN_AUX):

```
CONSERT Orbiter E-box and antenna temperatures object definition

OBJECT              = CN_AUX_TABLE
  NAME                = "E_BOX_ANT_TEMP"
  INTERCHANGE_FORMAT = ASCII
  ROWS                =
  ^STRUCTURE          = "CN_AUX.FMT"
  COLUMNS             = 7
  ROW_BYTES           = 141
END_OBJECT          = CN_AUX_TABLE
```

```
CONSERRT Orbiter E-box current object definition

OBJECT              = CN_AUX_TABLE
  NAME                = "E_BOX_CURRENT"
  INTERCHANGE_FORMAT = ASCII
  ROWS                =
  ^STRUCTURE          = "CN_AUX.FMT"
  COLUMNS             = 7
  ROW_BYTES           = 141
END_OBJECT          = CN_AUX_TABLE
```

```
CONSERT Lander E-box temperature (main and redondant) object definition

OBJECT              = CN_AUX_TABLE
  NAME                = "LCN_E_BOX_TEMP"
  INTERCHANGE_FORMAT = ASCII
  ROWS                = 1808
  ^STRUCTURE          = "CN_AUX.FMT"
  COLUMNS             = 7
  ROW_BYTES           = 141
END_OBJECT          = CN_AUX_TABLE
```

```
CONSERRT Lander E-box current object definition

OBJECT              = CN_AUX_TABLE
  NAME                = "LCN_E_BOX_CURRENT"
  INTERCHANGE_FORMAT = ASCII
  ROWS                = 1556
  ^STRUCTURE          = "CN_AUX.FMT"
  COLUMNS             = 7
  ROW_BYTES           = 141
END_OBJECT          = CN_AUX_TABLE
```

The structure of the TABLE object is described in the file CN_AUX.FMT (LABEL directory) as follows:

```
OBJECT              = COLUMN
    NAME             = "UTC_TIME"
    DATA_TYPE        = TIME
    START_BYTE       = 1
    BYTES            = 23
    DESCRIPTION = "This column represents the UTC in PDS standard format
                     YYYY-MM-DDThh:mm:ss.sss"
END_OBJECT          = COLUMN
```

```
OBJECT                  = COLUMN
    NAME                 = "OOBT_TIME"
    DATA_TYPE            = CHARACTER
    START_BYTE           = 26
    BYTES                = 17
    DESCRIPTION = "This column represents On Board Time represented as :
                        Reset number (integer starting at 1) / seconds
                        The time resolution is 1/65536 s"
END_OBJECT              = COLUMN

OBJECT                = COLUMN
    NAME                = "SID"
    DATA_TYPE           = ASCII_INTEGER
    START_BYTE          = 45
    BYTES               = 3
    FORMAT              = "I3"
    DESCRIPTION         = "SID reading in CDMS packet header
                           Possible values are :
                           151 or 102 "
END_OBJECT            = COLUMN

OBJECT                = COLUMN
    NAME                = "AUX_PARAM_UNIT"
    DATA_TYPE           = CHARACTER
    START_BYTE          = 50
    BYTES               = 11
    DESCRIPTION         = "Unit of parameter
                           Possible values are:
                           N/A
                           MILLIAMPERE
                           CELSIUS"
END_OBJECT            = COLUMN

OBJECT                  = COLUMN
    NAME                = "AUX_PARAM_LABEL"
    DATA_TYPE           = CHARACTER
    START_BYTE          = 64
    BYTES               = 17
    DESCRIPTION         = "Auxiliary parameter label
                           Possible values are:
                           ORB_LCL_52A_C
                           ORB_LCL_52B_C
                           ORB_LCL_52A_S
                           ORB_LCL_52B_S
                           ORB_CN_ANT_TEMPA
                           ORB_CN_ANT_TEMPB
                           ORB_CN_ELEC_TEMPA
                           ORB_CN_ELEC_TEMPB
                           ORB_CN_ANT_OUT_S
                           ORB_CN_ANT_IN_S
                           TCM_CONSERT
                           TCR_CONSERT
                           PSSH2_C_CONSERT"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
    NAME                = "AUX_PARAM_DESC"
    DATA_TYPE           = CHARACTER
    START_BYTE          = 84
    BYTES               = 47
    DESCRIPTION       = "AUX parameter description
                         Possible values are:
                         CONSERT PS1,LCL 52A CURR
```

```
                  CONSERT PS2,LCL 52B CURR
                  CONSERT PS1,LCL 52A STAT <0=OFF, 1=ON>
                  CONSERT PS2,LCL 52B STAT <0=OFF, 1=ON>
                  PAY402-ConsertAnt Temp A
                  PAY403-ConsertAnt Temp B
                  PAY404-Consert EL Temp A
                  PAY404-Consert EL Temp B
                  CN, OUTDEPLOYMENT STATUS <0=Stowed, 1=Deployed>
                  CN, INDEPLOYMENT STATUS <0=Stowed, 1=Deployed>
                  Temp of Consert
                  consert input current
                 "
END_OBJECT       = COLUMN

OBJECT           = COLUMN
    NAME           = "AUX_PARAM_VALUE"
    DATA_TYPE      = ASCII_REAL
    START_BYTE     = 133
    BYTES          = 7
    FORMAT         = "F7.2"
    DESCRIPTION    = "AUX parameter value"

END_OBJECT      = COLUMN
```

4.4.1.5 Mission Specific Keywords (Lander and Orbiter)

ROSETTA:CON_MISSION_TABLE_STARTTIC

- **Type** : integer (4 Bytes)
- **Standard values** :
- **Description** : Date of the first sounding in TIC

4.4.2 Ground calibration data Level 2 product design

4.4.2.1 Introduction

To produce the CONSERT calibrated data (cf. 5.1), data were acquired during the on-ground integration phases. Many functional tests and calibration experiments have been performed during this integration period, with various configurations.

All available experiment data are archived in Level 2 products, including pure functional test, interference tests and calibrations.

The experimental setup involved the CONSERT Flight Model Orbiter (FMO) working together (or not) with the Qualification Model Lander (QML), or the Flight Model Lander (FML) with (or without) the Qualification Model Orbiter (QMO). A laboratory bench has been also linked, in most cases, to the FMO and to the FML, or have been inserted between the two units for raw signal measurement purposes. All the experimental configurations are described in [AD 17], [AD 18] and [AD 19].

Data produced by FMO, FSL, QMO and QML have the same format as the data produced during in-flight mission phases, as described in above sections.

Data produced by the laboratory bench have a particular Level 2 format, described in 4.4.2.3.

The DOCUMENT directory, as presented in 4.2.3.7, contains calibration specific documents:

File Name	Contents
RO-OCN-TR-3801.LBL	PDS label of file RO-OCN-TR-3801.PDF
RO-OCN-TR-3801.PDF	Consert FMO Flight Model Orbiter Integration and calibration
RO-OCN-TR-3802.LBL	PDS label of file RO-OCN-TR-3802.PDF

RO-OCN-TR-3802.PDF	Consert FSL integration Calibration
RO-OCN-TR-3805.LBL	PDS label of file RO-OCN-TR-3805.PDF
RO-OCN-TR-3805.PDF	FMO-FSL calibration at Kourou

4.4.2.2 CONSERT instrument models data

The data that were produced from the CONSERT instrument models (FMO, FSL, QMO and QML) have the same format as the in-flight data. They contain all housekeeping value and the same signal format, separated in two channels I (in-phase) and Q (in quadrature) of 255 samples. On lander units (FSL and QML), the long and short signals are available, as defined in section 2. The signals are an accumulation of 1024 cycles of the CONSERT BPSK code. For further details, please refer to 2.2.

To exploit the calibration data, one would prefer to retrieve the whole data, coming from the tested units (FMO, FSL), the responding ones (QML, QMO) and the bench, for a single experiment. This can be done by using the calibration files correlation tables given in Appendix 8. This will also give the user a reference to the specific chapter in documentation that describes the particular experiment.

Note:

During the calibration tests, the absolute time was not correct. It is not of great importance because what matters is more the relative time between soundings, inside a single operation. We roughly corrected the START_TIME and STOP_TIME in data LABEL files in order to give an idea of the date of the operation, but is not fully reliable. ***Please prefer referring to the Appendix 8 tables*** *(also included in archive files in the DOCUMENT directory).*

4.4.2.3 CONSERT calibration laboratory bench data

The CONSERT calibration bench produces raw data as it contains pure signal without any housekeeping or acknowledgments information. Thus, the data format in use for archiving the bench data is quite different from the other CONSERT data, but also simpler.

Remark: the bench calibration data are only provided in Level 2 archive. There is no interest in re-processing these signal data.

The calibration data taken from the CONSERT bench are used for Science signal calibration. They are composed of raw in-phase (I) and in quadrature (Q) components which are not accumulated and not compressed by the matched filter. Detailed description is given in 4.4.2.3.1.

To exploit the calibration data, it would be interesting to retrieve the whole data, coming from the tested units (FMO, FSL), the responding ones (QML, QMO) and the bench, for a single experiment. This can be done by using the calibration files correlation tables given in Appendix 8. This will also give the user a reference to the specific chapter in documentation that describes the particular experiment.

Note:

As stated in 4.4.2.2, the absolute dates and time for datasets and soundings produced by the bench are not reliable. ***Please prefer referring to the Appendix 8 tables*** *(also included in archive files in the DOCUMENT directory).*

4.4.2.3.1 Calibration bench signal data description

The signal digitalized by the laboratory bench is the raw CONSERT signal as transmitted between the orbiter and the lander units. That means that no on-board processing has been applied on it. It is also sampled at twice the nominal rate.

- The 1024 BPSK code signals are not accumulated, but acquired sequentially
- Each step of the code is digitalized with double rate: so the data contains 510 samples for the 255 BSPK code steps
- Each sample value is expressed as an 8 bytes float (64 bits double precision floating point value).

In other words, to reconstruct a CONSERT signal as produced by the instrument, one shall accumulate 1024 consecutive signals of 510 samples. Then shrink the 510 samples into 255 samples.

4.4.2.3.2 Specific Data Object Definition

From the previous section, we define a different data object definition for the bench files.

```
/* DATA OBJECT DEFINITIONS*/
OBJECT                = I_TABLE
  NAME                = "I"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 1024
  ROW_BYTES           = 4080
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "I_SIGNAL"
    DATA_TYPE         = PC_REAL
    START_BYTE        = 1
    BYTES             = 4080
    ITEMS             = 510
    ITEM_BYTES        = 8
    ITEM_OFFSET       = 8
    DESCRIPTION       = "THIS TABLE REPRESENTS THE I VALUES OF THE
                         NON-ACCUMULATED AND UNCOMPRESSED CONSERT SOUNDING
                         SIGNAL, WITH 510 SAMPLES FOR 255 CODE STEPS."
  END_OBJECT   = COLUMN
END_OBJECT            = I_TABLE

OBJECT                = Q_TABLE
  NAME                = "Q"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 1024
  ROW_BYTES           = 4080
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "Q_SIGNAL"
    DATA_TYPE         = PC_REAL
    START_BYTE        = 1
    BYTES             = 4080
    ITEMS             = 510
    ITEM_BYTES        = 8
    ITEM_OFFSET       = 8
    DESCRIPTION       = " THIS TABLE REPRESENTS THE Q VALUES OF THE
                         NON-ACCUMULATED AND UNCOMPRESSED CONSERT SOUNDING
                         SIGNAL, WITH 510 SAMPLES FOR 255 CODE STEPS."
  END_OBJECT   = COLUMN
END_OBJECT            = Q_TABLE
```

5 Level 3 Specifications and Design

This part describes the L3 design and specifications.

5.1 CONSERT signals and calibrations

As a reminder from the previous sections, CONSERT instrument is a bi-static radar based on a transponder system. The orbiter unit (OCN) sends a BPSK coded signal to the lander unit (LCN), passing through the comet nucleus, and then transmitted back to the orbiter unit. Thus, the CONSERT measurements consist in a sequence of soundings: go and back travelling of the radar signal also called “ping-pong”. Typically, they are sent every 2 to 5 seconds. This time scale along the orbit is referred as the radar “long time”. A single sounding lasts in the order of tens to hundred µs depending mostly on the orbiter distance to the observed body. This time scale is referred as the radar “short time”. This signal is recorded in a cycling window of 25.5 µs.

For every sounding, we have one signal received on the lander and another received on the orbiter. For data volume saving reasons, the full signal on the lander cannot be send to the ground segment through Rosetta for each sounding. Thus, there’s an instrument setting (FIOW) that defines the soundings interval between full (always named “long”) signals on LCN which consist of 255 complex samples (I and Q components). When a long signal is not sent to TM on LCN, it is replaced by a shorter one. This reduced “short” signal consists of 21 complex samples (also I and Q components). In contrary with the long signal, the short is compressed with the BPSK coded matched filter (cf. Appendix 0) onboard LCN before submission to TM. The 21 samples are centered on the transponder detected peak. In all the cases each sample, or code step, corresponds to 0.1 µs.

In order to be able to adapt the instrument to various body compositions, sizes and structures (and the story showed that 67P was quite surprising!), an automatic gain control component is embedded onboard OCN and LCN. It automatically adapts the dynamic range of the instrument analog to digital converter (ADC) that is sampled by the radar system. The amplitude of the signal is thus defined in raw data by the instrument parameter GCW (gain control word). In addition, a digital framing is applied onboard after the ADC and accumulation stages to keep only the strongest weighted (and more useful) bits of each sample of the signal. This framing is performed in several steps during the CONSERT onboard processing.

More technical details can be found in section 4, for raw data description and [AD 16] for deeper data description and instrument functioning.

5.2 L3 data overview

The L3 processing focuses on CONSERT instrument internal calibration compensations. In other words, all the corrections involving simple engineering calibration due to on-board auto-adjustments and orbitography related corrections.

The L3 CONSERT signals are also given compressed by the radar code.

L3 data also includes physical conversion of all measured parameters for science and housekeeping. They will be described in details in the following section. The conversion functions used to translate internal instrument housekeeping as digital board and OCXO temperatures or OCXO frequency are given in appendix 0.

In addition to the in-flight datasets, on-ground calibration datasets have also been released after applying the Level 3 processing. These ground calibration datasets are described for the Level 2 in 4.4.2. Only "ping-pong" experiments have been processed to Level 3.
In the Level 3 archive, the bench calibration data are not provided because the calibration processing is not applicable. As specified in Appendix 8 tables, some of the Level 2 datasets could not have been processed and are not part of the Level 3 delivered datasets.

Note: as for the Level 2, the ground calibration datasets absolute dates and times are not completely reliable. Please refer to the test report related documentation [AD 17], [AD 18] and [AD 19].

5.2.1 Signal compression

The raw signal is processed by the matched filter (correlation with the copy of the model of transmitted signal) and this compressed data are given. On the OCN data the origin of each of this compressed signal T0 is given after the correction of the instrumental delays and the propagation ambiguity, which is due to the periodicity of transmitted signal. The sampling is 100ns. When the signal is present, a clear peak may be visible and the propagation time between the lander and orbiter is equal to T0 + N * 100 ns, where N is the position of the peak in samples, counting starting from zero. The accuracy of these measurements is +- 50 ns.

The time ambiguity due to the recording window is resolved by using the Rosetta and Philae orbitography, which provide a distance measurement with largely enough accuracy. The needed accuracy is half of the window, i.e. 12.75 µs that represents 3.8 km.

5.2.2 Interferences cancellation

During the processing, the spurious interfering lines coming from the S/C and other instruments have been detected and filtered out. The amplitude, frequency and phase of these frequencies are indicated in the data. The interferences detection is based on a power difference threshold on a single frequency line by regard to the signal average. This processing has been performed for FSS mostly, and the threshold value has been set to 20 dB. For other phases, no major interference problems have been identified.

5.2.3 Long time calibration

As OCN and LCN works together to exchange the CONSERT coded signal, their respective measurements must be mapped on each other's. After L2 raw data de-commutation, a few missing soundings (mostly on LCN) are detected. With this information, OCN and LCN soundings tables are checked and corrected to give to the user a clear mapping between the two in L3 data tables.

The dates for each sounding have been corrected in UTC by regard to the S/C time correlation, and the CONSERT instrument internal delays. The provided corrected UTC sounding date corresponds to middle of the ping-pong phase. This last correction is of the order of magnitude of 250 ms.

5.2.4 Amplitudes calibration

The amplitude calibration is constituted of the automatic gain control correction (digital scaling and thermal compensation), the digital framing correction and the thermal calibration in transmission (Tx) and receiving (Rx) radar channels.

The AGC gain control word (GCW) decoding is as simple as the amplitude of the signal is multiplied by $10^{\frac{GCW}{20}}$. GCW range of values is [0; 31].

The framing word decoding for LCN is documented in [AD 16– 5.5.1].

Important note: Concerning thermal calibration of CONSERT instrument (AGC, Tx and Rx thermal behavior), we have defined placeholder variables, which still are not analyzed in a satisfying way. For now, all these factors are equals to 1.0.

Due to the unexpected Philae landing and impossibility of rebuilding the exact measurement configuration, CONSERT signal amplitudes will be given without absolute physical units. This is not an issue in that sense that CONSERT measurements amplitude can be interpreted as relative attenuations of the signals which includes:

- Antenna losses (mismatch and polarization)
- Divergence losses through the propagation path
- Attenuation by the cometary materials

5.2.5 Short time calibration

The fine correction and most precise calculation of the signal travel time, mostly constituted by the peak detection and signal interpolation methods, will be part of the L4 data and thus not included in L3.

The reason for this is that the complexity of the interpolation process cannot be back-processed to previous level and leads to far bigger data volumes and different data structures (OCN and LCN information will then be merged in this process).

5.2.6 Data quality

At the end of the processing, CONSERT team attributes a quality flag for each sounding. It gives a global information on the quality of the receive signal (cf. section 5.3.1).

5.3 Data Validation

The CONSERT data products are delivered and validated to PSA by CONSERT Team.

5.3.1 Data Quality ID

Important note: For L3 data, this quality ID is given as indicative and as not been consolidated. Indeed, to define this quality index, the complete signal processing must be applied and it will be evaluated again in L4 data.

Data quality ID is equal to:

- 0 : Strong signal with good LCN/OCN transponder synchronization, usable for travel-time analysis
- 1 : Positive SNR but no transponder synchronization
- 2 : SNR close to 0 dB (statistical detection)
- 3 : No signal detected.

5.4 Content

Only the acquisition sequences where OCN and LCN worked in ping-pong mode are published in the L3 archives. Other sequences were only technical tests without scientific interest.

The L3 archive follows as much as possible the same structure as the L2 archive.

5.4.1 Acquisition sequences

CONSERT were operating onboard Rosetta and Philae from first in-flight phase in March 2004 until comet phase in December 2015. This section gives an overview of the acquisition sequences that are included in Level 3 data. Only data that can give an interest on scientific analysis and eventually signal calibration are included.

5.4.1.1 Science sequences

CONSERT operated to fulfil its scientific objectives in three phases. These are the CONSERT scientific data of interest for most of the users. It covers the very first on-comet phases:

Mission phase	Description	Date	Start time	Stop time
PDCS	Close observation period, (during MTP8 planning phase, for information)	16/10/2014	11:00:00	14:00:00
SDL	Philae’s Separation, Descent & Landing	12/11/2014	8:21:55	14:51:37
FSS	Philae’s First Science Sequence	12/11/2014	18:56:35	05:42:55 (day +1)

Table 3: CONSERT science sequences

CONSERT was intended to operate during the first 3 months after Philae’s touch down, but due to its unexpected landing, this has not been possible and no data came back in LTS (Long Term Science) phase.

Note: the intention in this chapter is to give a rough idea of what can be found, and the intention for each measurement sequence. This shall not be taken as any scientific interpretation.

During the PDCS sequence, Philae was still attached to Rosetta. Thus, OCN and LCN were used as a mono-static radar. There, the signal is largely dominated by the direct OCN to LCN propagation path. The intention of this sequence is to detect a comet nucleus surface echo near or below the signal noise level.

During the SDL sequence, OCN and LCN were used to monitor the distance between Rosetta and Philae. This data are useful for calibration and also for Philae attitude reconstruction during the descent. Surface echo might be detectable beneath the main direct path peak, as for PDCS.

During the FSS sequence, a single CONSERT tomography scan has been successfully performed. It gives data on a whole orbit revolution of Rosetta around the comet nucleus. The Rosetta orbit has been designed with a priority on the lander delivery constraints but CONSERT requirements were fulfilled. In that sequence, the CONSERT signal travelled through the 67P nucleus.

For more detailed information about CONSERT sequences, please refer to the operation reports included in the archive DOCUMENT folder.

5.4.1.2 In-flight calibration sequences

The in-flight ping-pong sequences were made in two purposes: to test the good functioning of the instrument and to collect calibration data for further signal processing. This calibration data are not used for L3 archive data generation but constitute the main input for L4. Please refer to this archive level documentation sections to get more information about it.

The in-flight calibration sequences covers the Cruise phases (CR2, CR4A, CR5, EAR2, EAR3 and MARS) and the post hibernation commissioning (PHC)

This data are of interest for advanced users that have a deepest knowledge in CONSERT instrument design [AD 16].

5.4.1.3 On-ground calibration sequences

On-ground and laboratory calibration measurements are included in Level 3 datasets. This data are of interest for advanced users that have a deepest knowledge in CONSERT instrument design [AD 16].
Note: the UTC timing for ground calibration datasets is not valid. However, on can use the instrument's internal timing as well.

5.4.1.4 Philae localization sequences

The exact location, orientation and local environment of Philae is of first interest to interpret CONSERT data. Philae bouncing and landing was not expected and could have completely jeopardized the CONSERT measurements. In the very first moment of Philae's unexpected landing operations, CONSERT instrument was used as a localization system over the comet. Those sequences at the end of FSS phase allowed Rosetta and Philae operation teams to approximate the localization of the lander. Fortunately, Philae was photographed by OSIRIS camera and identified by their team in early September 2016 inside this predicted zone.

These sequences are included in L3 data as "FSS ranging" operations.

Localization and communication attempts have been performed without success during the LTS and are not part of the L3 data.

5.4.2 Volume Set

One volume corresponds to one data set. The possible values of VOLUME keywords can be found in AD 8. The volume keyword values for the EAR3 mission phase are given in the following example.

```
VOLUME_NAME                  = "CONSERT CALIBRATED DATA FOR THE
                                EAR3 PHASE"
VOLUME_SERIES_NAME           = "ROSETTA SCIENCE ARCHIVE"
VOLUME_SET_ID                = "FR_CNRSUG_IPAG_RORLCN_10XX"
VOLUME_SET_NAME              = "ROSETTA CONSERT DATA"
VOLUME_ID                    = "RLCN2_1007"
VOLUME_VERSION_ID            = "VERSION 1"
VOLUME_FORMAT                = "ISO-9660"
MEDIUM_TYPE                  = "ELECTRONIC"
VOLUMES                      =  15
PUBLICATION_DATE             = 2006-11-13
DESCRIPTION                  = " This volume contains data
                                 and supporting documentation
                                 from the Rosetta EAR3
                                 mission phase "
```

5.4.3 Data Set

The CONSERT data are archived in as many Data Sets as simple mission phase, which contain ping-pong (Table 2-1 and AD 8) and level data processing. The descriptions of the fields of the keywords DATA_SET_ID and DATA_SET_NAME are given in the following table.

Field of DATASET_ID or DATA_SET_NAME	DATA_SET_ID	DATA_SET_NAME
INSTRUMENT_HOST_ID / INSTRUMENT_HOST_NAME	RO RL	ROSETTA-ORBITER ROSETTA-LANDER
Target id / target name	See AD 8	See AD 8
INSTRUMENT_ID	CONSERT	
Data processing level number	CODMAC level 3 (calibrated data)	
mission phase abbreviation	See AD 8	
description	Field not used in DATA_SET_ID	Field not used in DATA_SET_NAME
version	The first version of a data set is V1.0	

5.4.4 Directories

The organisation (directories) of a level 3 dataset is shown below.

```
                       |-AAREADME.TXT
                       |-CATALOG-
                       |-DATA-
                       |-GEOMETRY-
|-root directory------ |
                       |-DOCUMENT-
                       |-INDEX-
                       |-LABEL-
                       |-VOLDESC.CAT
```

5.4.4.1 Root Directory

File Name	Contents
AAREADME.TXT	Volume content and format information
VOLDESC.CAT	A description of the contents of this volume in PDS format readable by both humans and computers

The name of the root directory is the data set ID.

5.4.4.2 Calibration Directory

CONSERT instrument has no direct embedded calibration sub-system. So there is no calibration data directly linked to a scientific measurement sequence.

CONSERT calibration data are acquisition sequences themselves performed during Cruise, PHC and on-ground phases. Those data are delivered as separate datasets (cf. section 5.2).

5.4.4.3 Catalog Directory

The catalog directory provides a top level understanding of the mission, spacecraft, instruments and data sets.The catalog directory contains the following files:

File Name	Contents
CATINFO.TXT	A description of the contents of the catalog directory
DATASET.CAT	Data set information
INST.CAT	Instrument information
INSTHOST.CAT	Instrument host (spacecraft) information
MISSION.CAT	Mission information
REF.CAT	Full citations for references mentioned in any and all of the catalog files, or in any associated label files.
PERSON.CAT	PDS personnel catalog information about the instrument team responsible for generating the data products. There is one file for each instrument team providing data to this data set.
SOFTWARE.CAT	Information about the software included in the SOFTWARE directory

5.4.4.4 Index Directory

The index directory contains the indices for all data products on the volume. The following files are included in the index directory:

5.4.4.4.1 Dataset Index File, INDEX.LBL and INDEX.TAB

File Name	Contents
INDEX.LBL	PDS label for the volume index file, INDEX.TAB
INDEX.TAB	Volume index in tabular format
INDXINFO.TXT	A description of the contents of the Index Directory

5.4.4.5 Geometry Directory

CONSERT instrument science concept main interest is on signal travel-time comparison with relative position of Rosetta and Philae. Consequently, this is of high importance to have a good knowledge of the geometrical configuration of the measurements.

