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ROSETTA - CONSERT

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**Change Log**

Date	Sections Changed	Reasons for Change
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26/05/2015	<i>Updated:</i> 2.4.3 <i>In-Flight data products</i> 2.4.5 <i>Ancillary Data Usage</i> 4.2 <i>Datasets, Definition and Content</i> <i>Added:</i> 3.2.2.2.5 <i>Spacecraft Clock Count in PDS Labels</i> <i>Deleted:</i> 3.4.3.4.2 <i>Geometric Index File</i>	Delivery of Issue 1.1 updated for the comet phase
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16/12/2016	<i>Modified:</i> [All] <i>Structure of the document to keep consistency with level 3 description</i> [All] <i>CONSERT team review for L2</i> <i>Added:</i> App7 <i>on raw data conversion functions</i>	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	<i>Modified:</i> 2.4.3 <i>In flight operation products</i>	added quick description of lander search operations during LTS
28/07/2017	Added CONSERT auxiliary data format in: 3.1.4 <i>File naming Convention</i> 4.2.3.6 <i>Label Directory</i> 4.4.1.4 <i>Data Object Definition</i>	
31/08/2017	<i>Added :</i> 5 <i>Level 3 Specifications and Design</i>	Delivery of L3 archives
07/11/2017	5.4.4.5 <i>Geometry Directory</i> 5.4.4.6 <i>Label Directory</i> 5.4.4.7 <i>Document Directory</i>	From PSA review RIDs Oct. 2017



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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 CONCERT 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 and Level 3 CONCERT 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 CONCERT 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 CONCERT 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

1.6 Relationships to Other Interfaces

N/A



1.7 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
CONCERT	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	<i>Institut de Planétologie et d'Astrophysique de Grenoble</i>
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)

1.8 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 CONCERT 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 CONCERT 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.

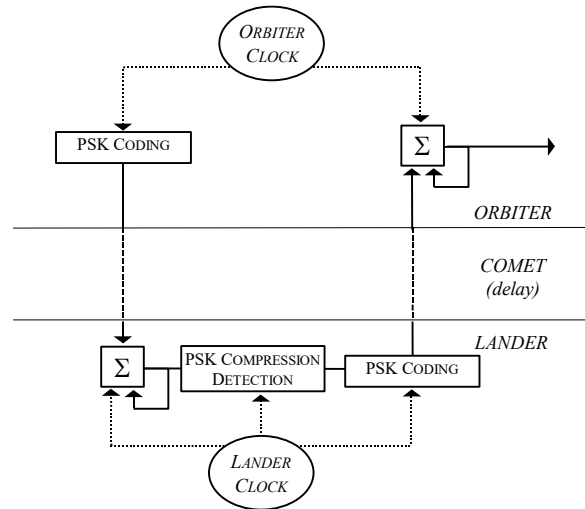


Figure 1 : Block diagram of the CONCERT experiment. The coded signal is emitted from the Orbiter. The Lander makes a coherent addition and a detection of the correlation principal peak. A clean coded signal is finally emitted with the found delay. The Orbiter accumulates the signal and send it to the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

The complete CONCERT 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, CONCERT instrument is waiting, not taking measurements. Some minutes before the occultation occurs, CONCERT starts its scientific measurement, acquiring the signal passing through the comet nucleus. This is the “ping-pong” phase of the CONCERT 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:

$$2 * \text{PI} * \text{Radius of comet} / (\text{lambda}/2)$$

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 CONCERT 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 CONCERT 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 CONCERT soundings during one orbit: 3000

Parameters:

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

The Rosetta Orbiter Spacecraft should be able to initiate the CONCERT 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 CONCERT 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

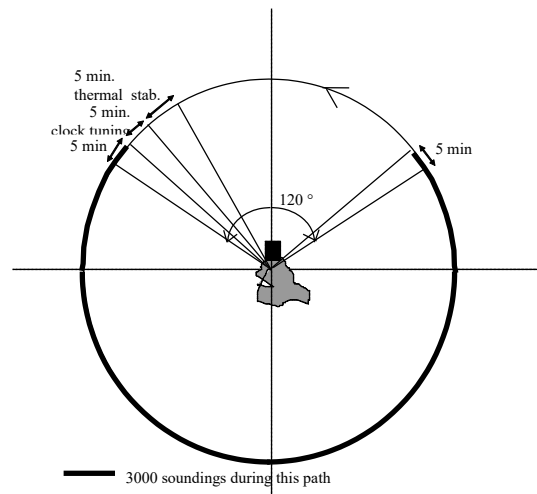
$T_{ON\ L}$: calculated on ground, based on orbit

$TUNESTART\ _o = T_{ON\ o} + 5\ \text{minutes}$

$TUNESTART\ _L = T_{ON\ L} + 5\ \text{minutes}$

And: $TUNESTART\ _o = TUNESTART\ _L + 30\ \text{seconds}$
(+/- 20 seconds)

$SOUNDSTART = TUNESTART + 5\ \text{minutes}$



The time accuracy that the experiment requires defines the necessary clock stability. This accuracy is given by the time-transponder structure of CONCERT. 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 CONCERT 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*.

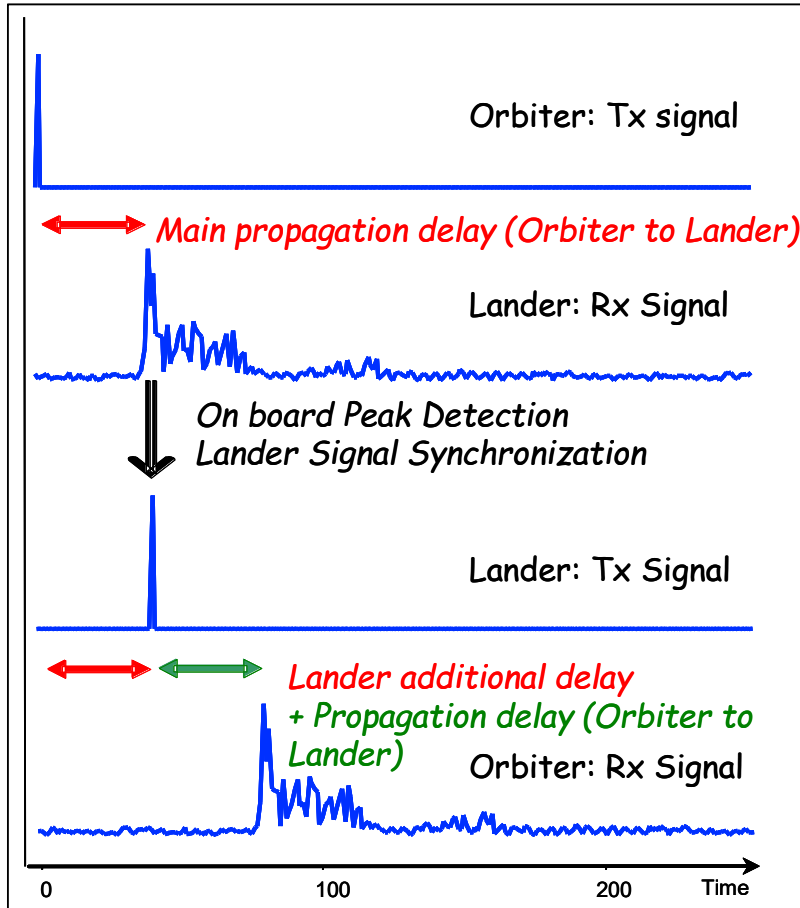


Figure 2 : In-Time transponder

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 are 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 CONCERT (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 CONCERT 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 authorized¹ 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 CONCERT 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 CONCERT 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 1.8.

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 CONCERT Flight Model Orbiter (FMO), the Flight Spare Lander (FSL) and the CONCERT 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 (Level 4). 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)	CONCERT 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 Manoeuvre 1 (including PC#13)	RMV1	04/09/2010	07/06/2011	X	
Cruise 6	CR6	08/06/2011	20/01/2014		
RV Manoeuvre 2	RMV2	21/01/2014	09/09/2014	X	
Post Hibernation Commissioning	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 CONCERT 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, CONCERT 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 7.

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 Elev	
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. Only level 2 (SONC level 0) and level 3 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 8 for more details.

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.

Level 4 data will be delivered in a next phase, as they are still being defined. They will include (to be finalized): signal peak detection with derived travel time and amplitude attenuation values.