That means that we have to define the position and rotation of both Rosetta and Philae as accurate as possible for the exact time of each CONSERT sounding.

First step is the sounding, radar long time correction. This includes three corrections:

- S/C time correlation correction based on Rosetta time correlation tables to convert sounding times to UTC times.
- Correction of the instrument internal error due to the TM submission delay. The on-board quantization of the timing follows a non-linear law due to data volume optimization and binary shifts on raw timing cycles. The bias has been evaluated by statistical analysis on calibration data and is equal to +0.20 s (CN time minus SCET time).
- The sounding time is a bit different as the TM submission time. Indeed it exists an offset of +0.25 s (TM time minus sounding time). This has been evaluated in laboratory by current curves analysis.

Once the time correction is applied and precise UTC dating of soundings are known, we use NAIF Spice ToolKit along with ESAC Rosetta and SONC Philae spice kernel to generate all the geometrical information. This geometry information is computed by ESAC team as B3F files, using the Spice kernels published in PSA archive.

Important notes:

- The geometry files have been produced for L3 and L4 data, along with time corrections and calibrations. This geometrical information is not available in L2 archive.
- For a single phase, all geometry data are stored inside a single file. That means that all CONSERT operations geometry inside a single Rosetta mission phase are available in the same geometry file.
- All the geometry information is given for each sounding, at UTC times corresponding to the soundings. The first column of the geometry file contains the UTC time.

5.4.4.5.1 OCN geometry data

The description of the geometry fields is given in the label file extract below. Some of those fields need a bit more of explanation, due to the specific concept of CONSERT instrument.

The CONSERT orbiter antenna can be considered as an 80° field of view (FOV) radar sensor. This FOV is centered on the BORESIGHT unit 3D vector and its circular boundary is defined by the two FOV_1 and FOV_2 unit 3D vectors. The projection of FOV_1 gives the orientation of the +X local frame for CONSERT antenna and the projection of FOV_2 gives the +Y vector, while the BORESIGHT is directly the CONSERT +Z local vector. This orientation vectors are derived from the Rosetta attitude spice kernels.

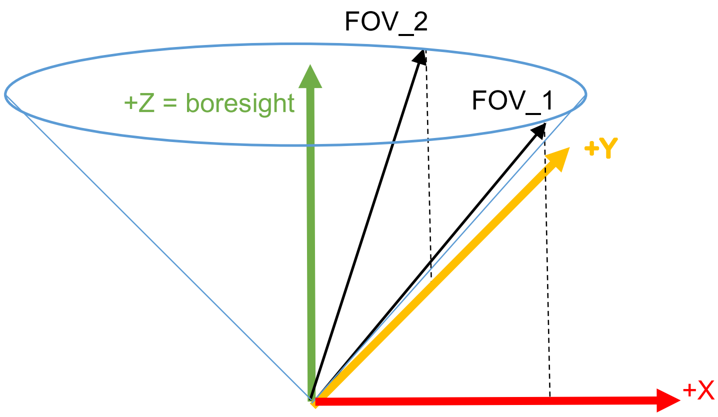


Figure 5: CONSERT orbiter boresight and FOV definition

```
/* DATA OBJECT DEFINITIONS  */
OBJECT                   = GEOMETRY_TABLE
  ROWS                   = 15468
  COLUMNS                = 16
  ROW_BYTES              = 370
  INTERCHANGE_FORMAT     = ASCII
  DESCRIPTION            = "This table contains the geometry data"
  OBJECT       = COLUMN
    NAME                 = "UTC"
    COLUMN_NUMBER        = 1
    DATA_TYPE            = TIME
    START_BYTE           = 1
    BYTES                = 23
    DESCRIPTION          = "Start time"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                 = "SC_POS_X"
    DATA_TYPE            = ASCII_REAL
    UNIT                 = "KILOMETER"
    START_BYTE           = 24
    BYTES                = 23
    DESCRIPTION          = "S/C Position X"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                 = "SC_POS_Y"
    DATA_TYPE            = ASCII_REAL
    UNIT                 = "KILOMETER"
    START_BYTE           = 47
```

```
    BYTES              = 23
    DESCRIPTION        = "S/C Position Y"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SC_POS_Z"
    DATA_TYPE          = ASCII_REAL
    UNIT               = "KILOMETER"
    START_BYTE         = 70
    BYTES              = 23
    DESCRIPTION        = "S/C Position Z"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SUN_POS_X"
    DATA_TYPE          = ASCII_REAL
    UNIT               = "KILOMETER"
    START_BYTE         = 93
    BYTES              = 23
    DESCRIPTION        = "Sun Position X"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SUN_POS_Y"
    DATA_TYPE          = ASCII_REAL
    UNIT               = "KILOMETER"
    START_BYTE         = 116
    BYTES              = 23
    DESCRIPTION        = "Sun Position Y"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SUN_POS_Z"
    DATA_TYPE          = ASCII_REAL
    UNIT               = "KILOMETER"
    START_BYTE         = 139
    BYTES              = 23
    DESCRIPTION        = "Sun Position Z"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "BORESIGHT_X"
    DATA_TYPE          = ASCII_REAL
    START_BYTE         = 162
    BYTES              = 23
    DESCRIPTION        = "Boresight X"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "BORESIGHT_Y"
    DATA_TYPE          = ASCII_REAL
    START_BYTE         = 185
    BYTES              = 23
    DESCRIPTION        = "Boresight Y"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "BORESIGHT_Z"
    DATA_TYPE          = ASCII_REAL
    START_BYTE         = 208
    BYTES              = 23
    DESCRIPTION        = "Boresight Z"
  END_OBJECT   = COLUMN
```

```
  OBJECT      = COLUMN
    NAME             = "FOV_1_X"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 231
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 1 X"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "FOV_1_Y"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 254
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 1 Y"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "FOV_1_Z"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 277
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 1 Z"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "FOV_2_X"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 300
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 2 X"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "FOV_2_Y"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 323
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 2 Y"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "FOV_2_Z"
    DATA_TYPE        = ASCII_REAL
    START_BYTE       = 346
    BYTES            = 23
    DESCRIPTION      = "FOV Corner 2 Z"
  END_OBJECT  = COLUMN

END_OBJECT             = GEOMETRY_TABLE
```

5.4.4.5.2 LCN geometry data

The description of the geometry fields is given in the label file extract below. Some of those fields need a bit more of explanation, due to the specific concept of CONSERT instrument.

The CONSERT lander antenna is omnidirectional and no FOV can be defined for it. Consequently, the local frame is directly defined as its X, Y, Z unit vectors in 3D Cartesian coordinates. This orientation vectors are derived from the Philae attitude spice kernels.

```
/* DATA OBJECT DEFINITIONS  */
OBJECT                = GEOMETRY_TABLE
  ROWS                = 15468
  COLUMNS             = 13
  ROW_BYTES           = 301
  INTERCHANGE_FORMAT = ASCII
  DESCRIPTION         = "This table contains the geometry data"
  OBJECT       = COLUMN
    NAME              = "UTC"
    COLUMN_NUMBER     = 1
    DATA_TYPE         = TIME
    START_BYTE        = 1
    BYTES             = 23
    DESCRIPTION       = "Start time"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME              = "SC_POS_X"
    DATA_TYPE         = ASCII_REAL
    UNIT              = "KILOMETER"
    START_BYTE        = 24
    BYTES             = 23
    DESCRIPTION       = "S/C Position X"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME              = "SC_POS_Y"
    DATA_TYPE         = ASCII_REAL
    UNIT              = "KILOMETER"
    START_BYTE        = 47
    BYTES             = 23
    DESCRIPTION       = "S/C Position Y"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME              = "SC_POS_Z"
    DATA_TYPE         = ASCII_REAL
    UNIT              = "KILOMETER"
    START_BYTE        = 70
    BYTES             = 23
    DESCRIPTION       = "S/C Position Z"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME              = "SUN_POS_X"
    DATA_TYPE         = ASCII_REAL
    UNIT              = "KILOMETER"
    START_BYTE        = 93
    BYTES             = 23
    DESCRIPTION       = "Sun Position X"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME              = "SUN_POS_Y"
    DATA_TYPE         = ASCII_REAL
    UNIT              = "KILOMETER"
    START_BYTE        = 116
    BYTES             = 23
    DESCRIPTION       = "Sun Position Y"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
```

```
    NAME                = "SUN_POS_Z"
    DATA_TYPE           = ASCII_REAL
    UNIT                = "KILOMETER"
    START_BYTE          = 139
    BYTES               = 23
    DESCRIPTION         = "Sun Position Z"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "Z_FRAME_X"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 162
    BYTES               = 23
    DESCRIPTION         = "Philae local frame Z vector (X)"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "Z_FRAME_Y"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 185
    BYTES               = 23
    DESCRIPTION         = "Philae local frame Z vector(Y)"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "Z_FRAME_Z"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 208
    BYTES               = 23
    DESCRIPTION         = "Philae local frame Z vector (Z)"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "X_FRAME_X"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 231
    BYTES               = 23
    DESCRIPTION         = "Philae local frame X vector (X)"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "X_FRAME_Y"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 254
    BYTES               = 23
    DESCRIPTION         = "Philae local frame X vector (Y)"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "X_FRAME_Z"
    DATA_TYPE           = ASCII_REAL
    START_BYTE          = 277
    BYTES               = 23
    DESCRIPTION         = "Philae local frame X vector (Z)"
  END_OBJECT   = COLUMN

END_OBJECT              = GEOMETRY_TABLE
```

5.4.4.6 Label Directory

The label directory contains include files (.FMT files with label definitions) referenced by data files on the data set. The following files are included in the index directory:

File Name	Contents
LABINFO.TXT	A description of the contents of this directory (.FMT files)
AOCS_L3.FMT	Auxiliary (AOCS) data – solar panel position (-Y/+Y) and High gain antenna (Azimuth and Elevation)
CARAC_LANDER_PARAMETER_DEF.FMT	For lander. L3 parameters
CARAC_PARAMETER_DEF.FMT	For orbiter. L3 parameters

Important note:
The AOCS_L3.FMT contains ancillary data of interest for CONSERT experiment coming from Rosetta and Philae platforms housekeeping. The information is the same as the one in L2 data but resampled from Spice kernels on CONSERT soundings. The name of the fields have changed to be more explanatory, by comparison to L2 archive. The angle values are given in degrees.

5.4.4.7 Document Directory

This directory contains all original documents necessary to understand the data.
The following files are included in the document directory:

File Name	Contents
DOCINFO.TXT	Identifies and describes the function of each file in the DOCUMENT subdirectory.
EAICD_CONSERT.LBL	PDS label of EAICD_CONSERT.PDF
EAICD_CONSERT.PDF	CONSERT EAICD (this document)
LOGBOOK_*ph*.LBL	PDS label of file RORL_CN_LOGBOOK_*ph*.ASC
LOGBOOK_*ph*.ASC	Logbook of CONSERT operations during mission phase *ph*
RO-OCN-TN-3067.LBL	PDS label of file RO-OCN-TN-3067.PDF
RO-OCN-TN-3067.PDF	CONSERT commissionning report
RO-OCN-TN-3802.LBL	PDS label of file RO-OCN-TN-3802.PDF
RO-OCN-TN-3802.PDF	CONSERT In-flight operation test report
RO-OCN-TN-3825.LBL	PDS label of file RO-OCN-TN-3825.PDF
RO-OCN-TN-3825.PDF	CONSERT User Manual Orbiter & Lander
RO-OCN-TN-3850.LBL	PDS label of file RO-OCN-TN-3850.PDF
RO-OCN-TN-3850.PDF	CONSERT stop&start procedure description
RO-OCN-TN-3851.LBL	PDS label of file RO-OCN-TN-3851.PDF
RO-OCN-TN-3851.PDF	CONSERT operation requests
RO-OCN-TN-3852.LBL	PDS label of file RO-OCN-TN-3852.PDF
RO-OCN-TN-3852.PDF	CONSERT post hibernation commissionning test report
RO-OCN-TN-3866.LBL	PDS label of file RO-OCN-TN-3866.PDF
RO-OCN-TN-3866.PDF	CONSERT operation report : Close Observation (PDCS), SDL, FSS
RO-OCN-TN-3868.LBL	PDS label of file RO-OCN-TN-3868.PDF
RO-OCN-TN-3868.PDF	CONSERT operation report : Long Term Science
RO-OCN-TR-3801.LBL	PDS label of file RO-OCN-TR-3801.PDF
RO-OCN-TR-3801.PDF	Consert FMO Flight Model Orbiter Integration and calibration
RO-OCN-TR-3802.LBL	PDS label of file RO-OCN-TR-3802.PDF
RO-OCN-TR-3802.PDF	Consert FSL integration Calibration
RO-OCN-TR-3805.LBL	PDS label of file RO-OCN-TR-3805.PDF
RO-OCN-TR-3805.PDF	FMO-FSL calibration at Kourou

5.4.4.8 Data Directory

The DATA directory contains all label and table files for OCN and LCN for the measurement sequences inside a given mission phase.

The DATA directory also contain AOCS data.

5.5 Data Sets Definition

The following table gives the definition of the name and id of the CONSERT data sets :

Data Set ID	Data Set Name
RO/RL-CAL-CONSERT-3-GRND-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 GRND V1.0
RO/RL-CAL-CONSERT-3-EAR2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 EAR2 V2.0
RO/RL-CAL-CONSERT-3-EAR3-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 EAR3 V2.0
RO/RL-CAL-CONSERT-3-MARS-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 MARS V2.0
RO/RL-CAL-CONSERT-3-CR2-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR2 V2.0
RO/RL-CAL-CONSERT-3-CR4A-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR4A V2.0
RO/RL-CAL-CONSERT-3-CR5-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR5 V2.0
RO/RL-CAL-CONSERT-3-PHC-V2.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 PHC V2.0
RO/RL-CAL-CONSERT-3-PDCS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 PDCS V1.0
RO/RL-C-CONSERT-3-SDL-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER C CONSERT 3 SDL V1.0
RO/RL-C-CONSERT-3-FSS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER C CONSERT 3 FSS V1.0

Note : Only the data sets with ping-pong are available.
Note : V2.0 was produced during the L4 generation to add some missing operations in Cruise phases.

5.6 Data Product Design

The CONSERT data products delivered to PSA are calibrated data (CODMAC level 3) containing sounding information.

All CONSERT data products have PDS detached labels.

5.6.1 Data Product Design

The Level 3 CONSERT data products are composed two DAT data files with their two associated LBL label filles. One is for the CONSERT lander (LCN) data with 'CN_L' prefix in file naming, while the other is for the CONSERT orbiter (OCN) data 'CN_O' prefix in file naming.

The LCN unit outputs two types of signals. One short and compressed signal composed of 21 samples in I and Q and available for each sounding. One long signal composed of 255 samples in I and Q, available for every N-th sounding, with N = FIOW parameter (cf. 2.2 for details).

The OCN DAT file is composed of 5 tables:

- 2 tables with I/Q long compressed signals: I_LONG_COMP_TABLE and Q_LONG_COMP_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times").
- 2 tables with I/Q long uncompressed signals: I_LONG_TABLE and Q_LONG_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times").
- 1 table with all signal characterization parameters: CARAC_TABLE. The columns are detailed in 5.6.1.4.1.

The LCN DAT file is composed of 3 tables:

- 2 tables for the short compressed signals: I_SHORT_TABLE and Q_SHORT_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times").

- 2 tables with I/Q long compressed signals: I_LONG_COMP_TABLE and Q_LONG_COMP_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times"). For the sounding where the long signal is not output by LCN, MISSING_VALUES are set.
- 2 tables with I/Q long uncompressed signals: I_LONG_TABLE and Q_LONG_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times"). For the sounding where the long signal is not output by LCN, MISSING_VALUES are set.
- 1 table with all signal characterization parameters: CARAC_TABLE. The columns are detailed in 5.6.1.4.2.

In practice, the DAT files taken as raw binary files include the interleaved data of the file's tables. The corresponding data product is organized as TABLE objects using ROW_PREFIX_BYTES and ROW_SUFFIX_BYTES for defining the 3 parts (cf. in label files definitions):

I signal	Q signal…	CARAC Table	➔ Record # 1
I signal	Q signal…	CARAC Table	➔ Record # 2

…

The record structure is shown in annex

5.6.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for CONSERT calibrated data (level 3 Orbiter and Lander) are:

```
RECORD_TYPE   = FIXED_LENGTH
RECORD_BYTES  = 6231
FILE_RECORDS  =
FILE_NAME     =

RECORD_TYPE   = FIXED_LENGTH
RECORD_BYTES  = 6378
FILE_RECORDS  =
FILE_NAME     =
```

The PDS file characteristic data elements for AOCS edited auxiliary data (level 3) are:

```
RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 121
FILE_RECORDS         =
```

5.6.1.2 Data Object Pointers Identification Data Elements

The CONSERT calibrated data are organized as binary tables. The data object pointers (^TABLE) reference TAB files.

5.6.1.3 Instrument and Detector Descriptive Data Elements

Orbiter file:

```
INSTRUMENT_HOST_NAME       = "ROSETTA-ORBITER"
INSTRUMENT_HOST_ID         = "RO"
INSTRUMENT_ID              = CONSERT
INSTRUMENT_NAME            = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                           TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONSERT IN SOUNDING MODE"
```

Lander file:

```
INSTRUMENT_HOST_NAME       = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID         = "RL"
INSTRUMENT_ID              = CONSERT
INSTRUMENT_NAME            = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                           TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONSERT IN SOUNDING MODE"
```

5.6.1.4 Data Object Definition

5.6.1.4.1 OCN data

The given signal amplitudes in L3 tables are already corrected with the parameters described below.

PARAMETER	DESCRIPTION
O_SN	The CONSERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
L_SN	The corresponding CONSERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding. It can occur that a sounding is missing in the data, the mapping between O_SN and L_SN allows to have a correct matching between OCN and LCN data.
TEMP_OCXO	Temperature (°C) on the orbiter instrument OCXO component. Conversion function from raw data given in appendix 0.
TEMP_DIGI	Temperature (°C) on the orbiter instrument digital board. Conversion function from raw data given in appendix 0.
OCXO	Frequency (Hz) of the OCXO after the tuning phase. Conversion function from raw data given in appendix 0.
UTC	The corrected UTC timing of each sounding given as a character string.
CN_SECONDS	The relative number of seconds from CONSERT instrument start-up.
GCW	The automatic gain control factor in dB. Please refer to 5.2.4 for details.
RADIOM_GCW	Placeholder for the thermal correction factor applied on linear amplitude for the automatic gain control component. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
RADIOM_THERM_RX	Placeholder for the thermal correction factor applied on linear amplitude for the instrument receiving chain. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
RADIOM_THERM_TX	Placeholder for the thermal correction factor applied on linear amplitude for the instrument transmitting chain. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
TOTAL_GAIN	The total gain factor applied on linear amplitudes. $$TOTAL\_GAIN = 10^{\frac{GCW}{20}} * RADIOM\_THERM\_RX * RADIOM\_THERM\_TX$$
IQ_CORR	The signal is composed of two complex components I and Q after demodulation. The electronics have an unbalanced constant error between the two components amplitudes. $I_{output} = I_{input}$ $Q_{output} = Q_{input} \times (1 + \epsilon)$ with ε equal to 5%

ENTROPY	**Placeholder for further information and signal quality estimation.**
QUALITY	For all the CONSERT sequences but FSS, quality of the signal was good, so the flag is set to 0. During the FSS science measurements are the most important ones for CONSERT, this parameter has been specifically analysed and qualitatively defined. Please refer to 5.3.1 for the detailed definition.
INTERF_FREQ	Cancelled interference frequency line position in spectrum (Hz). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)
INTERF_AMPLI	Cancelled interference frequency line amplitude (instrument unit). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)
INTERF_PHASE	Cancelled interference frequency line phase (rad). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)

Description of OCN data from label file is given below.

```
OBJECT                = I_LONG_COMP_TABLE
  NAME                = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 2040
  ROW_PREFIX_BYTES    = 0
  ROW_SUFFIX_BYTES    = 4191
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "I_LONG_COMP_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 2040
    ITEMS             = 255
    ITEM_BYTES        = 8
    ITEM_OFFSET       = 8
    DESCRIPTION       = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED ORBIT
                        ER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL I
                        S COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT SIGNA
                                                                              L."
  END_OBJECT   = COLUMN
END_OBJECT            = I_LONG_COMP_TABLE

OBJECT                = Q_LONG_COMP_TABLE
  NAME                = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 2040
  ROW_PREFIX_BYTES    = 2040
  ROW_SUFFIX_BYTES    = 2151
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 2040
```

```
    ITEMS             = 255
    ITEM_BYTES        = 8
    ITEM_OFFSET       = 8
    DESCRIPTION       = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                        ORBITER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIG
                        NAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT
                                                                      SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT            = Q_LONG_COMP_TABLE

OBJECT                = I_LONG_TABLE
  NAME                = "I_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 1020
  ROW_PREFIX_BYTES    = 4080
  ROW_SUFFIX_BYTES    = 1131
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "I_LONG_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 1020
    ITEMS             = 255
    ITEM_BYTES        = 4
    ITEM_OFFSET       = 4
    DESCRIPTION       = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED ORBIT
                        ER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGN
                        AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT S
                                                                       IGNAL."
  END_OBJECT   = COLUMN
END_OBJECT            = I_LONG_TABLE

OBJECT                = Q_LONG_TABLE
  NAME                = "Q_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 1020
  ROW_PREFIX_BYTES    = 5100
  ROW_SUFFIX_BYTES    = 111
  COLUMNS             = 1
  OBJECT       = COLUMN
    NAME              = "Q_LONG_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 1020
    ITEMS             = 255
    ITEM_BYTES        = 4
    ITEM_OFFSET       = 4
    DESCRIPTION       = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                        ORBITER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG
                         SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONS
                                                                  ERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT            = Q_LONG_TABLE

OBJECT                = CARAC_TABLE
  NAME                = "CARAC"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 111
  ROW_PREFIX_BYTES    = 6120
  ROW_SUFFIX_BYTES    = 0
```

```
  COLUMNS                = 15
  ^STRUCTURE             = "CARAC_PARAMETER_DEF.FMT"
END_OBJECT               = CARAC_TABLE
```

The structure of the TABLE object is described in the file *CARAC_PARAMETER_DEF* (LABEL directory) as follows:

```
 OBJECT      = COLUMN
    NAME                = "O_SN"
    COLUMN_NUMBER       = 1
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 4
    DESCRIPTION         = "CONSERT ORBITER SOUNDING NUMBER. IN THIS ARCHIVE, LAND
                          ER AND ORBITER SOUNDINGS TABLES ARE MAPPED TO MATCH EXA
                                                                            CTLY."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME                = "L_SN"
    COLUMN_NUMBER       = 2
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 5
    BYTES               = 4
    DESCRIPTION         = "CORRESPONDING CONSERT LANDER SOUNDING NUMBER."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME                = "TEMP_OCXO"
    COLUMN_NUMBER       = 3
    DATA_TYPE           = IEEE_REAL
    UNIT                = "DEGREE CELSIUS"
    START_BYTE          = 9
    BYTES               = 8
    DESCRIPTION         = "TEMPERATURE OF CONSERT ORBITER OVEN CONTROLLED EXTRA S
                                                     TABLE OSCILLATOR (OCXO)."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME                = "TEMP_DIGI"
    COLUMN_NUMBER       = 4
    DATA_TYPE           = IEEE_REAL
    UNIT                = "DEGREE CELSIUS"
    START_BYTE          = 17
    BYTES               = 8
    DESCRIPTION         = "TEMPERATURE OF CONSERT ORBITER DIGITAL BOARD."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME                = "OCXO"
    COLUMN_NUMBER       = 5
    DATA_TYPE           = IEEE_REAL
    UNIT                = "HERTZ"
    START_BYTE          = 25
    BYTES               = 4
    DESCRIPTION         = "CONSERT ORBITER OCXO STABLIZED FREQUENCY AFTER TUNING.
                                                                             "
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME                = "QUALITY"
```

```
  COLUMN_NUMBER     = 6
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 29
  BYTES             = 4
  DESCRIPTION       = "CONSERT SIGNAL QUALITY LEVEL (SEE LABEL FILE FOR DEFIN
                                                                  ITION)."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "UTC"
  COLUMN_NUMBER     = 7
  DATA_TYPE         = TIME
  START_BYTE        = 33
  BYTES             = 19
  DESCRIPTION       = "CONSERT UTC TIME OF THE SOUNDING. IT IS THE MID-TIME O
                                                         F THE PING-PONG."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "CN_SECONDS"
  COLUMN_NUMBER     = 8
  DATA_TYPE         = IEEE_REAL
  UNIT              = "SECOND"
  START_BYTE        = 52
  BYTES             = 8
  DESCRIPTION       = "CONSERT ON-BOARD TIME OF THE SOUNDING. THE VALUES ARE
                      GIVEN AS A FLOATING-POINT NUMBER OF SECONDS FROM THE BE
                                                     GINING OF OPERATION."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "GCW"
  COLUMN_NUMBER     = 9
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 60
  BYTES             = 4
  DESCRIPTION       = "CONSERT ORBITER GCW."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "RADIOM_GCW"
  COLUMN_NUMBER     = 10
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 64
  BYTES             = 8
  DESCRIPTION       = "RADIOMETRIC CORRECTION GCW."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "RADIOM_THERM_RX"
  COLUMN_NUMBER     = 11
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 72
  BYTES             = 8
  DESCRIPTION       = "THERMAL RADIOMETRIC CORRECTION."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME              = "RADIOM_THERM_TX"
  COLUMN_NUMBER     = 12
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 80
  BYTES             = 8
```

```
  DESCRIPTION      = "THERMAL RADIOMETRIC CORRECTION (Tx)."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "TOTAL_GAIN"
  COLUMN_NUMBER    = 13
  DATA_TYPE        = IEEE_REAL
  START_BYTE       = 88
  BYTES            = 8
  DESCRIPTION      = "TOTAL GAIN."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "IQ_CORR"
  COLUMN_NUMBER    = 14
  DATA_TYPE        = IEEE_REAL
  START_BYTE       = 96
  BYTES            = 8
  DESCRIPTION      = "I/Q BALANCING CORRECTION."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "ENTROPY"
  COLUMN_NUMBER    = 15
  DATA_TYPE        = IEEE_REAL
  START_BYTE       = 104
  BYTES            = 8
  DESCRIPTION      = "ENTROPY."
END_OBJECT  = COLUMN
```

5.6.1.4.2 LCN data

The given signal amplitudes in L3 tables are already corrected with the parameters described below.