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 mission 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

The file naming 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

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

- L3 only:
 - G_O for geometry data (Orbiter)
 - G_L for geometry data (Lander)

- **level** (1 character) = data processing level number norm CODMAC
(CONCERT archives only level 2 and level 3 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 CONCERT 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 CONCERT Orbiter slot beginning at 2010/02/21 12:25:01 (level 2)

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 bytes². 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 :

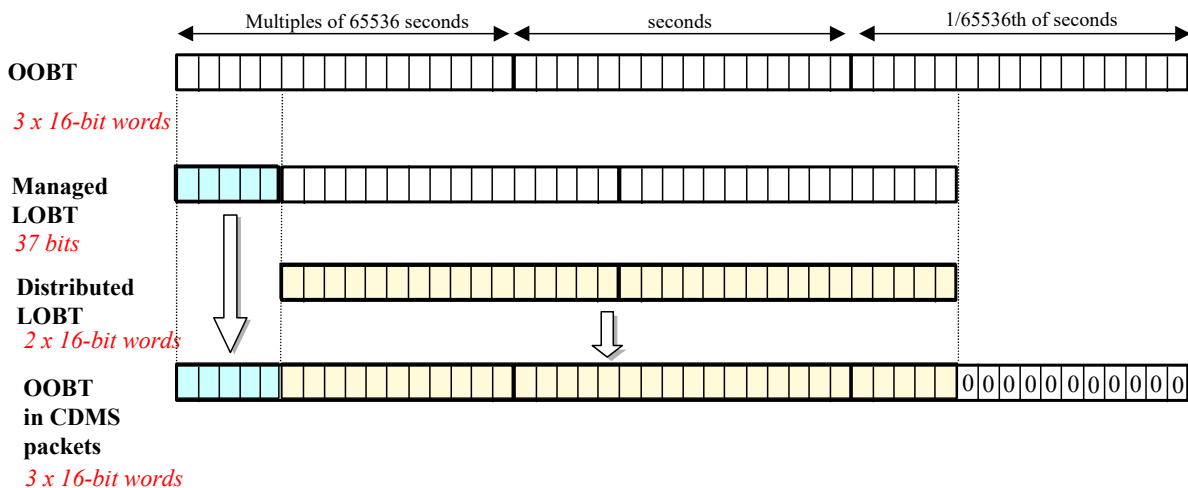


Figure 3 Reconstruction of on board time in CDMS packets

- ◆ 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 CONCERT data products.

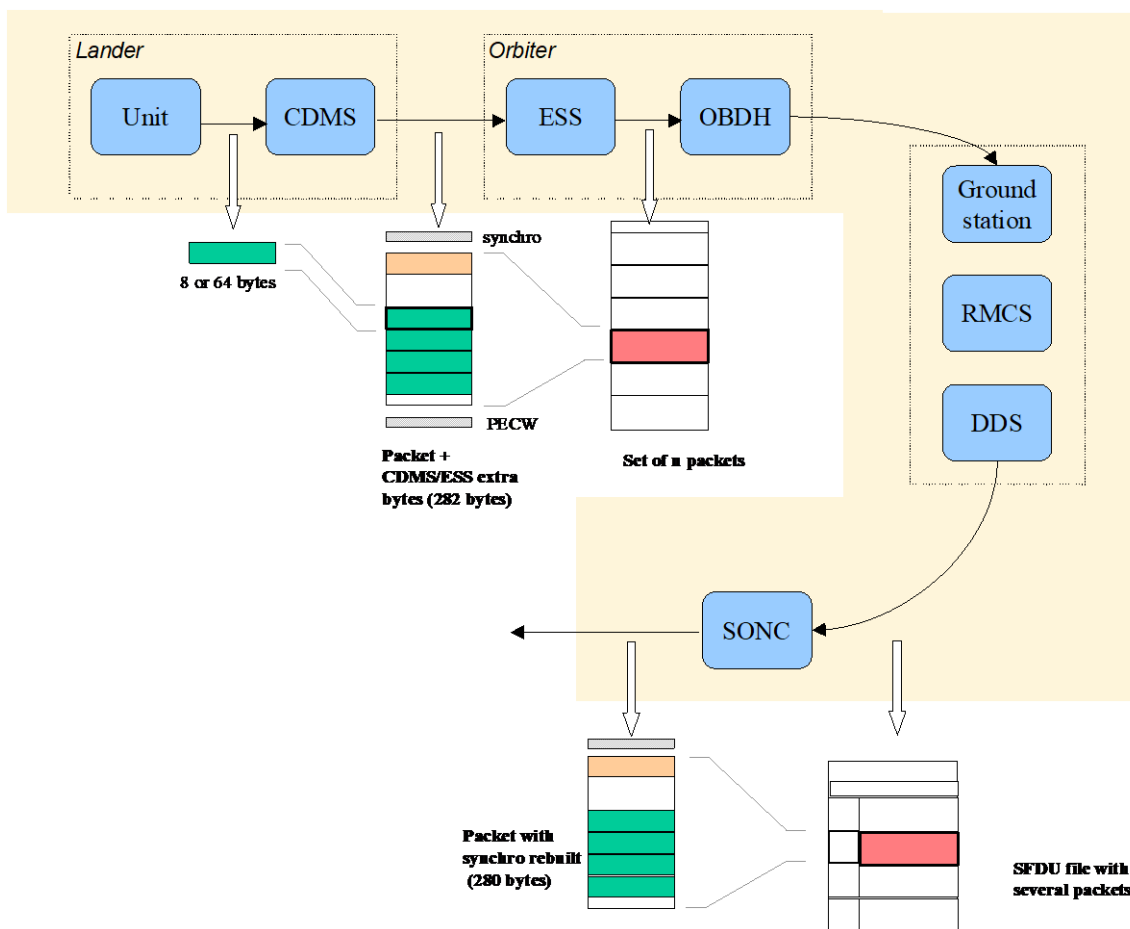


Figure 4 On board data flow

- ◆ 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 CONCERT time standards

3.2.2.2.1 The CONCERT internal Time

There are three different times for CONCERT:

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

All the CONCERT operation are synchronized on the CONCERT 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 Lander On-Board Time (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 CONCERT 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, CONCERT 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 $21 \times 2^{-5} = 0.65625$ 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

CONCERT 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).



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To Planetary Science Archive
Interface Control Document

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4 Level 2 Specifications and Design

This part will describe the L2 design and specifications.

4.1 Data Validation

The CONCERT data products are delivered to PSA by SONC. All the data produced by SONC are validated by CONCERT 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           = "CONCERT 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 CONCERT 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	CONCERT	
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

CONSERT measurements are time measurements, there is no specific instrument geometry applicable.

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_CONCERT.LBL	PDS label of EAICD_CONCERT.PDF
EAICD_CONCERT.PDF	CONCERT EAICD (this document)
CONCERT_COMPRESSION_CODE.LBL	PDS label of file CONCERT_COMPRESSION_CODE.TAB
CONCERT_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 CONCERT operations during mission phase <i>ph</i>
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	CONCERT commissioning report
RO-OCN-TN-3802.LBL	PDS label of file RO-OCN-TN-3802.PDF
RO-OCN-TN-3802.PDF	CONCERT In-flight operation test report
RO-OCN-TN-3825.LBL	PDS label of file RO-OCN-TN-3825.PDF
RO-OCN-TN-3825.PDF	CONCERT User Manual Orbiter & Lander
RO-OCN-TN-3850.LBL	PDS label of file RO-OCN-TN-3850.PDF
RO-OCN-TN-3850.PDF	CONCERT stop&start procedure description
RO-OCN-TN-3851.LBL	PDS label of file RO-OCN-TN-3851.PDF
RO-OCN-TN-3851.PDF	CONCERT operation requests
RO-OCN-TN-3852.LBL	PDS label of file RO-OCN-TN-3852.PDF
RO-OCN-TN-3852.PDF	CONCERT post hibernation commissioning test report
RO-OCN-TN-3866.LBL	PDS label of file RO-OCN-TN-3866.PDF
RO-OCN-TN-3866.PDF	CONCERT 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	CONCERT operation report : Long Term Science
RO-OCN-TR-3801.PDF	Concert 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	Concert 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 <i>ph</i>
TIMELINE_ph_DESC.TXT	Description of the timeline file for phase <i>ph</i> (PDS attached label)
TIMELINE_ph.PNG	Timeline Image file for phase <i>ph</i>
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 CONCERT 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 CONCERT 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 CONCERT BPSK code to be used to apply the matched filter to the signal (cf. Appendix 8 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

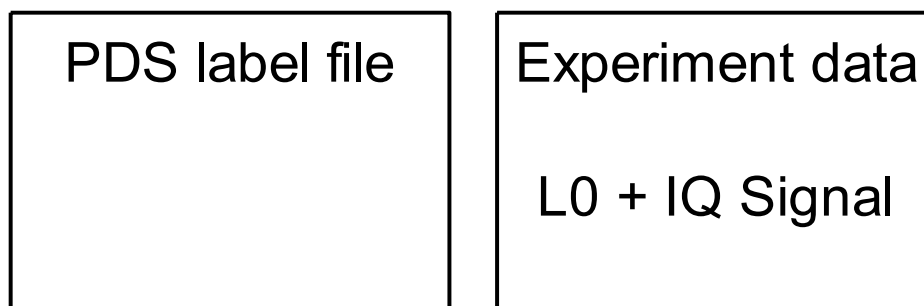
The CONSERT data products delivered to PSA are edited data (CODMAC level 2) in ADC units containing sounding information (from tuning phase to the I and Q signals and correlation peak)

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 global data product structure is shown below.