PARAMETER	DESCRIPTION
L_SN	The CONSERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
O_SN	The corresponding CONSERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding. It can occur that a sounding is missing in the data, the mapping between L_SN and O_SN allows to have a correct matching between OCN and LCN data.
L_LONG	A flag indicating if the current sounding is a long (1) or a short signal (0). Please note that a short signal always exists, wether a long one is present or not in the data. Where no long signal is present, missing constant fills the long signal table.
TEMP_OCXO	Temperature (°C) on the lander instrument OCXO component. Conversion function from raw data given in appendix 0.
TEMP_DIGI	Temperature (°C) on the lander instrument digital board. Conversion function from raw data given in appendix 0.
OCXO	Frequency (Hz) of the OCXO after the tuning phase. Conversion function from raw data given in appendix 0.

GCW	The automatic gain control factor in dB. Please refer to 5.2.4 for details.
FRAMING	The framing factor applied to the lander short signal linear amplitudes after decoding of the framing word. This factor is applied in addition to the TOTAL_GAIN factor.
RADIOM_GCW	Placeholder for the thermal correction factor applied on linear amplitude for the automatic gain control component. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
RADIOM_THERM_RX	Placeholder for the thermal correction factor applied on linear amplitude for the instrument receiving chain. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
RADIOM_THERM_TX	Placeholder for the thermal correction factor applied on linear amplitude for the instrument transmitting chain. This value is fixed to 1.0 in this version of the data (no thermal calibration applied).
TOTAL_GAIN	The total gain factor applied on linear amplitudes. $$TOTAL\_GAIN = 10^{\frac{GCW}{20}} * RADIOM\_THERM\_RX * RADIOM\_THERM\_TX$$
IQ_CORR	The signal is composed of two complex components I and Q after demodulation. The electronics have an unbalanced constant error between the two components amplitudes. $I_{output} = I_{input}$ $Q_{output} = Q_{input} \times (1 + \epsilon)$ with ε equal to 5%
ENTROPY	Placeholder for further information and signal quality estimation.
INTERF_FREQ	Cancelled interference frequency line position in spectrum (Hz). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)
INTERF_AMPLI	Cancelled interference frequency line amplitude (instrument unit). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)
INTERF_PHASE	Cancelled interference frequency line phase (rad). This parameter exists only when interference frequency lines have been detected (actually only in FSS dataset)

Complete LCN data definition from label file is listed below.

```
OBJECT                  = I_SHORT_TABLE
  NAME                  = "I_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                  = 100
  ROW_BYTES             = 84
  ROW_PREFIX_BYTES   = 0
  ROW_SUFFIX_BYTES   = 6294
  COLUMNS               = 1
  OBJECT       = COLUMN
    NAME                = "I_SHORT_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 84
    ITEMS               = 21
    ITEM_BYTES          = 4
    ITEM_OFFSET         = 4
    DESCRIPTION         = "THE I (IN-PHASE) COMPONENT OF CONSERT LANDER SHORT SIG
                          NAL. THIS SIGNAL IS COMPRESSED ON-BOARD. THE SHORT SIGN
                          AL IS COMPOSED OF ONLY 21 SAMPLES AROUND THE MAIN PEAK.
                                                                                "
  END_OBJECT   = COLUMN
END_OBJECT              = I_SHORT_TABLE

OBJECT                  = Q_SHORT_TABLE
  NAME                  = "Q_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                  = 100
  ROW_BYTES             = 84
  ROW_PREFIX_BYTES   = 84
  ROW_SUFFIX_BYTES   = 6210
  COLUMNS               = 1
  OBJECT       = COLUMN
    NAME                = "Q_SHORT_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 84
    ITEMS               = 21
    ITEM_BYTES          = 4
    ITEM_OFFSET         = 4
    DESCRIPTION         = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT LANDER SHOR
                          T SIGNAL. THIS SIGNAL IS COMPRESSED ON-BOARD. THE SHORT
                           SIGNAL IS COMPOSED OF ONLY 21 SAMPLES AROUND THE MAIN
                                                                           PEAK."
  END_OBJECT   = COLUMN
END_OBJECT              = Q_SHORT_TABLE

OBJECT                  = I_LONG_TABLE
  NAME                  = "I_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                  = 100
  ROW_BYTES             = 1020
  ROW_PREFIX_BYTES   = 168
  ROW_SUFFIX_BYTES   = 5190
  COLUMNS               = 1
  OBJECT       = COLUMN
    NAME                = "I_LONG_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 1020
    ITEMS               = 255
    ITEM_BYTES          = 4
```

```
    ITEM_OFFSET       = 4
    DESCRIPTION       = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED LANDE
                        R LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG
                        SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSE
                                                                  RT SIGNAL."
  END_OBJECT  = COLUMN
END_OBJECT            = I_LONG_TABLE

OBJECT                = Q_LONG_TABLE
  NAME                = "Q_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 1020
  ROW_PREFIX_BYTES    = 1188
  ROW_SUFFIX_BYTES    = 4170
  COLUMNS             = 1
  OBJECT      = COLUMN
    NAME              = "Q_LONG_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 1020
    ITEMS             = 255
    ITEM_BYTES        = 4
    ITEM_OFFSET       = 4
    DESCRIPTION       = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                        LANDER LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE
                        LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL
                                                             CONSERT SIGNAL."
  END_OBJECT  = COLUMN
END_OBJECT            = Q_LONG_TABLE

OBJECT                = I_LONG_COMP_TABLE
  NAME                = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 2040
  ROW_PREFIX_BYTES    = 2208
  ROW_SUFFIX_BYTES    = 2130
  COLUMNS             = 1
  OBJECT      = COLUMN
    NAME              = "I_LONG_COMP_SIGNAL"
    DATA_TYPE         = IEEE_REAL
    START_BYTE        = 1
    BYTES             = 2040
    ITEMS             = 255
    ITEM_BYTES        = 8
    ITEM_OFFSET       = 8
    DESCRIPTION       = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED LANDE
                        R LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGN
                        AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT S
                                                                      IGNAL."
  END_OBJECT  = COLUMN
END_OBJECT            = I_LONG_COMP_TABLE

OBJECT                = Q_LONG_COMP_TABLE
  NAME                = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 100
  ROW_BYTES           = 2040
  ROW_PREFIX_BYTES    = 4248
  ROW_SUFFIX_BYTES    = 90
  COLUMNS             = 1
  OBJECT      = COLUMN
```

```
    NAME                = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 2040
    ITEMS               = 255
    ITEM_BYTES          = 8
    ITEM_OFFSET         = 8
    DESCRIPTION         = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                          LANDER LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG
                           SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONS
                                                                   ERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT              = Q_LONG_COMP_TABLE

OBJECT                  = CARAC_TABLE
  NAME                  = "CARAC"
  INTERCHANGE_FORMAT    = BINARY
  ROWS                  = 100
  ROW_BYTES             = 90
  ROW_PREFIX_BYTES      = 6288
  ROW_SUFFIX_BYTES      = 0
  COLUMNS               = 14
  ^STRUCTURE            = "CARAC_LANDER_PARAMETER_DEF.FMT"
END_OBJECT              = CARAC_TABLE
```

The structure of the TABLE object is described in the file *CARAC_LANDER_PARAMETER_DEF* (LABEL directory) as follows:

```
 OBJECT       = COLUMN
    NAME                = "L_SN"
    COLUMN_NUMBER       = 1
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 4
    DESCRIPTION         = "CONSERT LANDER SOUNDING NUMBER. IN THIS ARCHIVE, LANDE
                          R AND ORBITER SOUNDINGS TABLES ARE MAPPED TO MATCH EXAC
                                                                          TLY."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "O_SN"
    COLUMN_NUMBER       = 2
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 5
    BYTES               = 4
    DESCRIPTION         = "CORRESPONDING CONSERT ORBITER SOUNDING NUMBER."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "L_LONG"
    COLUMN_NUMBER       = 3
    DATA_TYPE           = MSB_INTEGER
    START_BYTE          = 9
    BYTES               = 2
    DESCRIPTION         = "0 = SHORT SIGNAL, 1 = LONG SIGNAL"
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME                = "TEMP_OCXO"
    COLUMN_NUMBER       = 4
    DATA_TYPE           = IEEE_REAL
```

```
    UNIT                = "DEGREE CELSIUS"
    START_BYTE          = 11
    BYTES               = 8
    DESCRIPTION         = "TEMPERATURE OF CONSERT LANDER OVEN CONTROLLED EXTRA ST
                                                             ABLE OSCILLATOR."
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "TEMP_DIGI"
    COLUMN_NUMBER       = 5
    DATA_TYPE           = IEEE_REAL
    UNIT                = "DEGREE CELSIUS"
    START_BYTE          = 19
    BYTES               = 8
    DESCRIPTION         = "TEMPERATURE OF CONSERT LANDER DIGITAL BOARD."
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "OCXO"
    COLUMN_NUMBER       = 6
    DATA_TYPE           = IEEE_REAL
    UNIT                = "HERTZ"
    START_BYTE          = 27
    BYTES               = 4
    DESCRIPTION         = "CONSERT LANDER OCXO STABLIZED FREQUENCY AFTER TUNING."
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "GCW"
    COLUMN_NUMBER       = 7
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 31
    BYTES               = 4
    DESCRIPTION         = "CONSERT LANDER GCW."
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "FRAMING"
    COLUMN_NUMBER       = 8
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 35
    BYTES               = 8
    DESCRIPTION         = "CONSERT LANDER FRAMING"
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "RADIOM_GCW"
    COLUMN_NUMBER       = 9
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 43
    BYTES               = 8
    DESCRIPTION         = "RADIOMETRIC CORRECTION GCW."
  END_OBJECT    = COLUMN

  OBJECT        = COLUMN
    NAME                = "RADIOM_THERM_RX"
    COLUMN_NUMBER       = 10
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 51
    BYTES               = 8
    DESCRIPTION         = "THERMAL RADIOMETRIC CORRECTION (Rx)."
  END_OBJECT    = COLUMN
```

```
OBJECT       = COLUMN
  NAME              = "RADIOM_THERM_TX"
  COLUMN_NUMBER     = 11
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 59
  BYTES             = 8
  DESCRIPTION       = "THERMAL RADIOMETRIC CORRECTION (Tx)."
END_OBJECT   = COLUMN

OBJECT       = COLUMN
  NAME              = "TOTAL_GAIN"
  COLUMN_NUMBER     = 12
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 67
  BYTES             = 8
  DESCRIPTION       = "TOTAL GAIN."
END_OBJECT   = COLUMN

OBJECT       = COLUMN
  NAME              = "IQ_CORR"
  COLUMN_NUMBER     = 13
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 75
  BYTES             = 8
  DESCRIPTION       = "I/Q BALANCING CORRECTION."
END_OBJECT   = COLUMN

OBJECT       = COLUMN
  NAME              = "ENTROPY"
  COLUMN_NUMBER     = 14
  DATA_TYPE         = IEEE_REAL
  START_BYTE        = 83
  BYTES             = 8
  DESCRIPTION       = "ENTROPY."
END_OBJECT   = COLUMN
```

5.6.1.4.3 CONSERT auxiliary data

During the Cruise phase (Lander attached on the Orbiter), the Solar Array attitude and the High Gain Antenna attitude impact on the propagation paths between CONSERT Orbiter and Lander antennas. These parameters determine the shape of the calibration signals.

The SA attitude and the HGA attitude are given in the files that are one to one mapping of the corresponding SC files. The file naming is the same as for SC data: {**exp**}_{**inst**}_{**level**}_{**begin of observation**}.{**TAB**} with inst = A (for AOCS data).
Note: Platform housekeeping data (e-box currents and antenna and e-box temperature have not been included in L3, as available in L2 and does not present a great interest for further scientific exploitation of the data.

```
OBJECT                 = AOCS_TABLE
  NAME                 = "AOCS"
  INTERCHANGE_FORMAT = ASCII
  ROWS                 = 100
  ROW_BYTES            = 121
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 0
  COLUMNS              = 5
  ^STRUCTURE           = "AOCS_L3.FMT"
END_OBJECT             = AOCS_TABLE
```

The structure of the TABLE object is described in the file *AOCS_L3.FMT* (LABEL directory) as follows:

```
 OBJECT      = COLUMN
    NAME              = "UTC"
    COLUMN_NUMBER     = 1
    DATA_TYPE         = TIME
    START_BYTE        = 1
    BYTES             = 19
    DESCRIPTION       = "CONSERT UTC TIME OF THE SOUNDING. IT IS THE MID-TIME O
                                                          F THE PING-PONG."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME              = "HGA_AZ"
    COLUMN_NUMBER     = 2
    DATA_TYPE         = ASCII_REAL
    UNIT              = "DEGREE CELSIUS"
    START_BYTE        = 20
    BYTES             = 25
    DESCRIPTION       = "HIGH GAIN ANTENNA AZIMUTH"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME              = "HGA_EL"
    COLUMN_NUMBER     = 3
    DATA_TYPE         = ASCII_REAL
    UNIT              = "DEGREE CELSIUS"
    START_BYTE        = 45
    BYTES             = 25
    DESCRIPTION       = "HIGH GAIN ANTENNA ELEVATION"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME              = "SOLAR_PANEL_-Y"
    COLUMN_NUMBER     = 4
```

```
    DATA_TYPE         = ASCII_REAL
    UNIT              = "DEGREE CELSIUS"
    START_BYTE        = 70
    BYTES             = 25
    DESCRIPTION       = "SOLAR PANEL (-Y)"
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME              = "SOLAR_PANEL_+Y"
    COLUMN_NUMBER     = 5
    DATA_TYPE         = ASCII_REAL
    UNIT              = "DEGREE CELSIUS"
    START_BYTE        = 95
    BYTES             = 25
    DESCRIPTION       = "SOLAR PANEL (+Y)"
  END_OBJECT  = COLUMN
```

6 Level 4 Specifications and Design

This section describes the CONSERT L4 design and specifications.

6.1 L4 data overview

The CONSERT amplitude and sounding timing calibrations have been performed and released in the Level 3 datasets and documentation. Please refer to section 5 for more information.

Level 4 CONSERT data provide over-interpolated signal data. As seen in Level 3 description, the measured CONSERT signal on OCN is composed of 255 complex samples (I and Q components) for each sounding. This signal is compressed by the CONSERT BPSK code. The L4 signal is composed of 5100 complex samples, obtained by interpolation of the L3 compressed signal.

6.1.1 Signal interpolation

The CONSERT signal interpolation method allows a finer determination of the peak(s) in the radar short-time domain (inside a single sounding). The position of these peaks is the main measurement output of the CONSERT experiment. From them, the radio wave travel time can be determined between the Lander and the Orbiter units, giving physical information on the probed comet nucleus.

Basically, the CONSERT raw signal is compressed by the BPSK code, which is the reference signal. This code has 255 samples; it is the code actually transmitted. In this standard approach, one reference signal is used for the matched filter operation. By computing the matched filter in this way, one can reach at best a time accuracy of the compressed time samples of half one code step.

The idea of the implemented interpolation method for CONSERT L4 is to use modeled reference signal between two consecutive code steps. Different models have been tested, taken from calibration data or analytically produced. Finally, one was selected by regard to its performances. A complete description of the method is given in [RD 1] (also provided in REF.CAT as REFERENCE_KEY_ID = "PASQUEROETAL2016").

The interpolated signal is provided for OCN, and for both LCN long and short signals, with an over-sampling factor of 20.

6.1.2 Wave travel-time determination

Corrections are also applied on the peak position detection and travel time determination.

To determine the travel-time of the radio wave between the lander and the orbiter units, one must detect a peak on the CONSERT compressed signal. The position of this peak gives the propagation delay, in code steps unit. The interpolated signal is over-sampled by a factor of 20, that means that the code step unit is digitalized by 1 / 20 code steps.

The final determination of the propagation delay in µs requires several stages of correction, due to the CONSERT in-time transponder technique (cf. 2.2).

6.1.2.1 Transponder compensation

As seen in the CONSERT transponder description, the instrument measures the delay from OCN to LCN then back from LCN to OCN. That means that we actually measure twice the propagation delay. Then we must divide the measurement by two (the “ping” and the “pong”). This is what is meant by the transponder compensation.

6.1.2.2 System delay compensation

In order to generate the “pong” signal from LCN to OCN, the lander unit must detect the peak, then re-generate the reference signal in phase. This on-board operation takes a few code steps of processing time. This has to be also compensated. The system delay for CONSERT has been calibrated as a function of the temperature.

6.1.2.3 LCN peak jitter correction

To determine the actual position of the CONSERT signal peak on the OCN data, we suppose that LCN have correctly performed its on-board peak detection. However, we can refine this estimation with interpolated data on lander signals.
The on-board LCN peak detection is a simple maximum amplitude detection over the lander 255 on-board compressed samples. The real peak is in fact located somewhere inside the previous and next samples. Thanks to the interpolation process, we can refine this peak detection on-ground. The difference, given in code-steps, is what we call the lander peak jitter correction.
Then we apply this offset to the peak detection on the orbiter signal.

6.1.2.4 CONSERT signal window ambiguity

We have seen that the CONSERT signal is composed of 255 samples, each lasting 0.1 µs. The complete signal window is 25.5 µs. The CONSERT instrument is designed to operate at a distance of 10 to 30 kilometers from the comet nucleus target. 25.5 µs go-and-back wave propagation corresponds to a distance in free space of 3.82 km. As a consequence, the full propagation time is aliased over several signal windows.

In order to resolve this ambiguity, we use the reconstructed Rosetta and Philae orbitography and compute the number of aliased signal windows covered. Along with the peak detection inside the window (cf. 6.1.2), we can reconstruct a propagation time in µs. We call it the “time of arrival”, ToA.

6.1.2.5 LCN peak misdetection corrections

In some cases, more than one peak can be found in the CONSERT signal. This can be due for instance to multiple path taken by the radio wave inside the nucleus. In that case, there's a possibility that one of the two peaks was mis-detected on-board by the LCN unit as the strongest one. This is possible for example if interferences attenuate the actual reference peak.

In these cases, the detected peak can be followed by continuity, and the correct peak can be pointed on the lander signal. In that case, the final propagation time will be shifted by the distance in code steps between the two peaks.

These corrections have only been performed on First Science Sequence signals with good enough signal to noise ratio.

6.1.3 Signal repositioning

The final signal provided in the archive has been circularly shifted in order to put the peak at ¼ of the CONSERT signal window. That means that all the peaks and signal shapes can be superposed to compare their shapes easily. A parameter is given for each sounding to be able to circular shift back the signal and get the original one.

Remark: this shift offset is done in the original sampling rate (over 255 samples). Thus, in fact, the interpolated signal's peak can be located inside the 63th code step (20 possible over-sampled positions).

Remark: in the FSS dataset, actually concerning the CONSERT science measurement through the comet nucleus, two peaks are present in the signal. This induces the fact that one peak or the other could have been detected as the main peak (depending on its amplitude). This leads to a situation where the repositioning of the signal seems not consistent from sounding to sounding. In that case, you can use the window origin information to shift the signal (cf. 6.5.1.4.1).

6.1.4 Signal amplitude normalization

In the same idea as for 6.1.3, all soundings have been normalized in amplitude by regard to their respective maximum. The normalization factor is given as a separated parameter, which provide the absolute amplitude of the signal, in instrument's unit.

Note: the LCN long signal is normalized using the corresponding short signal maximum amplitude.

6.1.5 Entropy

The entropy criterion is a measurement of the signal quality ranging from -infinity to 0 in dB (0 to 1 in linear scale).

It is evaluated, for each sounding independently, by removing the samples around the maximum amplitude peak, and computing the variance (σ^2) of the remaining samples. Then we compute the maximum amplitude of the signal (M), including the peak. Then entropy indicator E is defined as:

$$E = 10 \cdot log\left(\frac{\sigma^2}{M^2}\right)$$

Signal with high signal to noise ratio corresponds to low entropy (Pmax >> P var). Entropy can be down to -55 dB, corresponding to the actual sensitivity limitation from the plateau of the compressed BPSK code, after all on-ground processing applied.

Signal with low signal to noise ratio corresponds to an entropy close to 0. In practice, it is around -15 dB corresponding to the power ratio between the maximum and the RMS of a 255 samples of pure noise.

6.2 Data Validation

The CONSERT data products are delivered and validated to PSA by the CONSERT Team.

6.2.1 Data Quality ID

In addition to the signal quality evaluation described in 6.1.5, we define a more qualitative quality ID, as described below:

- 0: Strong signal with good LCN/OCN transponder synchronization, usable for travel-time analysis
- 1: Positive SNR but no transponder synchronization
- 2: SNR close to 0 dB (statistical detection)
- 3: No signal detected.

6.3 Content

Only the acquisition sequences where OCN and LCN worked in ping-pong mode are published in the L4 archives. Other sequences were only technical tests without scientific interest.

The L4 archive follows as much as possible the same structure as the L3 archive. Due to the interpolation process, the data volume is increased by a factor of 20. The CONSERT lander long signal is sent to the ground only every FIOW soundings. In L2 and L3 data, we decided to put missing values in data where the long signal was not present, in order to make the data arrays simpler to use : in L2 and L3 datasets, for each row, we have the short and long signal or missing value if no long signal is available for the corresponding sounding

LCN L3 Short and Long Data:

Carac_Table	Short I	Short Q	Long I	Long Q
Sounding with long signal	X	X	X	X
Sounding without long signal	X	X	MISSING_VALUES	MISSING_VALUES
…	…	…	…	..
Sounding with long signal	X	X	X	X
…	…	…	…	..
…	…	…	…	..

(X : data present)

This is no longer possible with L4, due to this data volume increase. So a specific separated data file is generated for the LCN long signals. In the array, you will find sounding indices to map the LCN long signals to the right OCN and LCN short signals.

LCN L4 Short Data:

Carac_Table	Short I	Short Q
Sounding #N with long signal	X	X
Sounding #N+1 without long signal	X	X
…	…	…
Sounding #N + FIOW with long signal	X	X
…	…	…
…	…	…

(X : data present)

LCN L4 Long Data:

Carac_Table	Long I	Long Q
Sounding #N with long signal	X	X
Sounding #N + FIOW with long signal	X	X
…	…	…
…	…	…

(X : data present)

The provided acquisition signals for L4 are the exact same ones as for L3, please refer to 5.4.1 for their description. This includes the calibration (flight and ground) sequences, which are also provided as interpolated data.

6.3.1 Volume Set

One volume corresponds to one data set. The possible values of VOLUME keywords can be found in AD 8. The volume keyword values for the SDL mission phase are given in the following example.

```
VOLUME_NAME                  = "CONSERT REFORMATED DATA FOR THE
                                SDL PHASE"
VOLUME_SERIES_NAME           = "ROSETTA SCIENCE ARCHIVE"
VOLUME_SET_ID                = "FR_CNRSUG_IPAG_ROLCN4_1010"
VOLUME_SET_NAME              = "ROSETTA CONSERT DATA"
VOLUME_ID                    = "ROLCN4_1010"
VOLUME_VERSION_ID            = "VERSION 1"
VOLUME_FORMAT                = "ISO-9660"
MEDIUM_TYPE                  = "ELECTRONIC"
VOLUMES                      =  1
PUBLICATION_DATE             = 2017-03-15
DESCRIPTION                  = "This volume contains data
                                 and supporting documentation
                                 from the Rosetta SDL
                                 mission phase"
```

6.3.2 Data Set

The CONSERT data are archived in as many Data Sets as simple mission phase, which contain ping-pong (Table 2-1 and AD 8) and level data processing. The descriptions of the fields of the keywords DATA_SET_ID and DATA_SET_NAME are given in the following table.

Field of DATASET_ID or DATA_SET_NAME	DATA_SET_ID	DATA_SET_NAME
INSTRUMENT_HOST_ID / INSTRUMENT_HOST_NAME	RO RL	ROSETTA-ORBITER ROSETTA-LANDER
Target id / target name	See AD 8	See AD 8
INSTRUMENT_ID	CONSERT	
Data processing level number	CODMAC level 3 (calibrated data)	
mission phase abbreviation	See AD 8	
description	Field not used in DATA_SET_ID	Field not used in DATA_SET_NAME
version	The first version of a data set is V1.0	

6.3.3 Directories

The organisation (directories) of a level 3 dataset is shown below.

```
                         |-AAREADME.TXT
                         |-CATALOG-
                         |-DATA-
                         |-GEOMETRY-
|-root directory------ |
                         |-DOCUMENT-
                         |-INDEX-
                         |-LABEL-
                         |-VOLDESC.CAT
```

6.3.3.1 Root Directory

File Name	Contents
AAREADME.TXT	Volume content and format information
VOLDESC.CAT	A description of the contents of this volume in PDS format readable by both humans and computers

The name of the root directory is the data set ID.

6.3.3.2 Calibration Directory

CONSERT instrument has no direct embedded calibration sub-system. So there is no calibration data directly linked to a scientific measurement sequence.

CONSERT calibration data are acquisition sequences themselves performed during Cruise, PHC and on-ground phases. Those data are delivered as separate datasets (cf. Level 3, section 5.2).