One experiment data file consists in identical records. Each record consists in 3 parts (3 x 255 words - Integer 2 bytes): header (named L0), I signal and Q signal. The corresponding data product is organized as three TABLE objects using ROW_PREFIX_BYTES and ROW_SUFFIX_BYTES for defining the 3 parts. At first phases of the experiment (init, mission table received, tuning, waiting), there is no sounding and the records are completed by nulls. The length of these phases depends in the mission table and the time interval between records varies.

In sounding mode the time interval between two records is fixed (Mission Table)

L0	I signal	Q signal	Record # 1
L0	I signal	Q signal	Record # 2
...			
L0	I signal	Q signal	Record # n-1
L0	I signal	Q signal	Record # n

The record structure is shown in annex 4.

4.4.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for CONCERT 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 CONCERT 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        = CONCERT
INSTRUMENT_NAME       = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
TRANSMISSION"
INSTRUMENT_TYPE       = "RADAR"
INSTRUMENT_MODE_ID    = "PINGPONG"
INSTRUMENT_MODE_DESC = "CONCERT 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 CONCERT 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 CONCERT
                          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 CONCERT
  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: CONCERT PROGRESS REPORT and NCND0511
  is a CONCERT 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: CONCERT PROGRESS REPORT and NCND0512
is a CONCERT 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: CONCERT PROGRESS REPORT and
NCND0513 is a CONCERT 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:
CONCERT PROGRESS REPORT and NCND0514 is a
CONCERT 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:
                  CONCERT PROGRESS REPORT and NCND0515 is a
                  CONCERT 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:
                  CONCERT PROGRESS REPORT and NCND00339 is a
                  CONCERT telemetry parameter name: CONCERT
                  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:
  CONCERT 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:
  CONCERT 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:
                  CONCERT 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:
                  CONCERT HOUSEKEEPING REPORT) [AD 3]
                  - Lander: APID 112,12 (field 5)
                  (APID : Application Process ID) [AD 4]"
END_OBJECT     = COLUMN
```

/* ----- */

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

/* ----- */

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

/* ----- */

```
OBJECT          = COLUMN
NAME            = "CONCERT UTC MINUTES"
```



```
UNIT = "MINUTE"
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 113
BYTES = 2
COLUMN_NUMBER = 57
DESCRIPTION = "decoded CONCERT internal time minutes
- From Orbiter: ETM00325 (field 9&10)
(ETM00325 is a telemetry packet name:
CONCERT HOUSEKEEPING REPORT) [AD 3]
- From Lander: TM type 1 (field 1&2) [AD 4]"
END_OBJECT = COLUMN

/* ----- */

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

/* ----- */

OBJECT = COLUMN
NAME = "CONCERT UTC MILLISECONDS"
UNIT = "MILLISECOND"
DATA_TYPE = MSB_UNSIGNED_INTEGER
START_BYTE = 117
BYTES = 2
COLUMN_NUMBER = 59
DESCRIPTION = "decoded CONCERT internal time millisecond
- From Orbiter: ETM00325 (field 9&10)
(ETM00325 is a telemetry packet name:
CONCERT 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 equal 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: CONCERT 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: CONCERT 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:
   CONCERT PROGRESS/EVENT REPORT and NCNA0EID is
   a CONCERT 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
```




```
(ETM00325 is a telemetry packet name:
  CONCERT 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: CONCERT 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:
  CONCERT 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:
  CONCERT 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:
  CONCERT 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 1 or 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:
        CONCERT SCIENCE REPORT) [AD 3]
    - Lander: Last TM type 1 or 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:
        CONCERT 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:
        CONCERT 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:
CONCERT 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:
CONCERT 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                = "OBT_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 description
                  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):

CONCERT 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
```

CONCERT 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
```