6.3.3.3 Catalog Directory

The catalog directory provides a top level understanding of the mission, spacecraft, instruments and data sets. The catalog directory contains the following files:

File Name	Contents
CATINFO.TXT	A description of the contents of the catalog directory
DATASET.CAT	Data set information
INST.CAT	Instrument information
INSTHOST.CAT	Instrument host (spacecraft) information
MISSION.CAT	Mission information
REF.CAT	Full citations for references mentioned in any and all of the catalog files, or in any associated label files.
PERSON.CAT	PDS personnel catalog information about the instrument team responsible for generating the data products. There is one file for each instrument team providing data to this data set.
SOFTWARE.CAT	Information about the software included in the SOFTWARE directory

6.3.3.4 Index Directory

The index directory contains the indices for all data products on the volume. The following files are included in the index directory:

6.3.3.4.1 Dataset Index File, INDEX.LBL and INDEX.TAB

File Name	Contents
INDEX.LBL	PDS label for the volume index file, INDEX.TAB
INDEX.TAB	Volume index in tabular format
INDXINFO.TXT	A description of the contents of the Index Directory

6.3.3.5 Geometry Directory

CONSERT instrument science concept main interest is on signal travel-time comparison with relative position of Rosetta and Philae. Consequently, this is of high importance to have a good knowledge of the geometrical configuration of the measurements.

The content of CONSERT Level 4 GEOMETRY is the same as for Level 3. Please refer to section 5.4.4.5 for further details.

6.3.3.6 Label Directory

The label directory contains include files (.FMT files with label definitions) referenced by data files on the data set. The following files are included in the index directory:

File Name	Contents
LABINFO.TXT	A description of the contents of this directory (.FMT files)
AOCS_L4.FMT	Auxiliary (AOCS) data – solar panel position (-Y/+Y) and High gain antenna (Azimuth and Elevation)
CARAC_LANDER_PARAMETER_DEF.FMT	For lander short signal. L4 parameters
CARAC_LANDERL_PARAMETER_DEF.FMT	For lander long signal. L4 parameters
CARAC_PARAMETER_DEF.FMT	For orbiter. L4 parameters

Important note:
The AOCS_L4.FMT contains ancillary data of interest for CONSERT experiment coming from Rosetta and Philae platforms housekeeping. The information is the same as the one in L3 (cf. 5.4.4.6).

6.3.3.7 Document Directory

This directory contains all original documents necessary to understand the data.
The following files are included in the document directory:

File Name	Contents
DOCINFO.TXT	Identifies and describes the function of each file in the DOCUMENT subdirectory.
EAICD_CONSERT.LBL	PDS label of EAICD_CONSERT.PDF
EAICD_CONSERT.PDF	CONSERT EAICD (this document)
LOGBOOK_*ph*.LBL	PDS label of file RORL_CN_LOGBOOK_*ph*.ASC
LOGBOOK_*ph*.ASC	Logbook of CONSERT operations during mission phase *ph*
RO-OCN-TN-3067.LBL	PDS label of file RO-OCN-TN-3067.PDF
RO-OCN-TN-3067.PDF	CONSERT commissionning report
RO-OCN-TN-3802.LBL	PDS label of file RO-OCN-TN-3802.PDF
RO-OCN-TN-3802.PDF	CONSERT In-flight operation test report
RO-OCN-TN-3825.LBL	PDS label of file RO-OCN-TN-3825.PDF
RO-OCN-TN-3825.PDF	CONSERT User Manual Orbiter & Lander
RO-OCN-TN-3850.LBL	PDS label of file RO-OCN-TN-3850.PDF
RO-OCN-TN-3850.PDF	CONSERT stop&start procedure description
RO-OCN-TN-3851.LBL	PDS label of file RO-OCN-TN-3851.PDF
RO-OCN-TN-3851.PDF	CONSERT operation requests
RO-OCN-TN-3852.LBL	PDS label of file RO-OCN-TN-3852.PDF
RO-OCN-TN-3852.PDF	CONSERT post hibernation commissionning test report
RO-OCN-TN-3866.LBL	PDS label of file RO-OCN-TN-3866.PDF
RO-OCN-TN-3866.PDF	CONSERT operation report : Close Observation (PDCS), SDL, FSS
RO-OCN-TN-3868.LBL	PDS label of file RO-OCN-TN-3868.PDF
RO-OCN-TN-3868.PDF	CONSERT operation report : Long Term Science
RO-OCN-TR-3801.LBL	PDS label of file RO-OCN-TR-3801.PDF
RO-OCN-TR-3801.PDF	Consert FMO Flight Model Orbiter Integration and calibration
RO-OCN-TR-3802.LBL	PDS label of file RO-OCN-TR-3802.PDF
RO-OCN-TR-3802.PDF	Consert FSL integration Calibration
RO-OCN-TR-3805.LBL	PDS label of file RO-OCN-TR-3805.PDF
RO-OCN-TR-3805.PDF	FMO-FSL calibration at Kourou

6.3.3.8 Data Directory

The DATA directory contains all label and table files for OCN and LCN for the measurement sequences inside a given mission phase.
For the Level 4 datasets, an additional data file is provided, as explained in 6.1, to cover the CONSERT Lander Long interpolated signals.

The DATA directory also contain AOCS data.

6.4 Data Sets Definition

The following table gives the definition of the name and id of the CONSERT data sets :

Data Set ID	Data Set Name
RO/RL-CAL-CONSERT-4-GRND-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 GRND V1.0
RO/RL-CAL-CONSERT-4-EAR2-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 EAR2 V1.0
RO/RL-CAL-CONSERT-4-EAR3-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 EAR3 V1.0
RO/RL-CAL-CONSERT-4-MARS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 MARS V1.0
RO/RL-CAL-CONSERT-4-CR2-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 CR2 V1.0
RO/RL-CAL-CONSERT-4-CR4A-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 CR4A V1.0
RO/RL-CAL-CONSERT-4-CR5-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 CR5 V1.0
RO/RL-CAL-CONSERT-4-PHC-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 PHC V1.0
RO/RL-CAL-CONSERT-4-PDCS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 4 PDCS V1.0
RO/RL-C-CONSERT-4-SDL-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER C CONSERT 4 SDL V1.0
RO/RL-C-CONSERT-4-FSS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER C CONSERT 4 FSS V1.0

Remark: Only the data sets with ping-pong are available.

6.5 Data Product Design

The CONSERT data products delivered to PSA are calibrated data (CODMAC level 3) containing sounding information.

All CONSERT data products have PDS detached labels.

6.5.1 Data Product Design

The Level 4 CONSERT data products are composed of three DAT data files with their three associated LBL label filles. One is for the CONSERT orbiter (OCN) data with 'CN_O' prefix in file naming, while the other two are respectively for the CONSERT lander (LCN) short signal data with 'CN_L' prefix in file naming, and long signal data with 'CN_L_LONG' prefix in file naming.

The OCN DAT file is composed of 3 tables:

- 2 tables with I/Q long compressed and interpolated signals: I_LONG_COMP_TABLE and Q_LONG_COMP_TABLE. The rows correspond to the CONSERT sounding axis (radar "slow times") while the items correspond to the signal samples (radar "short times").
- 1 table with all signal characterization parameters: CARAC_TABLE. The columns are detailed in 6.5.1.4.1.

The LCN data is provided in two separate files: one for the short signals, the other for the long signals.

The LCN short DAT file is composed of 3 tables:

- 2 tables for the short compressed and interpolated signals: I_SHORT_TABLE and Q_SHORT_TABLE. The rows correspond to the CONSERT sounding axis (radar “slow times”) while the items correspond to the signal samples (radar “short times”).
- 1 table with all signal characterization parameters: CARAC_TABLE. The columns are detailed in 6.5.1.4.2.

The LCN long DAT file is composed of 3 tables:

- 2 tables for the long compressed and interpolated signals: I_LONG_COMP_TABLE and Q_LONG_COMP_TABLE. The rows correspond to the CONSERT sounding axis (radar “slow times”) while the items correspond to the signal samples (radar “short times”).
- 1 table for the long signals specific parameters (mainly composed of corresponding indices to the short and Orbiter soundings): CARAC_TABLE. The columns are detailed in 6.5.1.4.3.

In practice, the DAT files taken as raw binary files include the interleaved data of the file’s tables. The corresponding data product is organized as TABLE objects using ROW_PREFIX_BYTES and ROW_SUFFIX_BYTES for defining the 3 parts (cf. in label files definitions):

I signal	Q signal…	CARAC Table	➔ Record # 1
I signal	Q signal…	CARAC Table	➔ Record # 2

…

The record structure is shown in annex

6.5.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for CONSERT reformatted data (level 4 Orbiter and Lander) are:

OCN:

```
RECORD_TYPE  = FIXED_LENGTH
RECORD_BYTES = 40935
FILE_RECORDS =
FILE_NAME    =
```

LCN Short:

```
RECORD_TYPE  = FIXED_LENGTH
RECORD_BYTES = 3372
FILE_RECORDS =
FILE_NAME    =
```

LCN Long:

```
RECORD_TYPE  = FIXED_LENGTH
RECORD_BYTES = 40820
FILE_RECORDS =
FILE_NAME    =
```

The PDS file characteristic data elements for AOCS edited auxiliary data (level 4) are:

```
RECORD_TYPE     = FIXED_LENGTH
RECORD_BYTES     = 121
FILE_RECORDS     =
```

6.5.1.2 Data Object Pointers Identification Data Elements

The CONSERT calibrated data are organized as binary tables. The data object pointers (^TABLE) reference TAB files.

6.5.1.3 Instrument and Detector Descriptive Data Elements

Orbiter file:

```
INSTRUMENT_HOST_NAME       = "ROSETTA-ORBITER"
INSTRUMENT_HOST_ID         = "RO"
INSTRUMENT_ID              = CONSERT
INSTRUMENT_NAME     = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONSERT IN SOUNDING MODE"

Lander file:
INSTRUMENT_HOST_NAME       = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID         = "RL"
INSTRUMENT_ID              = CONSERT
INSTRUMENT_NAME     = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONSERT IN SOUNDING MODE"
```

6.5.1.4 Data Object Definition

6.5.1.4.1 OCN data

Each parameter described below is given for each sounding.

PARAMETER	DESCRIPTION
O_SN	The CONSERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
L_SN	The corresponding CONSERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding. It can occur that a sounding is missing in the data, the mapping between O_SN and L_SN allows to have a correct matching between OCN and LCN data.
UTC	The corrected UTC timing of each sounding given as a character string.
CN_SECONDS	The relative number of seconds from CONSERT instrument start-up.
NORM_FACTOR	When normalized to its maximum, the normalization factor for each sounding is reported in this array. It is given in instrument's unit.
CHANNEL_LOSS	The channel loss is the amplitude factor in instrument's unit after the calibration. It naturally follows the NORM_FACTOR behaviour.
LPEAK_JITTER	This gives the LCN peak jitter offset, in decimal code steps (cf. 6.1.2.3)
SIGMODULO	This integer number gives the number of CONSERT recording windows cycles needed for the complete wave propagation (cf. 6.1.2.4)
TIME_WINDOW_ORIGIN	A conversion of the SIGMODULO parameter, given in µs.
SYS_DELAY	The lander system delay in code steps, for each sounding, as calibrated to the respective system temperature (cf. 6.1.2.2).
TRANSPONDER_CORR	This is the transponder compensation value. It corresponds the half the peak detection value (due to go-and-back propagation using the transponder technique, cf. 6.1.2.1).
TRANSPONDER_ERROR	This is the eventual correction applied on-ground to the lander on-board transponder bad detection of the peak position (cf. 6.1.2.5).
TIME_WINDOW_FIRST_SAMPLE	This gives the initial first sample (in interpolated samples) of the original signal, before the circular shift (cf. 6.1.3)
TOA	The final Time-of-Arrival, or propagation time, in µs, including all the corrections. This parameter is composed of three components for each sounding, to allow the detection of the three first peaks. If no significant peak was detected, the missing value -1 is set.
PEAK_POWER	The power in instrument unit dB scale, corresponding to each TOA. It is also composed of three components for each sounding.

QUALITY	For all the CONSERT sequences but FSS, quality of the signal was good, so the flag is set to 0. During the FSS science measurements are the most important ones for CONSERT, this parameter has been specifically analyzed and qualitatively defined. Please refer to 6.2.1 for the detailed definition.
ENTROPY	The entropy criterion is a measurement of the signal quality ranging from -infinity to 0 in dB (0 to 1 in linear scale), (cf. 6.1.5).

For information, the following relations apply (blue variables are those provided in the archive):

PEAK_POS_UPSAMP: Position of the maximum amplitude peak in the compressed and interpolated signal. This position is in the range [0; 5099], which corresponds to an over-sampling factor of 20.0 on the initial signal composed of 255 samples. SIGNAL is the complex signal provided in I and Q tables.
= max(SIGNAL)

PEAK_POS: Position of the maximum amplitude peak in the signal for each sounding, given in code steps, which means between [0;255] from oversampled data.
= PEAK_POS_UPSAMP / 20.0

UNCIRC_PEAK_POS: the position of the peak in the original measured signal, not circularized.
= PEAK_POS - TIME_WINDOW_FIRST_SAMPLE / 20.0

TOA_CODESTEPS: Corrected time of arrival inside a signal window
= UNCIRC_PEAK_POS – (TRANSPONDER_CORR + TRANSPONDER_ERROR) +
(SYS_DELAY / 2.0)

TOA[0] : Final time of arrival of the maximum peak, given in microseconds
= TIME_WINDOW_ORIGIN + TOA_CODESTEPS * 25.5 / 255

Description of OCN data from label file is given below.

```
OBJECT                  = I_LONG_COMP_TABLE
  NAME                  = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                  = 9157
  ROW_BYTES             = 20400
  ROW_PREFIX_BYTES      = 0
  ROW_SUFFIX_BYTES      = 20547
  COLUMNS               = 1
  OBJECT       = COLUMN
    NAME                = "I_LONG_COMP_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 20400
    ITEMS               = 5100
    ITEM_BYTES          = 4
    ITEM_OFFSET         = 4
    DESCRIPTION         = "THE I (IN-PHASE) COMPONENT OF CONSERT INTERPOLATED ORB
                          ITER SIGNAL. THIS SIGNAL IS CALIBRATED AND COMPRESSED.
                          THE LONG SIGNAL IS COMPOSED OF 5100 SAMPLES AND IS THE
                                                          FULL CONSERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT              = I_LONG_COMP_TABLE
```

```
OBJECT                 = Q_LONG_COMP_TABLE
  NAME                 = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 9157
  ROW_BYTES            = 20400
  ROW_PREFIX_BYTES     = 20400
  ROW_SUFFIX_BYTES     = 147
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 20400
    ITEMS              = 5100
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT INTERPOLATE
                         D ORBITER SIGNAL. THIS SIGNAL IS CALIBRATED AND COMPRES
                         SED. THE LONG SIGNAL IS COMPOSED OF 5100 SAMPLES AND IS
                                                       THE FULL CONSERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = Q_LONG_COMP_TABLE

OBJECT                 = CARAC_TABLE
  NAME                 = "CARAC"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 9157
  ROW_BYTES            = 147
  ROW_PREFIX_BYTES     = 40800
  ROW_SUFFIX_BYTES     = 0
  COLUMNS              = 17
  ^STRUCTURE           = "CARAC_PARAMETER_DEF.FMT"
END_OBJECT             = CARAC_TABLE
```

The structure of the TABLE object is described in the file *CARAC_PARAMETER_DEF* (LABEL directory) as follows:

```
 OBJECT       = COLUMN
    NAME               = "O_SN"
    COLUMN_NUMBER      = 1
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 4
    DESCRIPTION        = "CONSERT ORBITER SOUNDING NUMBER. IN THIS ARCHIVE, LAND
                         ER AND ORBITER SOUNDINGS TABLES ARE MAPPED TO MATCH EXA
                                                                         CTLY."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "L_SN"
    COLUMN_NUMBER      = 2
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 5
    BYTES              = 4
    DESCRIPTION        = "CORRESPONDING CONSERT LANDER SOUNDING NUMBER."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "UTC"
    COLUMN_NUMBER      = 3
    DATA_TYPE          = TIME
    START_BYTE         = 9
```

```
    BYTES              = 23
    DESCRIPTION        = "CONSERT UTC TIME OF THE SOUNDING. IT IS THE MID-TIME O
                                                       F THE PING-PONG."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "CN_SECONDS"
    COLUMN_NUMBER      = 4
    DATA_TYPE          = IEEE_REAL
    UNIT               = "SECOND"
    START_BYTE         = 32
    BYTES              = 8
    DESCRIPTION        = "CONSERT ON-BOARD TIME OF THE SOUNDING. THE VALUES ARE
                         GIVEN AS A FLOATING-POINT NUMBER OF SECONDS FROM THE BE
                                                   GINING OF OPERATION."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "NORM_FACTOR"
    COLUMN_NUMBER      = 5
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 40
    BYTES              = 4
    DESCRIPTION        = "NORMALISATION FACTOR. WHEN NORMALIZED TO ITS MAXIMUM,
                         THE NORMALIZATION FACTOR FOR EACH SOUNDING IS REPORTED
                                 IN THIS ARRAY. IT IS GIVEN IN INSTRUMENT UNIT."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "CHANNEL_LOSS"
    COLUMN_NUMBER      = 6
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 44
    BYTES              = 8
    DESCRIPTION        = "THE CHANNEL LOSS IS THE AMPLITUDE FACTOR IN INSTRUMENT
                          UNIT AFTER THE CALIBRATION. IT NATURALLY FOLLOWS THE N
                                                  ORM_FACTOR BEHAVIOUR."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "LPEAK_JITTER"
    COLUMN_NUMBER      = 7
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 52
    BYTES              = 4
    DESCRIPTION        = "CORRECTED DETECTION OF LANDER PIC (JITTER LANDER), IN
                                                    DECIMAL CODE STEPS."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SIGMODULO"
    COLUMN_NUMBER      = 8
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 56
    BYTES              = 4
    DESCRIPTION        = "THIS INTEGER NUMBER GIVES THE NUMBER OF CONSERT RECORD
                         ING WINDOWS CYCLES NEEDED FOR THE COMPLETE WAVE PROPAGA
                                                                   TION."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "TIME WINDOW ORIGIN"
    COLUMN_NUMBER      = 9
```

```
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 60
    BYTES              = 4
    DESCRIPTION        = "A CONVERSION OF THE SIGMODULO PARAMETER, GIVEN IN MICR
                                                                   OSECONDS."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "SYS_DELAY"
    COLUMN_NUMBER      = 10
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 64
    BYTES              = 4
    DESCRIPTION        = "THE LANDER SYSTEM DELAY IN CODE STEPS, FOR EACH SOUNDI
                         NG, AS CALIBRATED TO THE RESPECTIVE SYSTEM TEMPERATURE.
                                                                              "
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "TRANSPONDER_CORR"
    COLUMN_NUMBER      = 11
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 68
    BYTES              = 8
    DESCRIPTION        = "THIS IS THE TRANSPONDER COMPENSATION VALUE. IT CORRESP
                         ONDS THE HALF THE PEAK DETECTION VALUE (DUE TO GO-AND-B
                              ACK PROPAGATION USING THE TRANSPONDER TECHNIQUE)."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "TRANSPONDER_ERROR"
    COLUMN_NUMBER      = 12
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 76
    BYTES              = 8
    DESCRIPTION        = "THIS IS THE EVENTUAL CORRECTION APPLIED ON-GROUND TO T
                         HE LANDER ON-BOARD TRANSPONDER BAD DETECTION OF THE PEA
                                                                 K POSITION ."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "TIME_WINDOW_FIRST_SAMPLE"
    COLUMN_NUMBER      = 13
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 84
    BYTES              = 4
    DESCRIPTION        = "THIS GIVES THE INITIAL FIRST SAMPLE (IN INTERPOLATED S
                         AMPLES) OF THE ORIGINAL SIGNAL, BEFORE THE CIRCULAR SHI
                                                                         FT ."
  END_OBJECT   = COLUMN

  OBJECT       = COLUMN
    NAME               = "TOA"
    COLUMN_NUMBER      = 14
    DATA_TYPE          = IEEE_REAL
    MISSING_CONSTANT   = -1
    START_BYTE         = 88
    BYTES              = 24
    ITEMS              = 3
    ITEM_BYTES         = 8
    ITEM_OFFSET        = 8
    DESCRIPTION        = "THE FINAL TIME-OF-ARRIVAL, OR PROPAGATION TIME, IN MIC
                         ROSECONDS, INCLUDING ALL THE CORRECTIONS. THIS PARAMETE
```

```
                         R IS COMPOSED OF THREE COMPONENTS FOR EACH SOUNDING, TO
                          ALLOW THE DETECTION OF THE THREE FIRST PEAKS. IF NO SI
                         GNIFICANT PEAK WAS DETECTED, THE MISSING VALUE -1 IS SE
                                                                              T."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "PEAK_POWER"
  COLUMN_NUMBER    = 15
  DATA_TYPE        = IEEE_REAL
  MISSING_CONSTANT = -1
  START_BYTE       = 112
  BYTES            = 24
  ITEMS            = 3
  ITEM_BYTES       = 8
  ITEM_OFFSET      = 8
  DESCRIPTION      = "THE POWER IN INSTRUMENT UNIT DB SCALE, CORRESPONDING T
                     O EACH TOA. IT IS ALSO COMPOSED OF THREE COMPONENTS FOR
                                                                EACH SOUNDING."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "QUALITY"
  COLUMN_NUMBER    = 16
  DATA_TYPE        = IEEE_REAL
  START_BYTE       = 136
  BYTES            = 4
  DESCRIPTION      = "FOR ALL THE CONSERT SEQUENCES BUT FSS, QUALITY OF THE
                     SIGNAL WAS GOOD, SO THE FLAG IS SET TO 0. DURING THE FS
                     S SCIENCE MEASUREMENTS ARE THE MOST IMPORTANT ONES FOR
                     CONSERT, THIS PARAMETER HAS BEEN SPECIFICALLY ANALYZED
                                                  AND QUALITATIVELY DEFINED."
END_OBJECT  = COLUMN

OBJECT      = COLUMN
  NAME             = "ENTROPY"
  COLUMN_NUMBER    = 17
  DATA_TYPE        = IEEE_REAL
  START_BYTE       = 140
  BYTES            = 8
  DESCRIPTION      = "THE ENTROPY CRITERION IS A MEASUREMENT OF THE SIGNAL Q
                     UALITY RANGING FROM -INFINITY TO 0 IN DB (0 TO 1 IN LIN
                                                                 EAR SCALE)."
END_OBJECT  = COLUMN
```

6.5.1.4.2 LCN data

The given signal amplitudes in L4 tables are already corrected with the parameters described below.

PARAMETER	DESCRIPTION
L_SN	The CONSERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
O_SN	The corresponding CONSERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding. It can occur that a sounding is missing in the data, the mapping between L_SN and O_SN allows to have a correct matching between OCN and LCN data.
NORM_FACTOR	When normalized to its maximum, the normalization factor for each short signal is reported in this array. It is given in instrument's unit.

Complete LCN data definition from label file is listed below.

```
OBJECT                 = I_SHORT_TABLE
  NAME                 = "I_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 9157
  ROW_BYTES            = 1680
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 1692
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "I_SHORT_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 1680
    ITEMS              = 420
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT LANDER INTERPOLA
                         TED SHORT SIGNAL. THIS SIGNAL IS COMPRESSED ON-BOARD. T
                         HE SHORT SIGNAL IS COMPOSED OF ONLY 420 SAMPLES AROUND
                                                                 THE MAIN PEAK."
  END_OBJECT   = COLUMN
END_OBJECT             = I_SHORT_TABLE

OBJECT                 = Q_SHORT_TABLE
  NAME                 = "Q_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 9157
  ROW_BYTES            = 1680
  ROW_PREFIX_BYTES     = 1680
  ROW_SUFFIX_BYTES     = 12
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_SHORT_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 1680
    ITEMS              = 420
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT LANDER INTE
```

```
                        RPOLATED SHORT SIGNAL. THIS SIGNAL IS COMPRESSED ON-BOA
                        RD. THE SHORT SIGNAL IS COMPOSED OF ONLY 420 SAMPLES AR
                                                          OUND THE MAIN PEAK."
  END_OBJECT  = COLUMN
END_OBJECT              = Q_SHORT_TABLE

OBJECT                  = CARAC_TABLE
  NAME                  = "CARAC"
  INTERCHANGE_FORMAT = BINARY
  ROWS                  = 9157
  ROW_BYTES             = 12
  ROW_PREFIX_BYTES      = 3360
  ROW_SUFFIX_BYTES      = 0
  COLUMNS               = 3
  ^STRUCTURE            = "CARAC_LANDER_PARAMETER_DEF.FMT"
END_OBJECT              = CARAC_TABLE
```

The structure of the TABLE object is described in the file *CARAC_LANDER_PARAMETER_DEF* (LABEL directory) as follows:

```
 OBJECT      = COLUMN
   NAME                 = "L_SN"
   COLUMN_NUMBER        = 1
   DATA_TYPE            = IEEE_REAL
   START_BYTE           = 1
   BYTES                = 4
   DESCRIPTION          = "CONSERT LANDER SOUNDING NUMBER. IN THIS ARCHIVE, LANDE
                          R AND ORBITER SOUNDINGS TABLES ARE MAPPED TO MATCH EXAC
                                                                            TLY."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
   NAME                 = "O_SN"
   COLUMN_NUMBER        = 2
   DATA_TYPE            = IEEE_REAL
   START_BYTE           = 5
   BYTES                = 4
   DESCRIPTION          = "CORRESPONDING CONSERT ORBITER SOUNDING NUMBER."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
   NAME                 = "NORM_FACTOR"
   COLUMN_NUMBER        = 3
   DATA_TYPE            = IEEE_REAL
   START_BYTE           = 9
   BYTES                = 4
   DESCRIPTION          = "WHEN NORMALIZED TO ITS MAXIMUM, THE NORMALIZATION FACT
                          OR FOR EACH SHORT SIGNAL IS REPORTED IN THIS ARRAY. IT
                                                   IS GIVEN IN INSTRUMENT UNIT."
  END_OBJECT  = COLUMN
```

6.5.1.4.3 LCN Long data

The given signal amplitudes in L4 tables are already corrected with the parameters described below.

PARAMETER	DESCRIPTION
L_SN	The CONSERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
O_SN	The corresponding CONSERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding. It can occur that a sounding is missing in the data, the mapping between L_SN and O_SN allows to have a correct matching between OCN and LCN data.
ENTROPY	The entropy criterion is a measurement of the signal quality ranging from -infinity to 0 in dB (0 to 1 in linear scale), (cf. 6.1.5).
NORM_FACTOR	The lander long signal is normalized using the corresponding short signal NORM_FACTOR. Slight differences exist between the amplitude of the short and long signals, so the normalization factor for the lander long signal is also provided, even if not applied.

Complete LCN Long data definition from label file is listed below.

```
OBJECT                 = I_LONG_COMP_TABLE
  NAME                 = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 366
  ROW_BYTES            = 20400
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 20420
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "I_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 20400
    ITEMS              = 5100
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT INTERPOLATED LAN
                         DER LONG SIGNAL. THIS SIGNAL IS CALIBRATED AND COMPRESS
                         ED. THE LONG SIGNAL IS COMPOSED OF 5100 SAMPLES AND IS
                                                         THE FULL CONSERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = I_LONG_COMP_TABLE

OBJECT                 = Q_LONG_COMP_TABLE
  NAME                 = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 366
  ROW_BYTES            = 20400
  ROW_PREFIX_BYTES     = 20400
  ROW_SUFFIX_BYTES     = 20
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
```

```
    START_BYTE       = 1
    BYTES            = 20400
    ITEMS            = 5100
    ITEM_BYTES       = 4
    ITEM_OFFSET      = 4
    DESCRIPTION      = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT INTERPOLATE
                       D LANDER LONG SIGNAL. THIS SIGNAL IS CALIBRATED AND COM
                       PRESSED. THE LONG SIGNAL IS COMPOSED OF 5100 SAMPLES AN
                                                 D IS THE FULL CONSERT SIGNAL."
  END_OBJECT  = COLUMN
END_OBJECT             = Q_LONG_COMP_TABLE

OBJECT                 = CARAC_TABLE
  NAME                 = "CARAC"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 366
  ROW_BYTES            = 20
  ROW_PREFIX_BYTES     = 40800
  ROW_SUFFIX_BYTES     = 0
  COLUMNS              = 4
  ^STRUCTURE           = "CARAC_LANDERL_PARAMETER_DEF.FMT"
END_OBJECT             = CARAC_TABLE
```

The structure of the TABLE object is described in the file *CARAC_LANDERL_PARAMETER_DEF* (LABEL directory) as follows:

```
  OBJECT      = COLUMN
    NAME             = "L_SN"
    COLUMN_NUMBER    = 1
    DATA_TYPE        = IEEE_REAL
    START_BYTE       = 1
    BYTES            = 4
    DESCRIPTION      = "CONSERT LANDER SOUNDING NUMBER. IN THIS ARCHIVE, LANDE
                       R AND ORBITER SOUNDINGS TABLES ARE MAPPED TO MATCH EXAC
                                                                         TLY."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "O_SN"
    COLUMN_NUMBER    = 2
    DATA_TYPE        = IEEE_REAL
    START_BYTE       = 5
    BYTES            = 4
    DESCRIPTION      = "CORRESPONDING CONSERT ORBITER SOUNDING NUMBER."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "ENTROPY"
    COLUMN_NUMBER    = 3
    DATA_TYPE        = IEEE_REAL
    START_BYTE       = 9
    BYTES            = 8
    DESCRIPTION      = "THE ENTROPY CRITERION IS A MEASUREMENT OF THE SIGNAL Q
                       UALITY RANGING FROM -INFINITY TO 0 IN DB (0 TO 1 IN LIN
                                                                  EAR SCALE)."
  END_OBJECT  = COLUMN

  OBJECT      = COLUMN
    NAME             = "NORM_FACTOR"
    COLUMN_NUMBER    = 4
    DATA_TYPE        = IEEE_REAL
    START_BYTE       = 17
```

```
    BYTES           = 4
    DESCRIPTION     = "THE LANDER LONG SIGNAL IS NORMALIZED USING THE CORRESP
                       ONDING SHORT SIGNAL NORM_FACTOR. SLIGHT DIFFERENCES EXI
                       ST BETWEEN THE AMPLITUDE OF THE SHORT AND LONG SIGNALS,
                        SO THE NORMALIZATION FACTOR FOR THE LANDER LONG SIGNAL
                                     IS ALSO PROVIDED, EVEN IF NOT APPLIED."
  END_OBJECT  = COLUMN
```

6.5.1.4.4 CONSERT auxiliary data

During the Cruise phase (Lander attached on the Orbiter), the Solar Array attitude and the High Gain Antenna attitude impact on the propagation paths between CONSERT Orbiter and Lander antennas. These parameters determine the shape of the calibration signals.

The SA attitude and the HGA attitude are given in the files that are one to one mapping of the corresponding SC files. The file naming is the same as for SC data: {**exp**}_{**inst**}_{**level**}_{**begin of observation**}.{**TAB**} with inst = A (for AOCS data).
Note: These files are the exact same as provided for Level 3, (cf. 5.6.1.4.3).

```
OBJECT         = AOCS_TABLE
 NAME         = "AOCS"
 INTERCHANGE_FORMAT = ASCII
 ROWS         = 100
 ROW_BYTES     = 121
 ROW_PREFIX_BYTES  = 0
 ROW_SUFFIX_BYTES  = 0
 COLUMNS       = 5
 ^STRUCTURE     = "AOCS_L4.FMT"
END_OBJECT      = AOCS_TABLE
```

The structure of the TABLE object is described in the file *AOCS_L4.FMT* (LABEL directory) as follows:

```
 OBJECT   = COLUMN
  NAME        = "UTC"
  COLUMN_NUMBER  = 1
  DATA_TYPE    = TIME
  START_BYTE    = 1
  BYTES       = 19
  DESCRIPTION   = "CONSERT UTC TIME OF THE SOUNDING. IT IS THE MID-TIME O
                               F THE PING-PONG."
 END_OBJECT = COLUMN

 OBJECT   = COLUMN
  NAME        = "HGA_AZ"
  COLUMN_NUMBER  = 2
  DATA_TYPE    = ASCII_REAL
  UNIT        = "DEGREE CELSIUS"
  START_BYTE    = 20
  BYTES       = 25
  DESCRIPTION   = "HIGH GAIN ANTENNA AZIMUTH"
 END_OBJECT = COLUMN

 OBJECT   = COLUMN
  NAME        = "HGA_EL"
  COLUMN_NUMBER  = 3
  DATA_TYPE    = ASCII_REAL
  UNIT        = "DEGREE CELSIUS"
  START_BYTE    = 45
  BYTES       = 25
  DESCRIPTION   = "HIGH GAIN ANTENNA ELEVATION"
 END_OBJECT = COLUMN

 OBJECT   = COLUMN
  NAME        = "SOLAR_PANEL_-Y"
  COLUMN_NUMBER  = 4
  DATA_TYPE    = ASCII_REAL
  UNIT        = "DEGREE CELSIUS"
```

```
 START_BYTE    = 70
 BYTES       = 25
 DESCRIPTION   = "SOLAR PANEL (-Y)"
END_OBJECT = COLUMN

OBJECT   = COLUMN
 NAME        = "SOLAR_PANEL_+Y"
 COLUMN_NUMBER  = 5
 DATA_TYPE    = ASCII_REAL
 UNIT        = "DEGREE CELSIUS"
 START_BYTE    = 95
 BYTES       = 25
 DESCRIPTION   = "SOLAR PANEL (+Y)"
END_OBJECT = COLUMN
```

1 Appendix: structure of Lander/Orbiter CONSERT level 2 data product

The level 2 data product has the same structure as the L0 data at SONC:

Block	N°	Size in bytes	Description
L0 Header	0-49	50	General parameters
	50-99	50	raw data parameters
	100-149	50	reserved for L1 format
	150-199	50	reserved for L1 format
	200-249	50	short signal for lander only
	250-254	5	free
I signal	255-509	255	Signal I
Q signal	510-764	255	Signal Q

Structure of the L0 Header (/XF means the most significant byte of the Xth word and /Xf means the least significant byte of the Xth word)

		General Parameters		Orbiter		Lander	
N°	Name	Description	For	Value		Value	
0	Data_level	Data level		0		0	
1	Version	Format version : 00		00		00	
2	Source	Acquisition system identifier 0: obdh, 1: Sish kfki 2: rolbin, 3: cdms, 4 :sfdu		File		File	
3	Box	Type : 1: Orbiter, 2:Lander		Prg		Prg	
4	Court	Short signal format on lander 1: SW12 2: SW15 [3]		2		Prg	
5	Nb	Incremental record number	NS	Internal		Internal	
6	Time_Fich	Year: *Raw file date*		File		File	
7		Month		File		File	
8		Day		File		File	
9		Hours		File		File	
10		Minutes		File		File	
11		Seconds		File		File	
12	Time_Pres	Year: L0 file creation date		Internal		Internal	
13		Month		Internal		Internal	
14		Day		Internal		Internal	
15		Hours		Internal		Internal	
16		Minutes		Internal		Internal	
17		Seconds		Internal		Internal	
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							
32							
33	TUN_stat	EV_ID code 41002/41020		59,7/8	L0		
34	TUN_ocxo	OCXO after tuning		59,7/9F [4]	L0	TM1/6F	L0
35	TUN_Inter	Intercartile		59,7/9f	L0		
36	TUN_gcw	Tuning GCW		59,7/10F	L0		
37	TUN_nblg	NBLL GCW		59,7/10f	L0		
38	TUN_nblz	NBLL Zero		59,7/ 11F	L0		
39	TUN_Tocxo	Temperature OCXO Tuning		59,4/10F	L0	TM1/4F	L0
40							
41							
42							
43-49							
		Raw data		Orbiter		Lander	
N°	Name	Description	For	Value	L.	Value	L.

[3] The SW Lander version determines the format of the short signal (I&Q / 8 bits or I2+Q2 / 16 bits)
The short signal from the Orbiter is computed in I&Q. It is thus compatible with the format SW15 Lander
[4] The TM used is of type TM 59,7 having the 8th word set to 41002

50	OBDH_PN	OBDH Packet Number	NS	59,12 / 1		112,12 / 1	
51	COBT	COBT Time second MSW	NS	59,12 / 3		112,12 / 3	
52		COBT Time second LSW	NS	59,12 / 4		112,12 / 4	
53		COBT Time fraction. second MSW	NS	59,12 / 5		112,12 / 5	
54	CTIC	Temps CONSERT en TIC MSW	NS	59,12/8		TM / 1	
55		LSW	NS	59,12/9		TM / 2	
56		Temps CONSERT TIC decoded : minutes	NS	Compute		Compute	
57		seconds	NS	Compute		Compute	
58		Milliseconds	NS	Compute		Compute	
59	Data_Type	Data type: For orbiter : 0, For Lander :TM long signal: 1, short signal:2		0		Prg [5]	
60	Sca_Seq_Ct	Scanning Sequence Count		Prg[6]		Prg	
61	S_Nb	Present Sounding Number	NS	59,12/ 11		TM / 8	
62	AK	Index of the last AK_report	NS	59,1 / 1		TM / 0	
63		AK TC nb		59,1 / 8		0	
64		AK failure code		59,1/10		0	
65	PR	Index of the last progress report	NS	59,7		TM/7F	
66		EV_ID	NS	59,7		TM/7f	
67	HK	Index of the last HK	NS	59,4 / 1		TM/0	
68							
69							
70							
71							
72	Status	Experiment sequence status bit 7 (0/1)		59,4 / 11		TM / 3f	
73		Experiment sequence status bit 6 (0/1)		59,4 / 11		TM / 3f	
74		Experiment sequence status bit 5 (0/1)		59,4 / 11		TM / 3f	
75		Experiment sequence status bit 4 (0/1)		59,4 / 11		TM / 3f	
76		Experiment sequence status bit 3 (0/1)		59,4 / 11		TM / 3f	
77		Experiment sequence status bit 2 (0/1)		59,4 / 11		0	
78		Experiment sequence status bit 1 (0/1)		59,4 / 11		0	
79		Experiment sequence status bit 0 (0/1)		59,4 / 11		0	
80							
81							
82	GCW	GCW		59,12/12F		TM / 9F	
83	FRAM	Framing		0		TM / 9f	
84	Peak_P	Peak position		0		TM / 10F	
85	Ocxo	OCXO DAC		59,12 / 12f		TM / 6F	
86	T_ocxo	T ocxo		59,12 / 10F		TM / 4F	
87	T_digi	T digit		59,12 / 10f		TM / 4f	
88	NBLS	NBL level		59,4/ 12f		TM / 5F	
89	TMIX	TMIX Level		59,4/ 13F		TM / 5f	

[5] Lander TM Type : Long signal (Type 3) or Short Signal (Type 1)
[6] Number of scanning sequence count, each sounding number begins at 1

		L1 data		Orbiter		Lander	
N°	**Name**	**Description**	**For**	**Value**	**L.**	**Value**	**L.**
100-199		reserved for L1 data					

		Short signal (2*21 pts)		Orbiter		Lander	
N°	**Name**	**Description**	**For**	**Value**	**L.**	**Value**	**L.**
200-220	Pic_I	Correlated signal I or SQRT(I ^ 2 + Q ^ 2)		0		TM	L0
221-242	Pic_Q	Q or 0		0		TM	L0
243-249		free		0		0	

		free		Orbiter		Lander	
N°	**Name**	**Description**	**For**	**Value**	**L.**	**Value**	**L.**
250-254							

I and Q signal

		Signal I and signal Q		Orbiter		Lander	
N°	**Name**	**Description**	**For**	**Value**	**L.**	**Value**	**L.**
1 - 255	Signal I	Signal I		59,12/13-268	L0	TM 32 – 286 [7]	L0
1 - 255	Signal Q	Signal Q		59,12/269-524	L0	TM 288 - 542	L0

2 Appendix: Available Software to read PDS files

The level 2 housekeeping and science PDS files can be read with the PDS table verifier tool “tbtool” and readpds (Small Bodies Node tool).

[7] Zero for short signal , else TM

3 Appendix: Example of Directory Listing of Data Set RO-RL-CAL-CONSERT-2-PDCS-V1.0

```
                                |-AAREADME.TXT
                                |
                                |              |-CATINFO.TXT
                                |              |-DATASET.CAT
                                |              |-INST.CAT
                                |-CATALOG------|-INSTHOST.CAT
                                |              |-MISSION.CAT
                                |              |-PERSON.CAT
                                |              |-REF.CAT
                                |              |-SOFTWARE.CAT
                                |
                                |                          |-CN_A_2_141112T173026.LBL
                                |                          |-CN_A_2_141112T173026.TAB
                                |                          |-CN_C_2_141112T173022.LBL
                                |                          |-CN_C_2_141112T173022.TAB
                                |                          |-CN_L_2_141112T185535.DAT
                                |                          |-CN_L_2_141112T185535.LBL
                                |-DATA---------|-2014-------|-CN_O_2_141112T185640.DAT
                                |                          |-CN_O_2_141112T185640.LBL
                                |                          |-CN_T_2_141112T173021.LBL
                                |                          |-CN_T_2_141112T173021.TAB
                                |                          |-CN_X_2_141112T173059.LBL
                                |                          |-CN_X_2_141112T173059.TAB
                                |                          |-CN_Y_2_141112T173209.LBL
                                |                          |-CN_Y_2_141112T173209.TAB
                                |
                                |              |-CONSERT_COMPRESSION_CODE.LBL
                                |              |-CONSERT_COMPRESSION_CODE.TAB
|-RO-RL-C-CONSERT-2-FSS-V1.0-|              |-DOCINFO.TXT
                                |              |-EAICD_CONSERT.LBL
                                |              |-EAICD_CONSERT.PDF
                                |              |-RO-LCN-TN-3048.LBL
                                |              |-RO-LCN-TN-3048.PDF
                                |              |-RO-OCN-TN-3044.LBL
                                |              |-RO-OCN-TN-3044.PDF
                                |-DOCUMENT-----|-RO-OCN-TN-3823.LBL
                                |              |-RO-OCN-TN-3823.PDF
                                |              |-RO-OCN-TR-3805.LBL
                                |              |-RO-OCN-TR-3805.PDF
                                |              |-RORL_CN_LOGBOOK_SDL_FSS.ASC
                                |              |-RORL_CN_LOGBOOK_SDL_FSS.LBL
                                |              |-TIMELINE_SDL_RBD_FSS.LBL
                                |              |-TIMELINE_SDL_RBD_FSS.TXT
                                |              |-TIMELINE_SDL_RBD_FSS_1.PNG
                                |              |-TIMELINE_SDL_RBD_FSS_2.PNG
                                |              |-TIMELINE_SDL_RBD_FSS_DESC.TXT
                                |
                                |              |-INDEX.LBL
                                |-INDEX--------|-INDEX.TAB
                                |              |-INDXINFO.TXT
                                |
                                |              |-AOCS.FMT
                                |              |-CN_AUX.FMT
                                |-LABEL--------|-CN_AUX.FMT~
                                |              |-L0_PARAMETER_DEF.FMT
```

```
|              |-LABINFO.TXT
|-VOLDESC.CAT
```

4 Appendix: Example of Consert Lander level 2 data product label

```
PDS_VERSION_ID               = PDS3
LABEL_REVISION_NOTE  = "2017-08-17, SONC, version 1.0"
/* PVV version 3.13 */

/*   Raw data (Level 2)               */

/* FILE CHARACTERISTIC DATA ELEMENTS */

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 1530
FILE_RECORDS         = 13938

FILE_NAME            = "CN_L_2_141112T185535.DAT"


/* DATA OBJECT POINTERS  */

^L0_TABLE       = ("CN_L_2_141112T185535.DAT",1 <BYTES>)
^I_TABLE        = ("CN_L_2_141112T185535.DAT",1 <BYTES>)
^Q_TABLE        = ("CN_L_2_141112T185535.DAT",1 <BYTES>)


/* IDENTIFICATION KEYWORDS */
DATA_SET_ID     = "RO/RL-C-CONSERT-2-FSS-V1.0"
DATA_SET_NAME   = "ROSETTA-ORBITER/ROSETTA-LANDER 67P CONSERT
                   2 FSS V1.0"
PRODUCT_ID      = "CN_L_2_141112T185535"
PRODUCT_CREATION_TIME  = 2017-08-17T09:36:47
MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_ID             = ROSETTA
INSTRUMENT_HOST_NAME   = "ROSETTA-LANDER"
INSTRUMENT_HOST_ID     = "RL"
OBSERVATION_TYPE    = "FIRST SCIENCE SEQUENCE"

MISSION_PHASE_NAME     = "FIRST SCIENCE SEQUENCE"
PRODUCT_TYPE         = EDR

START_TIME           = 2014-11-12T18:55:35
STOP_TIME            = 2014-11-14T23:46:12
SPACECRAFT_CLOCK_START_COUNT = "3/374439263.54824"
SPACECRAFT_CLOCK_STOP_COUNT  = "3/374629501.14341"
ORBIT_NUMBER          ="N/A"

PRODUCER_ID          = "SONC"
PRODUCER_FULL_NAME   = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID        = CONSERT
INSTRUMENT_NAME      = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                       TRANSMISSION"
INSTRUMENT_TYPE      = "RADAR"
```

```
INSTRUMENT_MODE_ID   = "PINGPONG"
INSTRUMENT_MODE_DESC = "CONSERT PERFORMS SOUNDING MEASUREMENTS AS
                        A TRANSPONDER. CONSERT ORBITER AND CONSERT LANDER
                        UNITS ARE SYNCHRONIZED."
TARGET_NAME         = "67P/CHURYUMOV-GERASIMENKO 1 (1969 R1)"
TARGET_TYPE         = "COMET"


PROCESSING_LEVEL_ID = "2"
DATA_QUALITY_ID   = "0"
DATA_QUALITY_DESC = "0: GOOD QUALITY, LESS THAN 30% OF LOSS
                     1: BAD QUALITY, MORE THAN 30% OF LOSS"

/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = ( -242597077.8, 320416244.5, 196073976.4)
/* TARGET PARAMETERS: Position <km>, Velocity <m/s> */
SC_TARGET_POSITION_VECTOR = (          8.5,       -16.2,        -0.7)
SC_TARGET_VELOCITY_VECTOR = (  0.506, 0.096, 0.006)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =          16.2 <km>
SUB_SPACECRAFT_LATITUDE =    -2.94 <deg>
SUB_SPACECRAFT_LONGITUDE =   336.53 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the equatorial J2000 inertial frame (EMEJ200).
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <m/s>, angles in <deg>"

/* DATA OBJECT DEFINITION  */


ROSETTA:CON_MISSION_TABLE_STARTTIC = 22983086

OBJECT                = L0_TABLE
  NAME                = "L0_TABLE"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 13938
  COLUMNS             = 115
  ROW_BYTES           = 510
  ROW_SUFFIX_BYTES    = 1020
  ^STRUCTURE          = "L0_PARAMETER_DEF.FMT"
END_OBJECT            = L0_TABLE

OBJECT                = I_TABLE
  NAME                = "I_TABLE"
  INTERCHANGE_FORMAT = BINARY
  ROWS                = 13938
  ROW_BYTES           = 510
  ROW_PREFIX_BYTES    = 510
  ROW_SUFFIX_BYTES    = 510
  COLUMNS             = 1
  OBJECT                = COLUMN
```

```
    NAME                 = "I_SIGNAL"
    DATA_TYPE            = MSB_INTEGER
    START_BYTE           = 1
    BYTES                = 510
    ITEMS                = 255
    ITEM_BYTES           = 2
    ITEM_OFFSET          = 2
    DESCRIPTION          = "THIS TABLE REPRESENTS THE I VALUES OF THE CONSERT
                             RADIO SOUNDING"
  END_OBJECT             = COLUMN
END_OBJECT             = I_TABLE

OBJECT                 = Q_TABLE
  NAME                 = "Q_TABLE"
  INTERCHANGE_FORMAT   = BINARY
  ROWS                 = 13938
  ROW_BYTES            = 510
  ROW_PREFIX_BYTES     = 1020
  COLUMNS              = 1
  OBJECT                 = COLUMN
    NAME                 = "Q_SIGNAL"
    DATA_TYPE            = MSB_INTEGER
    START_BYTE           = 1
    BYTES                = 510
    ITEMS                = 255
    ITEM_BYTES           = 2
    ITEM_OFFSET          = 2
    DESCRIPTION          = "THIS TABLE REPRESENTS THE Q VALUES OF THE CONSERT
                             RADIO SOUNDING"
  END_OBJECT             = COLUMN
END_OBJECT             = Q_TABLE

END
```

Appendix: Example of Consert Orbiter level 2 data product label

```
PDS_VERSION_ID               = PDS3
LABEL_REVISION_NOTE  = "2017-08-17, SONC, version 1.0"
/* PVV version 3.13 */

/*   Raw data (Level 2)               */

/* FILE CHARACTERISTIC DATA ELEMENTS */

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 1530
FILE_RECORDS         = 35733

FILE_NAME            = "CN_O_2_141112T185640.DAT"


/* DATA OBJECT POINTERS  */

^L0_TABLE       = ("CN_O_2_141112T185640.DAT",1 <BYTES>)
^I_TABLE        = ("CN_O_2_141112T185640.DAT",1 <BYTES>)
^Q_TABLE        = ("CN_O_2_141112T185640.DAT",1 <BYTES>)


/* IDENTIFICATION KEYWORDS */
DATA_SET_ID     = "RO/RL-C-CONSERT-2-FSS-V1.0"
DATA_SET_NAME   = "ROSETTA-ORBITER/ROSETTA-LANDER 67P CONSERT
                   2 FSS V1.0"
PRODUCT_ID      = "CN_O_2_141112T185640"
PRODUCT_CREATION_TIME  = 2017-08-17T09:37:02
MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_ID             = ROSETTA
INSTRUMENT_HOST_NAME   = "ROSETTA-ORBITER"
INSTRUMENT_HOST_ID     = "RO"
OBSERVATION_TYPE     = "FIRST SCIENCE SEQUENCE"

MISSION_PHASE_NAME     = "FIRST SCIENCE SEQUENCE"
PRODUCT_TYPE         = EDR

START_TIME           = 2014-11-12T18:56:40
STOP_TIME            = 2014-11-15T01:00:00
SPACECRAFT_CLOCK_START_COUNT = "1/374439329.11520"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/374633929.11520"
ORBIT_NUMBER          ="N/A"

PRODUCER_ID          = "SONC"
PRODUCER_FULL_NAME   = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID        = CONSERT
INSTRUMENT_NAME      = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                       TRANSMISSION"
INSTRUMENT_TYPE      = "RADAR"
INSTRUMENT_MODE_ID   = "PINGPONG"
INSTRUMENT_MODE_DESC = "CONSERT PERFORMS SOUNDING MEASUREMENTS AS
                        A TRANSPONDER. CONSERT ORBITER AND CONSERT LANDER
```

```
                        UNITS ARE SYNCHRONIZED."
TARGET_NAME          = "67P/CHURYUMOV-GERASIMENKO 1 (1969 R1)"
TARGET_TYPE          = "COMET"


PROCESSING_LEVEL_ID = "2"
DATA_QUALITY_ID    = "0"
DATA_QUALITY_DESC = "0: GOOD QUALITY, LESS THAN 30% OF LOSS
                     1: BAD QUALITY, MORE THAN 30% OF LOSS"

/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = ( -242597440.5, 320415224.3, 196073473.6)
/* TARGET PARAMETERS: Position <km>, Velocity <m/s> */
SC_TARGET_POSITION_VECTOR = (          8.6,       -16.2,        -0.7)
SC_TARGET_VELOCITY_VECTOR = (  0.506, 0.096, 0.006)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =          16.2 <km>
SUB_SPACECRAFT_LATITUDE =    -2.92 <deg>
SUB_SPACECRAFT_LONGITUDE =   336.86 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the equatorial J2000 inertial frame (EMEJ200).
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <m/s>, angles in <deg>"

/* DATA OBJECT DEFINITION  */


ROSETTA:CON_MISSION_TABLE_STARTTIC = 22983085

OBJECT                 = L0_TABLE
  NAME                 = "L0_TABLE"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 35733
  COLUMNS              = 115
  ROW_BYTES            = 510
  ROW_SUFFIX_BYTES     = 1020
  ^STRUCTURE           = "L0_PARAMETER_DEF.FMT"
END_OBJECT             = L0_TABLE

OBJECT                 = I_TABLE
  NAME                 = "I_TABLE"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 35733
  ROW_BYTES            = 510
  ROW_PREFIX_BYTES     = 510
  ROW_SUFFIX_BYTES     = 510
  COLUMNS              = 1
  OBJECT                 = COLUMN
    NAME                 = "I_SIGNAL"
    DATA_TYPE            = MSB_INTEGER
    START_BYTE           = 1
```

```
    BYTES                = 510
    ITEMS                = 255
    ITEM_BYTES           = 2
    ITEM_OFFSET          = 2
    DESCRIPTION          = "THIS TABLE REPRESENTS THE I VALUES OF THE CONSERT
                             RADIO SOUNDING"
  END_OBJECT             = COLUMN
END_OBJECT             = I_TABLE

OBJECT                 = Q_TABLE
  NAME                 = "Q_TABLE"
  INTERCHANGE_FORMAT   = BINARY
  ROWS                 = 35733
  ROW_BYTES            = 510
  ROW_PREFIX_BYTES     = 1020
  COLUMNS              = 1
  OBJECT                 = COLUMN
    NAME                 = "Q_SIGNAL"
    DATA_TYPE            = MSB_INTEGER
    START_BYTE           = 1
    BYTES                = 510
    ITEMS                = 255
    ITEM_BYTES           = 2
    ITEM_OFFSET          = 2
    DESCRIPTION          = "THIS TABLE REPRESENTS THE Q VALUES OF THE CONSERT
                             RADIO SOUNDING"
  END_OBJECT             = COLUMN
END_OBJECT             = Q_TABLE

END
```

Appendix: Example of Consert AOCS level 2 data product label

```
PDS_VERSION_ID                = PDS3
LABEL_REVISION_NOTE             = "2007-07-16, SONC, version 1.0"

/*              Edited data (Level 2)               */

/* FILE CHARACTERISTIC DATA ELEMENTS */

RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 132
FILE_RECORDS         = 8100

FILE_NAME            = "CN_A_2_070225T000130.TAB"


/* DATA OBJECT POINTERS  */



/* IDENTIFICATION KEYWORDS */
DATA_SET_ID            = "RO/RL-CAL-CONSERT-2-MARS-V1.0"
DATA_SET_NAME          = "ROSETTA-ORBITER MARS CONSERT 2 MARS V1.0"
PRODUCT_ID             = "CN_A_2_070225T000130"
PRODUCT_CREATION_TIME  = 2009-09-18T15:54:26
MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_ID             = ROSETTA
INSTRUMENT_HOST_NAME   = {"ROSETTA-ORBITER","ROSETTA-LANDER"}
INSTRUMENT_HOST_ID     = {"RO","RL"}
OBSERVATION_TYPE       = "MARS SWING-BY"

MISSION_PHASE_NAME     = "MARS SWING-BY"
PRODUCT_TYPE           = EDR

START_TIME           = 2007-02-25T00:01:30
STOP_TIME            = 2007-02-25T23:59:23
SPACECRAFT_CLOCK_START_COUNT = "1/130982462.04371"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/131068734.08113"
ORBIT_NUMBER         ="N/A"

PRODUCER_ID          = "SONC"
PRODUCER_FULL_NAME   = "SCIENCE OPERATIONS AND NAVIGATION CENTER"
PRODUCER_INSTITUTION_NAME = "CNES"

INSTRUMENT_ID        = CONSERT
INSTRUMENT_NAME      = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                       TRANSMISSION"
INSTRUMENT_TYPE      = "RADAR"
INSTRUMENT_MODE_ID   = "PINGPONG"
INSTRUMENT_MODE_DESC = "CONSERT IN SOUNDING MODE"
TARGET_NAME          = "MARS"
TARGET_TYPE          = "PLANET"


PROCESSING_LEVEL_ID = 2
DATA_QUALITY_ID   = "N/A"
```

```
DATA_QUALITY_DESC = "N/A"

/* GEOMETRY PARAMETERS */

/* SPACECRAFT LOCATION: Position <km> */
SC_SUN_POSITION_VECTOR = (  -18392147.6, 195586521.2,  90211464.9)
/* TARGET PARAMETERS: Position <km>, Velocity <km/s> */
SC_TARGET_POSITION_VECTOR = ( -153539618.6, 251085093.4, 114271891.0)
SC_TARGET_VELOCITY_VECTOR = (        -36.3,       -20.8,        -9.1)
/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE =   315709008.7 <km>
SUB_SPACECRAFT_LATITUDE =   -21.07 <deg>
SUB_SPACECRAFT_LONGITUDE =   151.15 <deg>
NOTE = "The values of the keywords SC_SUN_POSITION_VECTOR,
       SC_TARGET_POSITION_VECTOR and SC_TARGET_VELOCITY_VECTOR
       are related to the EMEJ2000 reference frame.
       The values of SUB_SPACECRAFT_LATITUDE and SUB_SPACECRAFT_LONGITUDE
       are northern latitude and eastern longitude in the standard
       planetocentric IAU_<TARGET_NAME> frame.
       All values are computed for the time = START_TIME.
       Distances are given in <km> velocities in <km/s>, Angles in <deg>"

/* DATA OBJECT DEFINITION  */


OBJECT                = FILE
  RECORD_TYPE         = FIXED_LENGTH
  FILE_RECORDS        = 8100
  RECORD_BYTES        = 132
  ^AOCS_TABLE         = "CN_A_2_070225T000130.TAB"
  OBJECT              = AOCS_TABLE
    NAME                = AOCS
    INTERCHANGE_FORMAT = ASCII
    ROWS                = 8100
    ^STRUCTURE          = "AOCS.FMT"
    COLUMNS             = 7
    ROW_BYTES           = 132
  END_OBJECT          = AOCS_TABLE
END_OBJECT            = FILE

END
```

Appendix: CONSERT ADC raw units (ADC_COUNTS) to physical units conversion

4.1 Temperature

The temperature in degrees Celsius $T_{°C}$ are calculated from ADC raw data T_{ADC} using the following formula:

For $T_{ADC} < 196$, $T_{°C} = 1940 – 10 * T_{ADC}$

For $T_{ADC} \geq 196$, $T_{°C} = -0.00075 * (T_{ADC} – 188) ^ 3 - 0.05 * (T_{ADC} – 188) ^ 2 - 2.4 * (T_{ADC} – 188) - 1$

4.2 Frequency

The CONSERT OCXO tuning frequency is calculated using the following table. To get the absolute frequency value of the OCXO tuning result frequency, the given values have to be added to 90 MHz. Given values are taken from CONSERT Flight Model Orbiter (FMO) DAC calibration tests.

Table 4: CONSERT OCXO raw data to frequency conversion table

ADC raw value	OCXO frequency difference to 90 MHz (Hz)
0	-614.66
1	-612.36
2	-610.06
3	-607.77
4	-605.47
5	-603.17
6	-600.49
7	-598.19
8	-595.51
9	-593.21
10	-590.53
11	-587.85
12	-585.17
13	-582.49
14	-579.43
15	-576.75
16	-573.68
17	-570.62
18	-567.17
19	-564.11
20	-560.28
21	-556.83
22	-553
23	-549.17
24	-545.34
25	-541.13
26	-536.53
27	-531.94
28	-526.58
29	-521.6
30	-516.24
31	-510.49
32	-503.98
33	-497.86
34	-491.34
35	-484.45

36	-476.79
37	-469.9
38	-462.24
39	-454.96
40	-446.92
41	-439.64
42	-431.99
43	-424.71
44	-416.67
45	-409.39
46	-402.11
47	-394.84
48	-387.56
49	-380.67
50	-373.77
51	-366.88
52	-359.6
53	-353.09
54	-346.58
55	-340.07
56	-333.56
57	-327.05
58	-320.93
59	-314.8
60	-308.29
61	-302.54
62	-296.42
63	-290.67
64	-284.54
65	-278.8
66	-273.05
67	-267.31
68	-261.57
69	-255.82
70	-250.46
71	-245.1
72	-239.35
73	-234.38
74	-229.01
75	-224.03
76	-218.29
77	-213.31
78	-208.33
79	-203.35
80	-197.99
81	-193.4
82	-188.42
83	-183.44
84	-178.46
85	-173.48
86	-168.89
87	-164.29
88	-159.31
89	-154.72
90	-150.12
91	-145.53

92	-140.55
93	-136.34
94	-131.74
95	-127.14
96	-122.93
97	-118.34
98	-114.12
99	-109.53
100	-104.93
101	-100.72
102	-96.51
103	-92.68
104	-88.08
105	-83.87
106	-80.04
107	-75.83
108	-71.23
109	-67.4
110	-63.19
111	-59.36
112	-55.15
113	-51.32
114	-47.1
115	-43.28
116	-39.06
117	-35.23
118	-31.4
119	-27.57
120	-23.74
121	-19.91
122	-16.47
123	-12.64
124	-8.04
125	-4.6
126	-0.77
127	2.68
128	5.36
129	8.81
130	12.64
131	16.85
132	20.68
133	24.13
134	27.57
135	31.02
136	34.85
137	38.3
138	41.74
139	45.19
140	49.02
141	52.47
142	55.91
143	59.36
144	62.81
145	66.25
146	69.7
147	72.76

148	76.21
149	79.66
150	83.1
151	86.17
152	89.61
153	92.68
154	96.12
155	99.19
156	102.63
157	105.7
158	108.76
159	111.83
160	115.66
161	118.34
162	121.4
163	124.46
164	127.91
165	130.97
166	134.04
167	137.1
168	140.17
169	143.23
170	145.91
171	148.97
172	152.04
173	155.1
174	158.16
175	160.85
176	163.91
177	166.59
178	169.65
179	172.33
180	175.4
181	178.08
182	181.14
183	183.82
184	186.5
185	189.57
186	192.25
187	194.93
188	197.61
189	200.29
190	202.97
191	205.65
192	207.95
193	210.63
194	213.31
195	215.99
196	218.67
197	221.35
198	224.03
199	226.33
200	229.01
201	231.69
202	233.99
203	236.67

204	239.35
205	241.65
206	243.95
207	246.63
208	249.31
209	251.61
210	253.91
211	256.2
212	258.88
213	261.18
214	263.48
215	265.78
216	268.08
217	270.37
218	272.67
219	274.97
220	277.27
221	279.56
222	281.86
223	283.78
224	286.46
225	288.37
226	290.67
227	292.59
228	294.88
229	297.18
230	299.48
231	301.39
232	303.31
233	305.61
234	307.52
235	309.82
236	312.12
237	314.03
238	315.95
239	317.86
240	320.16
241	322.07
242	323.99
243	325.9
244	328.2
245	**-5685.51**
246	332.03
247	333.95
248	335.86
249	337.78
250	339.69
251	341.61
252	343.52
253	345.44
254	347.35
255	349.26

Appendix: CONSERT Matched Filter

The CONSERT experiment main objective is to measure travel time of a radio signal through the comet nucleus. This transmitted signal is a binary phase shift key (BPSK). The received signal has to be compressed by this code. The matched filter operation is performed by applying an inter-correlation between the CONSERT signal and the code.

The BPSK code is composed of 255 symbols at -1 or 1 level sampled at 10 MHz (on sample per symbol). The code table is provided in the archive DOCUMENT folder in the CONSERT_COMPRESSION_CODE.TAB.

5 Appendix: Example of Consert Lander level 3 data product label

```
OBJECT                 = I_SHORT_TABLE
  NAME                 = "I_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 84
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 6294
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "I_SHORT_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 84
    ITEMS              = 21
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT LANDER SHORT SIG
                         NAL. THIS SIGNAL IS COMPRESSED ON-BOARD. THE SHORT SIGN
                         AL IS COMPOSED OF ONLY 21 SAMPLES AROUND THE MAIN PEAK.
                                                                               "
  END_OBJECT   = COLUMN
END_OBJECT             = I_SHORT_TABLE

OBJECT                 = Q_SHORT_TABLE
  NAME                 = "Q_SHORT"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 84
  ROW_PREFIX_BYTES     = 84
  ROW_SUFFIX_BYTES     = 6210
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_SHORT_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 84
    ITEMS              = 21
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT LANDER SHOR
                         T SIGNAL. THIS SIGNAL IS COMPRESSED ON-BOARD. THE SHORT
                          SIGNAL IS COMPOSED OF ONLY 21 SAMPLES AROUND THE MAIN
                                                                          PEAK."
  END_OBJECT   = COLUMN
```

```
END_OBJECT             = Q_SHORT_TABLE

OBJECT                 = I_LONG_TABLE
  NAME                 = "I_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 1020
  ROW_PREFIX_BYTES     = 168
  ROW_SUFFIX_BYTES     = 5190
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "I_LONG_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 1020
    ITEMS              = 255
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED LANDE
                         R LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG
                         SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSE
                                                                      RT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = I_LONG_TABLE

OBJECT                 = Q_LONG_TABLE
  NAME                 = "Q_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 1020
  ROW_PREFIX_BYTES     = 1188
  ROW_SUFFIX_BYTES     = 4170
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_LONG_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 1020
    ITEMS              = 255
    ITEM_BYTES         = 4
    ITEM_OFFSET        = 4
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                         LANDER LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE
                         LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL
                                                                  CONSERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = Q_LONG_TABLE

OBJECT                 = I_LONG_COMP_TABLE
  NAME                 = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 2040
  ROW_PREFIX_BYTES     = 2208
  ROW_SUFFIX_BYTES     = 2130
  COLUMNS              = 1
  OBJECT       = COLUMN
```

```
    NAME               = "I_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 2040
    ITEMS              = 255
    ITEM_BYTES         = 8
    ITEM_OFFSET        = 8
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED LANDE
                         R LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGN
                         AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT S
                                                                          IGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = I_LONG_COMP_TABLE

OBJECT                 = Q_LONG_COMP_TABLE
  NAME                 = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 2040
  ROW_PREFIX_BYTES     = 4248
  ROW_SUFFIX_BYTES     = 90
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 2040
    ITEMS              = 255
    ITEM_BYTES         = 8
    ITEM_OFFSET        = 8
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                         LANDER LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG
                          SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONS
                                                                     ERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = Q_LONG_COMP_TABLE

OBJECT                 = CARAC_TABLE
  NAME                 = "CARAC"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 90
  ROW_PREFIX_BYTES     = 6288
  ROW_SUFFIX_BYTES     = 0
  COLUMNS              = 14
  ^STRUCTURE           = "CARAC_LANDER_PARAMETER_DEF.FMT"
END_OBJECT             = CARAC_TABLE
```

6 Appendix: Example of Consert Orbiter level 3 data product label

```
OBJECT                 = I_LONG_COMP_TABLE
  NAME                 = "I_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 2040
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 4191
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "I_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 2040
    ITEMS              = 255
    ITEM_BYTES         = 8
    ITEM_OFFSET        = 8
    DESCRIPTION        = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED ORBIT
                         ER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL I
                         S COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT SIGNA
                                                                              L."
  END_OBJECT   = COLUMN
END_OBJECT             = I_LONG_COMP_TABLE

OBJECT                 = Q_LONG_COMP_TABLE
  NAME                 = "Q_LONG_COMP"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 2040
  ROW_PREFIX_BYTES     = 2040
  ROW_SUFFIX_BYTES     = 2151
  COLUMNS              = 1
  OBJECT       = COLUMN
    NAME               = "Q_LONG_COMP_SIGNAL"
    DATA_TYPE          = IEEE_REAL
    START_BYTE         = 1
    BYTES              = 2040
    ITEMS              = 255
    ITEM_BYTES         = 8
    ITEM_OFFSET        = 8
    DESCRIPTION        = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                         ORBITER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIG
                         NAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT
                                                                         SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT             = Q_LONG_COMP_TABLE

OBJECT                 = I_LONG_TABLE
  NAME                 = "I_LONG"
  INTERCHANGE_FORMAT = BINARY
  ROWS                 = 100
  ROW_BYTES            = 1020
  ROW_PREFIX_BYTES     = 4080
  ROW_SUFFIX_BYTES     = 1131
  COLUMNS              = 1
```

```
  OBJECT       = COLUMN
    NAME                = "I_LONG_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 1020
    ITEMS               = 255
    ITEM_BYTES          = 4
    ITEM_OFFSET         = 4
    DESCRIPTION         = "THE I (IN-PHASE) COMPONENT OF CONSERT CALIBRATED ORBIT
                          ER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGN
                          AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONSERT S
                                                                         IGNAL."
  END_OBJECT   = COLUMN
END_OBJECT              = I_LONG_TABLE

OBJECT                  = Q_LONG_TABLE
  NAME                  = "Q_LONG"
  INTERCHANGE_FORMAT    = BINARY
  ROWS                  = 100
  ROW_BYTES             = 1020
  ROW_PREFIX_BYTES      = 5100
  ROW_SUFFIX_BYTES      = 111
  COLUMNS               = 1
  OBJECT       = COLUMN
    NAME                = "Q_LONG_SIGNAL"
    DATA_TYPE           = IEEE_REAL
    START_BYTE          = 1
    BYTES               = 1020
    ITEMS               = 255
    ITEM_BYTES          = 4
    ITEM_OFFSET         = 4
    DESCRIPTION         = "THE Q (IN-QUADRATURE) COMPONENT OF CONSERT CALIBRATED
                          ORBITER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG
                           SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONS
                                                                    ERT SIGNAL."
  END_OBJECT   = COLUMN
END_OBJECT              = Q_LONG_TABLE

OBJECT                  = CARAC_TABLE
  NAME                  = "CARAC"
  INTERCHANGE_FORMAT    = BINARY
  ROWS                  = 100
  ROW_BYTES             = 111
  ROW_PREFIX_BYTES      = 6120
  ROW_SUFFIX_BYTES      = 0
  COLUMNS               = 15
  ^STRUCTURE            = "CARAC_PARAMETER_DEF.FMT"
END_OBJECT              = CARAC_TABLE
```

7 Appendix: Example of Consert AOCS level 3 data product label

```
PDS_VERSION_ID         = PDS3
LABEL_REVISION_NOTE    = "2017-08-22, IPAG, version 1.0"

/* FILE CHARACTERISTIC */
RECORD_TYPE            = FIXED_LENGTH
RECORD_BYTES           = 121
FILE_RECORDS           = 100
FILE_NAME              = "CN_A_3_20051004T080013.TAB"

/* DATA OBJECT POINTERS  */
^AOCS_TABLE         = ("CN_A_3_20051004T080013.TAB",1 <BYTES>)

/* IDENTIFICATION KEYWORDS */
DATA_SET_ID    = "RO/RL-CAL-CONSERT-3-CR2-V1.0"
DATA_SET_NAME  = "ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR2 V1.0"

PRODUCT_ID             = "CN_A_3_20051004T080013"
PRODUCT_CREATION_TIME = 2017-08-22T10:15:02
PRODUCT_TYPE           = RDR
PROCESSING_LEVEL_ID    = "3"

MISSION_ID             = ROSETTA
MISSION_NAME           = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME     = "CRUISE 2"

INSTRUMENT_HOST_ID     = "RO"
INSTRUMENT_HOST_NAME   = "ROSETTA-ORBITER"
INSTRUMENT_ID          = CONSERT
INSTRUMENT_NAME        = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                         TRANSMISSION"
INSTRUMENT_TYPE        = "RADAR"
INSTRUMENT_MODE_ID     = "PINGPONG"
INSTRUMENT_MODE_DESC   = "CONSERT PERFORMS SOUNDING MEASUREMENTS AS A
  TRANSPONDER. CONSERT ORBITER AND CONSERT LANDER UNITS ARE SYNCHRONIZED."

TARGET_NAME            = "CALIBRATION"
TARGET_TYPE            = "CALIBRATION"

START_TIME             = 2005-10-04T08:00:13
STOP_TIME              = 2005-10-04T08:08:23

PRODUCER_ID                   = "CONSERT TEAM"
PRODUCER_FULL_NAME            = "INSTITUT DE PLANETOLOGIE
                                ET D ASTROPHYSIQUE DE GRENOBLE"
PRODUCER_INSTITUTION_NAME     = "IPAG/OSUG/UGA/CNRS"

DATA_QUALITY_ID               = "N/A"
DATA_QUALITY_DESC             = "N/A"

SPACECRAFT_CLOCK_START_COUNT = "1/0087033591.25671"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/0087034081.26391"

/* GEOMETRY PARAMETERS */
/* SPACECRAFT LOCATION: Position <km> */
```

```
SC_SUN_POSITION_VECTOR    = ("N/A", "N/A", "N/A")

/* TARGET PARAMETERS: Position <km>, Velocity <km/s> */
SC_TARGET_POSITION_VECTOR    = ("N/A", "N/A", "N/A")
SC_TARGET_VELOCITY_VECTOR = ("N/A", "N/A", "N/A")

/* SPACECRAFT POSITION WITH RESPECT TO CENTRAL BODY */
SPACECRAFT_ALTITUDE       = "N/A"
SUB_SPACECRAFT_LATITUDE   = "N/A"
SUB_SPACECRAFT_LONGITUDE  = "N/A"

/* DATA OBJECT DEFINITIONS  */
OBJECT                 = AOCS_TABLE
  NAME                 = "AOCS"
  INTERCHANGE_FORMAT = ASCII
  ROWS                 = 100
  ROW_BYTES            = 121
  ROW_PREFIX_BYTES     = 0
  ROW_SUFFIX_BYTES     = 0
  COLUMNS              = 5
  ^STRUCTURE           = "AOCS_L3.FMT"
END_OBJECT             = AOCS_TABLE
END
```

8 Appendix: Calibration files correlation tables

As stated in section 4.4.2 and 5.2, a single calibration operation produces 1, 2 or 3 files coming from the main tested unit (FMO or FSL), the responding unit (QMO or QML) and the laboratory bench.

Then following tables give for each integration phase the correspondence between the files given in the archive. One can also get the specific section inside the related calibration and test report document, describing each particular experiment and some first analysis and comments.

These tables can be found as a numerical format in the DOCUMENT directory, in coma-separated values format.

8.1 FMO calibration

Chapter numbering corresponds to [AD 17]. The following correlation table replaces the one existing in the document (which specifies original experiment output file names).

8.1.1 Level 2

CN ORBTIER UNIT	ORIGINAL ORBITER FILE	ARCHIVE L2 ORBITER	CN LANDER UNIT	ORIGINAL LANDER FILE	ARCHIVE L2 LANDER	ARCHIVE L2 BENCH	DATE	CHAPTER	COMMENT
FMO	AP050953.D04	CN_O_2_010405T095304	QML	050401_01.xls	CN_L_2_010405T095300	CN_2_OBloc_IQ_4_1b_01.bin	05.04.01	4.1.2	
FMO	AP051007.D08	CN_O_2_010405T100708	QML	050401_02.xls	CN_L_2_010405T100700	CN_2_OBloc_IQ_4_1b_02.bin	05.04.01	4.1.2	
FMO	AP051017.D36	CN_O_2_010405T101736	QML	050401_03.xls	CN_L_2_010405T101700	CN_2_OBloc_IQ_4_1b_03.bin	05.04.01	4.1.2	
FMO	AP051601.D31	CN_O_2_010405T160131	QML	050401_26.xls	CN_L_2_010405T160100	CN_2_OBloc_IQ_4_1b_26.bin	05.04.01	4.1.2	
FMO	AP051027.D58	CN_O_2_010405T102758	QML	050401_04.xls	CN_L_2_010405T102700	CN_2_OBloc_IQ_4_1b_04.bin	05.04.01	4.1.2	
FMO	AP051041.D02	CN_O_2_010405T104102	QML	050401_05.xls	CN_L_2_010405T104100	CN_2_OBloc_IQ_4_1b_05.bin	05.04.01	4.1.2	No L3 - issue long signal
FMO	AP051051.D44	CN_O_2_010405T105144	QML	050401_06.xls	CN_L_2_010405T105100	CN_2_OBloc_IQ_4_1b_06.bin	05.04.01	4.1.2	No L3 - many operation into Orbiter file
			QML	050401_07.xls	CN_L_2_010405T110000	CN_2_OBloc_IQ_4_1b_07.bin	05.04.01	4.1.2	
FMO	AP051110.D41	CN_O_2_010405T111041	QML	050401_08.xls	CN_L_2_010405T111000	CN_2_OBloc_IQ_4_1b_08.bin	05.04.01	4.1.2	No L3 - many operation into Orbiter file
FMO	AP051550.D03	CN_O_2_010405T155003	QML	050401_25.xls	CN_L_2_010405T155000	CN_2_OBloc_IQ_4_1b_25.bin	05.04.01	4.1.2	
			QML	050401_09.xls	CN_L_2_010405T111200	CN_2_OBloc_IQ_4_1b_09.bin	05.04.01	4.1.2	
FMO	AP051142.D08	CN_O_2_010405T114208	QML	050401_10.xls	CN_L_2_010405T114200	CN_2_OBloc_IQ_4_1b_10.bin	05.04.01	4.1.2	
FMO	AP051151.D44	CN_O_2_010405T115144	QML	050401_11.xls	CN_L_2_010405T115100	CN_2_OBloc_IQ_4_1b_11.bin	05.04.01	4.1.2	
FMO	AP051201.D43	CN_O_2_010405T120143	QML	050401_12.xls	CN_L_2_010405T120100	CN_2_OBloc_IQ_4_1b_12.bin	05.04.01	4.1.2	

FMO	AP051210.D37	CN_O_2_010405T121037	QML	050401_13.xls	CN_L_2_010405T121000	CN_2_OBloc_IQ_4_1b_13.bin	05.04.01	4.1.2	
FMO	AP051534.D28	CN_O_2_010405T153428	QML	050401_24.xls	CN_L_2_010405T153400	CN_2_OBloc_IQ_4_1b_24.bin	05.04.01	4.1.2	
FMO	AP051220.D45	CN_O_2_010405T122045	QML	050401_14.xls	CN_L_2_010405T122000	CN_2_OBloc_IQ_4_1b_14.bin	05.04.01	4.1.2	
FMO	AP051230.D34	CN_O_2_010405T123034	QML	050401_16.xls	CN_L_2_010405T123000	CN_2_OBloc_IQ_4_1b_16.bin	05.04.01	4.1.2	
FMO	AP051404.D06	CN_O_2_010405T140406	QML	050401_17.xls	CN_L_2_010405T140400	CN_2_OBloc_IQ_4_1b_17.bin	05.04.01	4.1.2	
FMO	AP051420.D51	CN_O_2_010405T142051	QML	050401_18.xls	CN_L_2_010405T142000	CN_2_OBloc_IQ_4_1b_18.bin	05.04.01	4.1.2	
FMO	AP051428.D40	CN_O_2_010405T142840	QML	050401_19.xls	CN_L_2_010405T142800	CN_2_OBloc_IQ_4_1b_19.bin	05.04.01	4.1.2	
FMO	AP051441.D42	CN_O_2_010405T144142	QML	050401_20.xls	CN_L_2_010405T144100	CN_2_OBloc_IQ_4_1b_20.bin	05.04.01	4.1.2	
FMO	AP051524.D26	CN_O_2_010405T152426	QML	050401_23.xls	CN_L_2_010405T152400	CN_2_OBloc_IQ_4_1b_23.bin	05.04.01	4.1.2	
FMO	AP051452.D02	CN_O_2_010405T145202	QML	050401_21.xls	CN_L_2_010405T145200	CN_2_OBloc_IQ_4_1b_21.bin	05.04.01	4.1.2	
FMO	AP051506.D56	CN_O_2_010405T150656	QML	050401_22.xls	CN_L_2_010405T150600	CN_2_OBloc_IQ_4_1b_22.bin	05.04.01	4.1.2	
FMO	AP040910.D51	CN_O_2_010404T091051					04.04.01	4.4.3	
FMO	AP040941.D17	CN_O_2_010404T094117					04.04.01	4.4.3	
FMO	AP031525.D02	CN_O_2_010403T152502					03.04.01	4.4.4	
FMO	AP031845.D13	CN_O_2_010403T184513					03.04.01	4.4.5	
FMO	AP040742.D25	CN_O_2_010404T074225					04.04.01	4.4.5	
FMO	AP041948.D31	CN_O_2_010404T194831	QML	040401_09.xls	CN_L_2_010404T194800		04.04.01	4.6	No L3 - missing long signal
FMO	AP041958.D18	CN_O_2_010404T195818	QML	040401_10.xls	CN_L_2_010404T195800	CN_2_OBloc_IQ_4_6_1 .bin to OBloc_IQ_4_6_5 .bin	04.04.01	4.6	
FMO	AP051621.D23	CN_O_2_010405T162123	QML	050401_27.xls	CN_L_2_010405T162100		05.04.01	4.7	
FMO	AP051649.D56	CN_O_2_010405T164956	QML	050401_28.xls	CN_L_2_010405T164900		05.04.01	4.7	
FMO	AP121706.D40	CN_O_2_010412T170640	QML	120401_17.xls	CN_L_2_010412T170600	CN_2_OBloc_IQ_5_3_01 .bin to OBloc_IQ_5_3_25 .bin	12.04.01	5.3	
FMO	AP191120.D53	CN_O_2_010419T112053	QML	010419_04.xls	CN_L_2_010419T112000	CN_2_FMO_VT_5_3_00 .bin to FMO_VT_5_3_08 .bin	19.04.01	5.3	
FMO	AP121456.D00	CN_O_2_010412T145600	QML	120401_04.xls	CN_L_2_010412T145600	CN_2_OBloc_IQ_5_4_01 .bin	12.04.01	5.4	

FMO	AP121505.D23	CN_O_2_010412T150523	QML	120401_05.xls	CN_L_2_010412T150500	CN_2_OBloc_IQ_5_4_02 .bin	12.04.01	5.4	No L3 - issue long signal
FMO	AP121514.D30	CN_O_2_010412T151430	QML	120401_06.xls	CN_L_2_010412T151400	CN_2_OBloc_IQ_5_4_03 .bin	12.04.01	5.4	No L3 - issue long signal
FMO	AP121653.D32	CN_O_2_010412T165332	QML	120401_16.xls	CN_L_2_010412T165300	CN_2_OBloc_IQ_5_4_13 .bin	12.04.01	5.4	
FMO	AP121524.D21	CN_O_2_010412T152421	QML	120401_07.xls	CN_L_2_010412T152400	CN_2_OBloc_IQ_5_4_04 .bin	12.04.01	5.4	No L3 - no common sounding
FMO	AP121539.D05	CN_O_2_010412T153905	QML	120401_08.xls	CN_L_2_010412T153900	CN_2_OBloc_IQ_5_4_05 .bin	12.04.01	5.4	
FMO	AP121548.D09	CN_O_2_010412T154809	QML	120401_09.xls	CN_L_2_010412T154800	CN_2_OBloc_IQ_5_4_06 .bin	12.04.01	5.4	
FMO	AP121558.D59	CN_O_2_010412T155859	QML	120401_10.xls	CN_L_2_010412T155800	CN_2_OBloc_IQ_5_4_07 .bin	12.04.01	5.4	
FMO	AP121608.D22	CN_O_2_010412T160822	QML	120401_11.xls	CN_L_2_010412T160800	CN_2_OBloc_IQ_5_4_08 .bin	12.04.01	5.4	
FMO	AP121617.D16	CN_O_2_010412T161716	QML	120401_12.xls	CN_L_2_010412T161700	CN_2_OBloc_IQ_5_4_09 .bin	12.04.01	5.4	
FMO	AP121626.D24	CN_O_2_010412T162624	QML	120401_13.xls	CN_L_2_010412T162600	CN_2_OBloc_IQ_5_4_10 .bin	12.04.01	5.4	
FMO	AP121635.D17	CN_O_2_010412T163517	QML	120401_14.xls	CN_L_2_010412T163500	CN_2_OBloc_IQ_5_4_11 .bin	12.04.01	5.4	No L3 - issue long signal
FMO	AP121644.D10	CN_O_2_010412T164410	QML	120401_15.xls	CN_L_2_010412T164400	CN_2_OBloc_IQ_5_4_12 .bin	12.04.01	5.4	
FMO	AP121046.D40	CN_O_2_010412T104640	QML	120401_02.xls	CN_L_2_010412T104600	CN_2_OBloc_IQ_5_5_01 .bin to OBloc_IQ_5_5_08 .bin	12.04.01	5.5	
FMO	AP121107.D49	CN_O_2_010412T110749	QML	120401_03.xls	CN_L_2_010412T110700		12.04.01	5.5	
FMO	AP121200.D21	CN_O_2_010412T120021					12.04.01	5.6	
FMO	AP121413.D25	CN_O_2_010412T141325					12.04.01	5.7	
FMO	AP131034.D03	CN_O_2_010413T103403	QML	010413_01.xls	CN_L_2_010413T103400	CN_2_OBloc_6_3_01 .bin to OBloc_6_3_25 .bin	13.04.01	6.3	
FMO	AP181048.D04		QML	010418_02.xls	CN_L_2_010418T104800		18.04.01	6.4	No L2/L3 - sounding issue
FMO	AP181057.D23	CN_O_2_010418T105723	QML	010418_03.xls	CN_L_2_010418T105700	CN_2_OBloc_IQ_6_4_01 .bin	18.04.01	6.4	
FMO	AP181112.D18	CN_O_2_010418T111218	QML	010418_04.xls	CN_L_2_010418T111200	CN_2_OBloc_IQ_6_4_02 .bin	18.04.01	6.4	
FMO	AP181122.D45	CN_O_2_010418T112245	QML	010418_05.xls	CN_L_2_010418T112200	CN_2_OBloc_IQ_6_4_03 .bin	18.04.01	6.4	
FMO	AP181132.D10	CN_O_2_010418T113210	QML	010418_06.xls	CN_L_2_010418T113200	CN_2_OBloc_IQ_6_4_04 .bin	18.04.01	6.4	

FMO	AP181141.D29	CN_O_2_010418T114129	QML	010418_07.xls	CN_L_2_010418T114100	CN_2_OBloc_IQ_6_4_05 .bin	18.04.01	6.4	
FMO	AP181150.D54	CN_O_2_010418T115054	QML	010418_08.xls	CN_L_2_010418T115000	CN_2_OBloc_IQ_6_4_06 .bin	18.04.01	6.4	
FMO	AP181200.D32	CN_O_2_010418T120032	QML	010418_09.xls	CN_L_2_010418T120000	CN_2_OBloc_IQ_6_4_07 .bin	18.04.01	6.4	
FMO	AP181211.D20	CN_O_2_010418T121120	QML	010418_10.xls	CN_L_2_010418T121100	CN_2_OBloc_IQ_6_4_08 .bin	18.04.01	6.4	
FMO	AP181219.D30	CN_O_2_010418T121930	QML	010418_11.xls	CN_L_2_010418T121900	CN_2_OBloc_IQ_6_4_09 .bin	18.04.01	6.4	
FMO	AP181228.D31	CN_O_2_010418T122831	QML	010418_12.xls	CN_L_2_010418T122800	CN_2_OBloc_IQ_6_4_10 .bin	18.04.01	6.4	
FMO	AP181243.D53	CN_O_2_010418T124353	QML	010418_13.xls	CN_L_2_010418T124300	CN_2_OBloc_IQ_6_4_11 .bin	18.04.01	6.4	
FMO	AP181253.D16	CN_O_2_010418T125316	QML	010418_14.xls	CN_L_2_010418T125300	CN_2_OBloc_IQ_6_4_12 .bin	18.04.01	6.4	
FMO	AP180943.D58	CN_O_2_010418T094358	QML	010418_01.xls	CN_L_2_010418T094300	CN_2_OBloc_IQ_6_5_01 .bin to OBloc_IQ_6_5_09 .bin	18.04.01	6.5	
FMO	AP131204.D41	CN_O_2_010413T120441					13.04.01	6.6	
FMO	AP131429.D29	CN_O_2_010413T142929					13.04.01	6.7	
FMO	AP041521.D36	CN_O_2_010404T152136					04.04.01	7.3.a	
FMO	AP191555.D08	CN_O_2_010419T155508	QML	010419_06.xls	CN_L_2_010419T155500	CN_2_VT_FMO_7_3_00 .bin to VT_FMO_7_3_25 .bin	19.04.01	7.3.b	
FMO	AP041659.D39	CN_O_2_010404T165939	QML	040401_03.xls	CN_L_2_010404T165900	CN_2_OBloc_IQ_7_4_1_T .bin	04.04.01	7.4.a	
FMO	AP041710.D42	CN_O_2_010404T171042	QML	040401_04.xls	CN_L_2_010404T171000	CN_2_OBloc_IQ_7_4_2_T .bin	04.04.01	7.4.a	
FMO	AP041722.D59	CN_O_2_010404T172259	QML	040401_05.xls	CN_L_2_010404T172200	CN_2_OBloc_IQ_7_4_3_T .bin	04.04.01	7.4.a	
FMO	AP041733.D51	CN_O_2_010404T173351	QML	040401_06.xls	CN_L_2_010404T173300	CN_2_OBloc_IQ_7_4_4_T .bin	04.04.01	7.4.a	
FMO	AP171359.D51	CN_O_2_010417T135951	QML	010417_03.xls	CN_L_2_010417T135900	CN_2_FMO_VT_7_4_1.bin	17.04.01	7.4.b	
FMO	AP171415.D18	CN_O_2_010417T141518	QML	010417_04.xls	CN_L_2_010417T141500	CN_2_FMO_VT_7_4_2.bin	17.04.01	7.4.b	
FMO	AP171425.D53	CN_O_2_010417T142553	QML	010417_05.xls	CN_L_2_010417T142500	CN_2_FMO_VT_7_4_3.bin	17.04.01	7.4.b	
			QML	010417_06.xls	CN_L_2_010417T143000	CN_2_FMO_VT_7_4_4.bin	17.04.01	7.4.b	
FMO	AP171439.D40	CN_O_2_010417T143940	QML	010417_07.xls	CN_L_2_010417T143900	CN_2_FMO_VT_7_4_5.bin	17.04.01	7.4.b	No L3 - only one sounding, need more

FMO	AP171503.D50	CN_O_2_010417T150350	QML	010417_08.xls	CN_L_2_010417T150300	CN_2_FMO_VT_7_4_6.bin	17.04.01	7.4.b	
FMO	AP171517.D45	CN_O_2_010417T151745	QML	010417_09.xls	CN_L_2_010417T151700	CN_2_FMO_VT_7_4_7.bin	17.04.01	7.4.b	
FMO	AP171538.D17	CN_O_2_010417T153817	QML	010417_10.xls	CN_L_2_010417T153800	CN_2_FMO_VT_7_4_8.bin	17.04.01	7.4.b	
FMO	AP171549.D52	CN_O_2_010417T154952	QML	010417_11.xls	CN_L_2_010417T154900	CN_2_FMO_VT_7_4_9.bin	17.04.01	7.4.b	
FMO	AP171601.D06	CN_O_2_010417T160106	QML	010417_12.xls	CN_L_2_010417T160100	CN_2_FMO_VT_7_4_10.bin	17.04.01	7.4.b	
FMO	AP171612.D41	CN_O_2_010417T161241	QML	010417_13.xls	CN_L_2_010417T161200	CN_2_FMO_VT_7_4_11.bin	17.04.01	7.4.b	
FMO	AP171623.D59	CN_O_2_010417T162359	QML	010417_14.xls	-	CN_2_FMO_VT_7_4_12.bin	17.04.01	7.4.b	No L2/L3 - sounding issue
FMO	AP171112.D55	CN_O_2_010417T111255	QML	010417_01.xls	CN_L_2_010417T111200	CN_2_ OBloc_IQ_7_5_01 .bin to OBloc_IQ_7_5_08 .bin	17.04.01	7.5	No L3 - missing long signal
FMO	AP171638.D52	CN_O_2_010417T163852					17.04.01	7.6	
FMO	AP171224.D19	CN_O_2_010417T122419					17.04.01	7.7	
FMO	AP111052.D29	CN_O_2_010411T105229	QML	110401_01.xls	CN_L_2_010411T105200		11.04.01	8.3	
FMO	AP111103.D17	CN_O_2_010411T110317	QML	110401_02.xls	CN_L_2_010411T110300	CN_2_ Obloc_IQ_8_3_01 .bin to Obloc_IQ_8_3_25 .bin	11.04.01	8.3	
FMO	AP111631.D21	CN_O_2_010411T163121	QML	110401_05.xls	CN_L_2_010411T163100	CN_2_ Obloc_IQ_8_4_01 .bin	11.04.01	8.4	
FMO	AP111646.D11	CN_O_2_010411T164611	QML	110401_06.xls	CN_L_2_010411T164600	CN_2_ Obloc_IQ_8_4_02 .bin	11.04.01	8.4	
FMO	AP111656.D41	CN_O_2_010411T165641	QML	110401_07.xls	CN_L_2_010411T165600	CN_2_ Obloc_IQ_8_4_03 .bin	11.04.01	8.4	
FMO	AP111706.D48	CN_O_2_010411T170648	QML	110401_08.xls	CN_L_2_010411T170600	CN_2_ Obloc_IQ_8_4_04 .bin	11.04.01	8.4	
FMO	AP111721.D07	CN_O_2_010411T172107	QML	110401_09.xls	CN_L_2_010411T172100	CN_2_ Obloc_IQ_8_4_05 .bin	11.04.01	8.4	
FMO	AP111730.D33	CN_O_2_010411T173033	QML	110401_10.xls	CN_L_2_010411T173000	CN_2_ Obloc_IQ_8_4_06 .bin	11.04.01	8.4	
FMO	AP111739.D38	CN_O_2_010411T173938	QML	110401_11.xls	CN_L_2_010411T173900	CN_2_ Obloc_IQ_8_4_07 .bin	11.04.01	8.4	
FMO	AP111752.D54	CN_O_2_010411T175254	QML	110401_12.xls	CN_L_2_010411T175200	CN_2_ Obloc_IQ_8_4_08 .bin	11.04.01	8.4	
FMO	AP111801.D53	CN_O_2_010411T180153	QML	110401_13.xls	CN_L_2_010411T180100	CN_2_ Obloc_IQ_8_4_09 .bin	11.04.01	8.4	
FMO	AP111810.D57	CN_O_2_010411T181057	QML	110401_14.xls	CN_L_2_010411T181000	CN_2_ Obloc_IQ_8_4_10 .bin	11.04.01	8.4	
FMO	AP111819.D48	CN_O_2_010411T181948	QML	110401_15.xls	CN_L_2_010411T181900	CN_2_ Obloc_IQ_8_4_11 .bin	11.04.01	8.4	
FMO	AP111828.D44	CN_O_2_010411T182844	QML	110401_16.xls	CN_L_2_010411T182800	CN_2_ Obloc_IQ_8_4_12 .bin	11.04.01	8.4	

FMO	AP111510.D37	CN_O_2_010411T151037	QML	110401_03.xls	CN_L_2_010411T151000	CN_2_ Obloc_IQ_8_5_01 .bin to Obloc_IQ_8_5_10 .bin	11.04.01	8.5	
FMO	AP111527.D36	CN_O_2_010411T152736	QML	110401_04.xls	CN_L_2_010411T152700	CN_2_ Obloc_IQ_8_5_01 .bin to Obloc_IQ_8_5_10 .bin	11.04.01	8.5	
FMO	AP111218.D32	CN_O_2_010411T121832					11.04.01	8.6	
FMO	AP111431.D53	CN_O_2_010411T143153					11.04.01	8.7	
FMO	AP121840.D21	CN_O_2_010412T184021	QML	120401_18.xls	CN_L_2_010412T184000	CN_2_ Obloc_IQ_9_1_1_01 .bin to Obloc_IQ_9_1_1_04 .bin	12.04.01	9.1.1	
FMO	AP131512.D01	CN_O_2_010413T151201	QML	010413_03.xls	CN_L_2_010413T151200	CN_2_ Obloc_IQ_9_1_2_01 .bin to Obloc_IQ_9_1_2_05 .bin	13.04.01	9.1.2	
FMO	AP141122.D51	CN_O_2_010414T112251	QML	010413_03_1.xls		CN_2_ Obloc_IQ_9_1_2_01 .bin to Obloc_IQ_9_1_2_05 .bin	14.04.01	9.1.2	010413_03 copied > 010413_03_1
FMO	AP151303.D24	CN_O_2_010415T130324	QML	010413_03_2.xls		CN_2_ Obloc_IQ_9_1_2_01 .bin to Obloc_IQ_9_1_2_05 .bin	15.04.01	9.1.2	010413_03 copied > 010413_03_2
FMO	AP161443.D58	CN_O_2_010416T144358	QML	010413_03_3.xls		CN_2_ Obloc_IQ_9_1_2_01 .bin to Obloc_IQ_9_1_2_05 .bin	16.04.01	9.1.2	010413_03 copied > 010413_03_3
FMO	AP181303.D46	CN_O_2_010418T130346					18.04.01	9.2	

8.1.2 Level 3

CN ORBTIER UNIT	ORIGINAL ORBITER FILE	ARCHIVE L3 ORBITER	CN LANDER UNIT	ORIGINAL LANDER FILE	ARCHIVE L3 LANDER	DATE	CHAPTER	COMMENT
FMO	AP050953.D04	CN_O_3_20010405T095304	QML	050401_01.xls	CN_L_3_20010405T095300	05.04.01	4.1.2	
FMO	AP051007.D08	CN_O_3_20010405T100708	QML	050401_02.xls	CN_L_3_20010405T100700	05.04.01	4.1.2	
FMO	AP051017.D36	CN_O_3_20010405T101736	QML	050401_03.xls	CN_L_3_20010405T101700	05.04.01	4.1.2	
FMO	AP051601.D31	CN_O_3_20010405T160131	QML	050401_26.xls	CN_L_3_20010405T160100	05.04.01	4.1.2	
FMO	AP051027.D58	CN_O_3_20010405T102758	QML	050401_04.xls	CN_L_3_20010405T102700	05.04.01	4.1.2	
FMO	AP051041.D02		QML	050401_05.xls		05.04.01	4.1.2	No L3 - issue long signal
FMO	AP051051.D44		QML	050401_06.xls		05.04.01	4.1.2	No L3 - many operation into Orbiter file
			QML	050401_07.xls		05.04.01	4.1.2	
FMO	AP051110.D41		QML	050401_08.xls		05.04.01	4.1.2	No L3 - many operation into Orbiter file
FMO	AP051550.D03	CN_O_3_20010405T155003	QML	050401_25.xls	CN_L_3_20010405T155000	05.04.01	4.1.2	
			QML	050401_09.xls		05.04.01	4.1.2	
FMO	AP051142.D08	CN_O_3_20010405T114208	QML	050401_10.xls	CN_L_3_20010405T114200	05.04.01	4.1.2	
FMO	AP051151.D44	CN_O_3_20010405T115144	QML	050401_11.xls	CN_L_3_20010405T115100	05.04.01	4.1.2	
FMO	AP051201.D43	CN_O_3_20010405T120143	QML	050401_12.xls	CN_L_3_20010405T120100	05.04.01	4.1.2	
FMO	AP051210.D37	CN_O_3_20010405T121037	QML	050401_13.xls	CN_L_3_20010405T121000	05.04.01	4.1.2	
FMO	AP051534.D28	CN_O_3_20010405T153428	QML	050401_24.xls	CN_L_3_20010405T153400	05.04.01	4.1.2	
FMO	AP051220.D45	CN_O_3_20010405T122045	QML	050401_14.xls	CN_L_3_20010405T122000	05.04.01	4.1.2	
FMO	AP051230.D34	CN_O_3_20010405T123034	QML	050401_16.xls	CN_L_3_20010405T123000	05.04.01	4.1.2	
FMO	AP051404.D06	CN_O_3_20010405T140406	QML	050401_17.xls	CN_L_3_20010405T140400	05.04.01	4.1.2	
FMO	AP051420.D51	CN_O_3_20010405T142051	QML	050401_18.xls	CN_L_3_20010405T142000	05.04.01	4.1.2	
FMO	AP051428.D40	CN_O_3_20010405T142840	QML	050401_19.xls	CN_L_3_20010405T142800	05.04.01	4.1.2	
FMO	AP051441.D42	CN_O_3_20010405T144142	QML	050401_20.xls	CN_L_3_20010405T144100	05.04.01	4.1.2	

FMO	AP051524.D26	CN_O_3_20010405T152426	QML	050401_23.xls	CN_L_3_20010405T152400	05.04.01	4.1.2	
FMO	AP051452.D02	CN_O_3_20010405T145202	QML	050401_21.xls	CN_L_3_20010405T145200	05.04.01	4.1.2	
FMO	AP051506.D56	CN_O_3_20010405T150656	QML	050401_22.xls	CN_L_3_20010405T150600	05.04.01	4.1.2	
FMO	AP040910.D51					04.04.01	4.4.3	
FMO	AP040941.D17					04.04.01	4.4.3	
FMO	AP031525.D02					03.04.01	4.4.4	
FMO	AP031845.D13					03.04.01	4.4.5	
FMO	AP040742.D25					04.04.01	4.4.5	
FMO	AP041948.D31		QML	040401_09.xls		04.04.01	4.6	No L3 - missing long signal
FMO	AP041958.D18	CN_O_3_20010404T195818	QML	040401_10.xls	CN_L_3_20010404T195800	04.04.01	4.6	
FMO	AP051621.D23	CN_O_3_20010405T162123	QML	050401_27.xls	CN_L_3_20010405T162100	05.04.01	4.7	
FMO	AP051649.D56	CN_O_3_20010405T164956	QML	050401_28.xls	CN_L_3_20010405T164900	05.04.01	4.7	
FMO	AP121706.D40	CN_O_3_20010412T170640	QML	120401_17.xls	CN_L_3_20010412T170600	12.04.01	5.3	
FMO	AP191120.D53	CN_O_3_20010419T112053	QML	010419_04.xls	CN_L_3_20010419T112000	19.04.01	5.3	
FMO	AP121456.D00	CN_O_3_20010412T145600	QML	120401_04.xls	CN_L_3_20010412T145600	12.04.01	5.4	
FMO	AP121505.D23		QML	120401_05.xls		12.04.01	5.4	No L3 - issue long signal
FMO	AP121514.D30		QML	120401_06.xls		12.04.01	5.4	No L3 - issue long signal
FMO	AP121653.D32	CN_O_3_20010412T165332	QML	120401_16.xls	CN_L_3_20010412T165300	12.04.01	5.4	
FMO	AP121524.D21		QML	120401_07.xls		12.04.01	5.4	No L3 - no common sounding
FMO	AP121539.D05	CN_O_3_20010412T153905	QML	120401_08.xls	CN_L_3_20010412T153900	12.04.01	5.4	
FMO	AP121548.D09	CN_O_3_20010412T154809	QML	120401_09.xls	CN_L_3_20010412T154800	12.04.01	5.4	
FMO	AP121558.D59	CN_O_3_20010412T155859	QML	120401_10.xls	CN_L_3_20010412T155800	12.04.01	5.4	
FMO	AP121608.D22	CN_O_3_20010412T160822	QML	120401_11.xls	CN_L_3_20010412T160800	12.04.01	5.4	
FMO	AP121617.D16	CN_O_3_20010412T161716	QML	120401_12.xls	CN_L_3_20010412T161700	12.04.01	5.4	
FMO	AP121626.D24	CN_O_3_20010412T162624	QML	120401_13.xls	CN_L_3_20010412T162600	12.04.01	5.4	
FMO	AP121635.D17		QML	120401_14.xls		12.04.01	5.4	No L3 - issue long signal

FMO	AP121644.D10	CN_O_3_20010412T164410	QML	120401_15.xls	CN_L_3_20010412T164400	12.04.01	5.4	
FMO	AP121046.D40	CN_O_3_20010412T104640	QML	120401_02.xls	CN_L_3_20010412T104600	12.04.01	5.5	
FMO	AP121107.D49	CN_O_3_20010412T110749	QML	120401_03.xls	CN_L_3_20010412T110700	12.04.01	5.5	
FMO	AP121200.D21					12.04.01	5.6	
FMO	AP121413.D25					12.04.01	5.7	
FMO	AP131034.D03	CN_O_3_20010413T103403	QML	010413_01.xls	CN_L_3_20010413T103400	13.04.01	6.3	
FMO	AP181048.D04		QML	010418_02.xls		18.04.01	6.4	No L2/L3 - sounding issue
FMO	AP181057.D23	CN_O_3_20010418T105723	QML	010418_03.xls	CN_L_3_20010418T105700	18.04.01	6.4	
FMO	AP181112.D18	CN_O_3_20010418T111218	QML	010418_04.xls	CN_L_3_20010418T111200	18.04.01	6.4	
FMO	AP181122.D45	CN_O_3_20010418T112245	QML	010418_05.xls	CN_L_3_20010418T112200	18.04.01	6.4	
FMO	AP181132.D10	CN_O_3_20010418T113210	QML	010418_06.xls	CN_L_3_20010418T113200	18.04.01	6.4	
FMO	AP181141.D29	CN_O_3_20010418T114129	QML	010418_07.xls	CN_L_3_20010418T114100	18.04.01	6.4	
FMO	AP181150.D54	CN_O_3_20010418T115054	QML	010418_08.xls	CN_L_3_20010418T115000	18.04.01	6.4	
FMO	AP181200.D32	CN_O_3_20010418T120032	QML	010418_09.xls	CN_L_3_20010418T120000	18.04.01	6.4	
FMO	AP181211.D20	CN_O_3_20010418T121120	QML	010418_10.xls	CN_L_3_20010418T121100	18.04.01	6.4	
FMO	AP181219.D30	CN_O_3_20010418T121930	QML	010418_11.xls	CN_L_3_20010418T121900	18.04.01	6.4	
FMO	AP181228.D31	CN_O_3_20010418T122831	QML	010418_12.xls	CN_L_3_20010418T122800	18.04.01	6.4	
FMO	AP181243.D53	CN_O_3_20010418T124353	QML	010418_13.xls	CN_L_3_20010418T124300	18.04.01	6.4	
FMO	AP181253.D16	CN_O_3_20010418T125316	QML	010418_14.xls	CN_L_3_20010418T125300	18.04.01	6.4	
FMO	AP180943.D58	CN_O_3_20010418T094358	QML	010418_01.xls	CN_L_3_20010418T094300	18.04.01	6.5	
FMO	AP131204.D41					13.04.01	6.6	
FMO	AP131429.D29					13.04.01	6.7	
FMO	AP041521.D36					04.04.01	7.3.a	
FMO	AP191555.D08	CN_O_3_20010419T155508	QML	010419_06.xls	CN_L_3_20010419T155500	19.04.01	7.3.b	
FMO	AP041659.D39	CN_O_3_20010404T165939	QML	040401_03.xls	CN_L_3_20010404T165900	04.04.01	7.4.a	
FMO	AP041710.D42	CN_O_3_20010404T171042	QML	040401_04.xls	CN_L_3_20010404T171000	04.04.01	7.4.a	

FMO	AP041722.D59	CN_O_3_20010404T172259	QML	040401_05.xls	CN_L_3_20010404T172200	04.04.01	7.4.a	
FMO	AP041733.D51	CN_O_3_20010404T173351	QML	040401_06.xls	CN_L_3_20010404T173300	04.04.01	7.4.a	
FMO	AP171359.D51	CN_O_3_20010417T135951	QML	010417_03.xls	CN_L_3_20010417T135900	17.04.01	7.4.b	
FMO	AP171415.D18	CN_O_3_20010417T141518	QML	010417_04.xls	CN_L_3_20010417T141500	17.04.01	7.4.b	
FMO	AP171425.D53	CN_O_3_20010417T142553	QML	010417_05.xls	CN_L_3_20010417T142500	17.04.01	7.4.b	
			QML	010417_06.xls		17.04.01	7.4.b	
FMO	AP171439.D40		QML	010417_07.xls		17.04.01	7.4.b	No L3 - only one sounding, need more
FMO	AP171503.D50	CN_O_3_20010417T150350	QML	010417_08.xls	CN_L_3_20010417T150300	17.04.01	7.4.b	
FMO	AP171517.D45	CN_O_3_20010417T151745	QML	010417_09.xls	CN_L_3_20010417T151700	17.04.01	7.4.b	
FMO	AP171538.D17	CN_O_3_20010417T153817	QML	010417_10.xls	CN_L_3_20010417T153800	17.04.01	7.4.b	
FMO	AP171549.D52	CN_O_3_20010417T154952	QML	010417_11.xls	CN_L_3_20010417T154900	17.04.01	7.4.b	
FMO	AP171601.D06	CN_O_3_20010417T160106	QML	010417_12.xls	CN_L_3_20010417T160100	17.04.01	7.4.b	
FMO	AP171612.D41	CN_O_3_20010417T161241	QML	010417_13.xls	CN_L_3_20010417T161200	17.04.01	7.4.b	
FMO	AP171623.D59		QML	010417_14.xls		17.04.01	7.4.b	No L2/L3 - sounding issue
FMO	AP171112.D55		QML	010417_01.xls		17.04.01	7.5	No L3 - missing long signal
FMO	AP171638.D52					17.04.01	7.6	
FMO	AP171224.D19					17.04.01	7.7	
FMO	AP111052.D29	CN_O_3_20010411T105229	QML	110401_01.xls	CN_L_3_20010411T105200	11.04.01	8.3	
FMO	AP111103.D17	CN_O_3_20010411T110317	QML	110401_02.xls	CN_L_3_20010411T110300	11.04.01	8.3	
FMO	AP111631.D21	CN_O_3_20010411T163121	QML	110401_05.xls	CN_L_3_20010411T163100	11.04.01	8.4	
FMO	AP111646.D11	CN_O_3_20010411T164611	QML	110401_06.xls	CN_L_3_20010411T164600	11.04.01	8.4	
FMO	AP111656.D41	CN_O_3_20010411T165641	QML	110401_07.xls	CN_L_3_20010411T165600	11.04.01	8.4	
FMO	AP111706.D48	CN_O_3_20010411T170648	QML	110401_08.xls	CN_L_3_20010411T170600	11.04.01	8.4	
FMO	AP111721.D07	CN_O_3_20010411T172107	QML	110401_09.xls	CN_L_3_20010411T172100	11.04.01	8.4	
FMO	AP111730.D33	CN_O_3_20010411T173033	QML	110401_10.xls	CN_L_3_20010411T173000	11.04.01	8.4	
FMO	AP111739.D38	CN_O_3_20010411T173938	QML	110401_11.xls	CN_L_3_20010411T173900	11.04.01	8.4	

FMO	AP111752.D54	CN_O_3_20010411T175254	QML	110401_12.xls	CN_L_3_20010411T175200	11.04.01	8.4	
FMO	AP111801.D53	CN_O_3_20010411T180153	QML	110401_13.xls	CN_L_3_20010411T180100	11.04.01	8.4	
FMO	AP111810.D57	CN_O_3_20010411T181057	QML	110401_14.xls	CN_L_3_20010411T181000	11.04.01	8.4	
FMO	AP111819.D48	CN_O_3_20010411T181948	QML	110401_15.xls	CN_L_3_20010411T181900	11.04.01	8.4	
FMO	AP111828.D44	CN_O_3_20010411T182844	QML	110401_16.xls	CN_L_3_20010411T182800	11.04.01	8.4	
FMO	AP111510.D37	CN_O_3_20010411T151037	QML	110401_03.xls	CN_L_3_20010411T151000	11.04.01	8.5	
FMO	AP111527.D36	CN_O_3_20010411T152736	QML	110401_04.xls	CN_L_3_20010411T152700	11.04.01	8.5	
FMO	AP111218.D32					11.04.01	8.6	
FMO	AP111431.D53					11.04.01	8.7	
FMO	AP121840.D21	CN_O_3_20010412T184021	QML	120401_18.xls	CN_L_3_20010412T184000	12.04.01	9.1.1	
FMO	AP131512.D01	CN_O_3_20010413T151201	QML	010413_03.xls	CN_L_3_20010413T151200	13.04.01	9.1.2	
FMO	AP141122.D51	CN_O_3_20010414T112251	QML	010413_03_1.xls	CN_L_3_20010414T112200	14.04.01	9.1.2	010413_03 copied > 010413_03_1
FMO	AP151303.D24	CN_O_3_20010415T130324	QML	010413_03_2.xls	CN_L_3_20010415T130300	15.04.01	9.1.2	010413_03 copied > 010413_03_2
FMO	AP161443.D58	CN_O_3_20010416T144358	QML	010413_03_3.xls	CN_L_3_20010416T144300	16.04.01	9.1.2	010413_03 copied > 010413_03_3
FMO	AP181303.D46					18.04.01	9.2	

8.2 FSL calibration

Chapter numbering corresponds to [AD 18]. The following correlation table replaces the one existing in the document (which specifies original experiment output file names).

8.2.1 Level 2

CN LANDER UNIT	ORIGINAL LANDER FILE	ARCHIVE L2 LANDER	CN ORBITER UNIT	ORIGINAL ORBITER FILE	ARCHIVE L2 ORBITER	ARCHIVE L2 BENCH	DATE	CHAPTER	COMMENT
FSL	250701_1.xls	-					25.07.01	4.1.1	
FSL	250701_2.xls	CN_L_2_010725T120000					25.07.01	4.1.2.1	
FSL	260701_1.xls	CN_L_2_010726T080000					26.07.01	4.1.3.2	
FSL	250701_4.xls	CN_L_2_010725T180000					25.07.01	4.1.3.3	
FSL	300701_3.xls	CN_L_2_010730T180000					30.07.01	4.1.3.3	
FSL	250701_3.xls	CN_L_2_010725T151500					25.07.01	4.1.3.4	
FSL	260701_2.xls	CN_L_2_010726T160000					26.07.01	4.1.3.5	
FSL	300701_2.xls	CN_L_2_010730T140000					30.07.01	4.1.3.5	
FSL	270701_1.xls	CN_L_2_010727T115500	QMO	JL271155.D00	CN_O_2_010727T115500	CN_2_FSL_LABO_001.bin to FSL_LABO_003.bin	27.07.01	4.3.1	
FSL	300701_1.xls	CN_L_2_010730T102100	QMO	JL301021.D00	CN_O_2_010730T102100	CN_2_FSL_LABO_004.bin	30.07.01	4.4	
FSL	181001_7.xls	-					18.10.01	5.3	
FSL	181001_8.xls	-					18.10.01	5.4	
FSL	181001_1.xls	CN_L_2_011018T100000	QMO	OC181000.D00	CN_O_2_011018T100000	CN_2_FSL_VT_551_0.bin to FSL_VT_551_2.bin	18.10.01	5.5.1	
FSL	181001_2.xls	CN_L_2_011018T102000	QMO	OC181020.D46	CN_O_2_011018T102046		18.10.01	5.5.1	
FSL	181001_3.xls	CN_L_2_011018T104000	QMO	OC181040.D11	CN_O_2_011018T104011	CN_2_FSL_VT_551_3.bin to FSL_VT_551_8.bin	18.10.01	5.5.1	
FSL	181001_4.xls	CN_L_2_011018T120900	QMO	OC181209.D36	CN_O_2_011018T120936		18.10.01		

FSL	181001_5.xls	CN_L_2_011018T122500	QMO	OC181225.D53	CN_O_2_011018T122553	CN_2_FSL_VT_552_01.bin to FSL_VT_552_26.bin	18.10.01	5.5.2	
FSL	181001_12.xls	CN_L_2_011018T140000					18.10.01	5.6	
FSL	181001_13.xls	CN_L_2_011018T160000					18.10.01	5.6	
FSL	181001_9.xls	CN_L_2_011018T180000					18.10.01	5.7	
FSL	181001_14.xls	CN_L_2_011018T192100	QMO	OC181921.D44	CN_O_2_011018T192144	CN_2_FSL_VT_58_1.bin FSL_VT_58_2.bin	18.10.01	5.8	
FSL	191001_7.xls	-					19.10.01	6.3	
FSL	191001_8.xls	-					19.10.01	6.4	
FSL	191001_2.xls	-	QMO	OC191026.D37	-		19.10.01	6.5.1	
FSL	191001_3.xls	CN_L_2_011019T102900	QMO	OC191029.D26	CN_O_2_011019T102926	CN_2_FSL_VT_651_00.bin to FSL_VT_651_08.bin	19.10.01	6.5.1	
FSL	191001_5.xls	CN_L_2_011019T134300	QMO	OC191343.D34	CN_O_2_011019T134334	CN_2_FSL_VT_652_01.bin to FSL_VT_652_20.bin	19.10.01	6.5.2	
FSL	191001_6.xls	CN_L_2_011019T143500	QMO	OC191435.D17	CN_O_2_011019T143517	CN_2_FSL_VT_652_21.bin to FSL_VT_652_32.bin	19.10.01	6.5.2	
FSL	191001_9.xls	CN_L_2_011019T154500					19.10.01	6.6	
FSL	191001_4.xls	CN_L_2_011019T163000					19.10.01	6.7	
FSL	171001_4.xls	-					17.10.01	7.3	
FSL	171001_5.xls	-					17.10.01	7.4	
FSL	171001_1.xls	CN_L_2_011017T105300	QMO	OC171053.D26	CN_O_2_011017T105326	CN_2_FSL_VT_751_1.bin to FSL_VT_751_8.bin	17.10.01	7.5.1	
FSL	171001_7.xls	CN_L_2_011017T165600	QMO	OC171656.D25	CN_O_2_011017T165625	CN_2_FSL_VT_752_01.bin to FSL_VT_752_25.bin	17.10.01	7.5.2	No L3 - generation issue
FSL	171001_2.xls	CN_L_2_011017T172500					17.10.01	7.6	
FSL	171001_3.xls	CN_L_2_011017T180500					17.10.01	7.7	

FSL	171001_9.xls	CN_L_2_011017T181700	QMO	OC171817.d23	CN_O_2_011017T181723		17.10.01	7.8	
FSL	151001_1.xls	-					15.10.01	8.3	
FSL	151001_2.xls	CN_L_2_011015T120000					15.10.01	8.4	
FSL	151001_4.xls	CN_L_2_011015T170800				CN_2_FSL_VT_851_1.bin FSL_VT_851_2.bin	15.10.01	8.5.1	
FSL	151001_5.xls	CN_L_2_011015T173200	QMO	OC151732.D35	CN_O_2_011015T173235	CN_2_FSL_VT_851_3.bin to FSL_VT_851_10.bin	15.10.01	8.5.1	
FSL	151001_3.xls	CN_L_2_011015T140000					15.10.01	8.6	
FSL	151001_6.xls	CN_L_2_011015T191600	QMO	OC151916.D12	CN_O_2_011015T191612		15.10.01	8.8	
FSL	161001_4.xls	-					16.10.01	9.3	
FSL	161001_5.xls	-					16.10.01	9.4	
FSL	161001_1.xls	CN_L_2_011016T103600	QMO	OC161036.D41	CN_O_2_011016T103641	CN_2_FSL_VT_951_1.bin to FSL_VT_951_8.bin	16.10.01	9.5.1	
FSL	161001_7.xls	CN_L_2_011016T171600	QMO	OC161716.D44	CN_O_2_011016T171644	CN_2_FSL_VT_952_01.bin FSL_VT_952_03.bin to FSL_VT_952_26.bin	16.10.01	9.5.2	
FSL	161001_2.xls	CN_L_2_011016T080000					16.10.01	9.6	
FSL	161001_3.xls	CN_L_2_011016T090000					16.10.01	9.7	
FSL	161001_8.xls	CN_L_2_011016T183000	QMO	OC161830.D36	CN_O_2_011016T183036		16.10.01	9.8	
FSL	161001_9.xls	CN_L_2_011016T190100	QMO	OC161901.d20	CN_O_2_011016T190120		16.10.01	9.8	
FSL	191001_10.xls	CN_L_2_011019T180000					19.10.01	10	
FSL	160402_2.xls	CN_L_2_020416T113200	QMO	AP161132.D29	CN_O_2_020416T113229	CN_2_FSL_VT_1451_1.bin FSL_VT_1451_13.bin	16.04.02	14.5.1	
FSL	160402_5.xls	-					16.04.02	14.5.2	
FSL	160402_6.xls	CN_L_2_020416T163300	QMO	AP161633.D19	CN_O_2_020416T163319	CN_2_FSL_VT_1452_1.bin FSL_VT_1452_28.bin	16.04.02	14.5.2	

FSL	160402_3.xls	CN_L_2_020416T133000					16.04.02	14.6	
FSL	160402_4.xls	CN_L_2_020416T155000					16.04.02	14.7	
FSL	170402_5.xls	CN_L_2_020417T144300	QMO	AP171443.D17	CN_O_2_020417T144317	CN_2_FSL_VT_1551_1.bin FSL_VT_1551_2.bin	17.04.02	15.5.1	
FSL	170402_6.xls	CN_L_2_020417T150000	QMO	AP171500.D50	CN_O_2_020417T150050	CN_2_FSL_VT_1551_3.bin FSL_VT_1551_11.bin	17.04.02	15.5.1	
FSL	170402_1.xls	CN_L_2_020417T101000	QMO	AP171010.D06	CN_O_2_020417T101006	CN_2_FSL_VT_1552_01.bin FSL_VT_1552_28.bin	17.04.02	15.5.2	
FSL	170402_3.xls	CN_L_2_020417T120000					17.04.02	15.6	
FSL	170402_2.xls	CN_L_2_020417T113000					17.04.02	15.7	
FSL	170402_4.xls	CN_L_2_020417T114000					17.04.02	15.7	
FSL	160402_7.xls	CN_L_2_020416T180200	QMO	AP161802.D53	CN_O_2_020416T180253	CN_2_FSL_VT_161_1.bin FSL_VT_161_5.bin	16.04.02	16.1	
FSL	170402_7.xls	CN_L_2_020417T160000					17.04.02	16.3	

8.2.2 Level 3

CN LANDER UNIT	ORIGINAL LANDER FILE	ARCHIVE L3 LANDER	CN ORBITER UNIT	ORIGINAL ORBITER FILE	ARCHIVE L3 ORBITER	DATE	CHAPTER	COMMENT
FSL	250701_1.xls	-			-	25.07.01	4.1.1	
FSL	250701_2.xls	-			-	25.07.01	4.1.2.1	
FSL	260701_1.xls	-			-	26.07.01	4.1.3.2	
FSL	250701_4.xls	-			-	25.07.01	4.1.3.3	
FSL	300701_3.xls	-			-	30.07.01	4.1.3.3	
FSL	250701_3.xls	-			-	25.07.01	4.1.3.4	
FSL	260701_2.xls	-			-	26.07.01	4.1.3.5	
FSL	300701_2.xls	-			-	30.07.01	4.1.3.5	
FSL	270701_1.xls	CN_L_3_20010727T115500	QMO	JL271155.D00	CN_O_3_20010727T115500	27.07.01	4.3.1	
FSL	300701_1.xls	CN_L_3_20010730T102100	QMO	JL301021.D00	CN_O_3_20010730T102100	30.07.01	4.4	
FSL	181001_7.xls	-			-	18.10.01	5.3	
FSL	181001_8.xls	-			-	18.10.01	5.4	
FSL	181001_1.xls	CN_L_3_20011018T100000	QMO	OC181000.D00	CN_O_3_20011018T100000	18.10.01	5.5.1	
FSL	181001_2.xls	CN_L_3_20011018T102000	QMO	OC181020.D46	CN_O_3_20011018T102046	18.10.01	5.5.1	
FSL	181001_3.xls	CN_L_3_20011018T104000	QMO	OC181040.D11	CN_O_3_20011018T104011	18.10.01	5.5.1	
FSL	181001_4.xls	CN_L_3_20011018T120900	QMO	OC181209.D36	CN_O_3_20011018T120936	18.10.01		
FSL	181001_5.xls	CN_L_3_20011018T122500	QMO	OC181225.D53	CN_O_3_20011018T122553	18.10.01	5.5.2	
FSL	181001_12.xls	-			-	18.10.01	5.6	

FSL	181001_13.xls	-			-	18.10.01	5.6	
FSL	181001_9.xls	-			-	18.10.01	5.7	
FSL	181001_14.xls	CN_L_3_20011018T192100	QMO	OC181921.D44	CN_O_3_20011018T192144	18.10.01	5.8	
FSL	191001_7.xls	-			-	19.10.01	6.3	
FSL	191001_8.xls	-			-	19.10.01	6.4	
FSL	191001_2.xls	-	QMO	OC191026.D37	-	19.10.01	6.5.1	
FSL	191001_3.xls	CN_L_3_20011019T102900	QMO	OC191029.D26	CN_O_3_20011019T102926	19.10.01	6.5.1	
FSL	191001_5.xls	CN_L_3_20011019T134300	QMO	OC191343.D34	CN_O_3_20011019T134334	19.10.01	6.5.2	
FSL	191001_6.xls	CN_L_3_20011019T143500	QMO	OC191435.D17	CN_O_3_20011019T143517	19.10.01	6.5.2	
FSL	191001_9.xls	-			-	19.10.01	6.6	
FSL	191001_4.xls	-			-	19.10.01	6.7	
FSL	171001_4.xls	-			-	17.10.01	7.3	
FSL	171001_5.xls	-			-	17.10.01	7.4	
FSL	171001_1.xls	CN_L_3_20011017T105300	QMO	OC171053.D26	CN_O_3_20011017T105326	17.10.01	7.5.1	
FSL	171001_7.xls	-	QMO	OC171656.D25	-	17.10.01	7.5.2	No L3 - generation issue
FSL	171001_2.xls	-			-	17.10.01	7.6	
FSL	171001_3.xls	-			-	17.10.01	7.7	
FSL	171001_9.xls	CN_L_3_20011017T181700	QMO	OC171817.d23	CN_O_3_20011017T181723	17.10.01	7.8	
FSL	151001_1.xls	-			-	15.10.01	8.3	
FSL	151001_2.xls	-			-	15.10.01	8.4	

FSL	151001_4.xls	-			-	15.10.01	8.5.1	
FSL	151001_5.xls	CN_L_3_20011015T173200	QMO	OC151732.D35	CN_O_3_20011015T173235	15.10.01	8.5.1	
FSL	151001_3.xls	-			-	15.10.01	8.6	
FSL	151001_6.xls	CN_L_3_20011015T191600	QMO	OC151916.D12	CN_O_3_20011015T191612	15.10.01	8.8	
FSL	161001_4.xls	-			-	16.10.01	9.3	
FSL	161001_5.xls	-			-	16.10.01	9.4	
FSL	161001_1.xls	CN_L_3_20011016T103600	QMO	OC161036.D41	CN_O_3_20011016T103641	16.10.01	9.5.1	
FSL	161001_7.xls	CN_L_3_20011016T171600	QMO	OC161716.D44	CN_O_3_20011016T171644	16.10.01	9.5.2	
FSL	161001_2.xls	-			-	16.10.01	9.6	
FSL	161001_3.xls	-			-	16.10.01	9.7	
FSL	161001_8.xls	CN_L_3_20011016T183000	QMO	OC161830.D36	CN_O_3_20011016T183036	16.10.01	9.8	
FSL	161001_9.xls	CN_L_3_20011016T190100	QMO	OC161901.d20	CN_O_3_20011016T190120	16.10.01	9.8	
FSL	191001_10.xls	-			-	19.10.01	10	
FSL	160402_2.xls	CN_L_3_20020416T113200	QMO	AP161132.D29	CN_O_3_20020416T113229	16.04.02	14.5.1	
FSL	160402_5.xls	-			-	16.04.02	14.5.2	
FSL	160402_6.xls	CN_L_3_20020416T163300	QMO	AP161633.D19	CN_O_3_20020416T163319	16.04.02	14.5.2	
FSL	160402_3.xls	-			-	16.04.02	14.6	
FSL	160402_4.xls	-			-	16.04.02	14.7	

FSL	170402_5.xls	CN_L_3_20020417T144300	QMO	AP171443.D17	CN_O_3_20020417T144317	17.04.02	15.5.1	
FSL	170402_6.xls	CN_L_3_20020417T150000	QMO	AP171500.D50	CN_O_3_20020417T150050	17.04.02	15.5.1	
FSL	170402_1.xls	CN_L_3_20020417T101000	QMO	AP171010.D06	CN_O_3_20020417T101006	17.04.02	15.5.2	
FSL	170402_3.xls	-			-	17.04.02	15.6	
FSL	170402_2.xls	-			-	17.04.02	15.7	
FSL	170402_4.xls	-			-	17.04.02	15.7	
FSL	160402_7.xls	CN_L_3_20020416T180200	QMO	AP161802.D53	CN_O_3_20020416T180253	16.04.02	16.1	
FSL	170402_7.xls	-			-	17.04.02	16.3	

8.3 FMO / FSL calibration in Kourou

The tests are described in [AD 19].

For Kourou calibration campaign, only bench data are available. The file names in the archive are constructed directly from the file names as cited in [AD 19]:

```
CN_2_{bench file name in AD19}.LBL
CN_2_{bench file name in AD19}.DAT
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