CONCERT Lander E-box temperature (main and redundant) 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
```

CONCERT 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 = "OBT_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_TEMP_A
 ORB_CN_ANT_TEMP_B
 ORB_CN_ELEC_TEMP_A
 ORB_CN_ELEC_TEMP_B
 ORB_CN_ANT_OUT_S
 ORB_CN_ANT_IN_S
 TCM_CONCERT
 TCR_CONCERT
 PSSH2_C_CONCERT"
END_OBJECT = COLUMN

OBJECT = COLUMN
 NAME = "AUX_PARAM_DESC"
 DATA_TYPE = CHARACTER
 START_BYTE = 84



```
BYTES          = 47
DESCRIPTION    = "AUX parameter description
                  Possible values are:
                  CONCERT PS1,LCL 52A CURR
                  CONCERT PS2,LCL 52B CURR
                  CONCERT PS1,LCL 52A STAT <0=OFF, 1=ON>
                  CONCERT 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 CONCERT 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 CONCERT 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 CONCERT instrument models data

The data that were produced from the CONCERT 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 CONCERT 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 12. 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 12 tables (also included in archive files in the DOCUMENT directory).

4.4.2.3 CONCERT calibration laboratory bench data

The CONCERT 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 CONCERT 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 CONCERT 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 12. 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 12 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 CONCERT 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 CONCERT 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 CONCERT 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 CONCERT 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 sent 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 8) 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 CONCERT 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 CONCERT 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 7.

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 12 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 T_0 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 $T_0 + N * 100 \text{ ns}$, where N is the position of the peak in samples, counting starting from zero. The accuracy of these measurements is $\pm 50 \text{ ns}$.

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. $12.75 \mu\text{s}$ 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 CONCERT 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 CONCERT 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 CONCERT 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, CONCERT signal amplitudes will be given without absolute physical units. This is not an issue in that sense that CONCERT 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, CONCERT 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 CONCERT data products are delivered and validated to PSA by CONCERT 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

CONCERT 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

CONCERT operated to fulfil its scientific objectives in three phases. These are the CONCERT 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: CONCERT science sequences

CONCERT 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 CONCERT 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 CONCERT requirements were fulfilled. In that sequence, the CONCERT signal travelled through the 67P nucleus.

For more detailed information about CONCERT 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 will be part of a later delivery and are not included in this version. This data are of interest for advanced users that have a deepest knowledge in CONSERT instrument design [AD 16]. This section is to be updated at that time.

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           = "CONCERT CALIBRATED DATA FOR THE
                        EAR3 PHASE"
VOLUME_SERIES_NAME    = "ROSETTA SCIENCE ARCHIVE"
VOLUME_SET_ID         = "FR_CNRSUG_IPAG_RORLCN_10XX"
VOLUME_SET_NAME       = "ROSETTA CONCERT 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 CONCERT 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	CONCERT	
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.

```
|-root directory----- |
                        | -AAREADME.TXT
                        | -CATALOG-
                        | -DATA-
                        |
                        | -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

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

CONCERT 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

CONCERT 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 CONCERT 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 data, along with time corrections and calibrations. These geometrical information are not available in L2 archive.
- For a single phase, all geometry data are stored inside a single file. That means that all CONCERT 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 CONCERT instrument.

The CONCERT 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 CONCERT antenna and the projection of FOV_2 gives the +Y vector, while the BORESIGHT is directly the CONCERT +Z local vector. This orientation vectors are derived from the Rosetta attitude spice kernels.

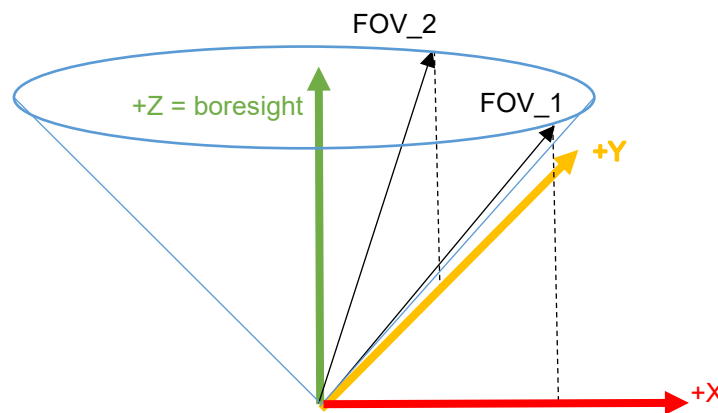


Figure 5: CONCERT orbiter boresight and FOV definition

```

/* 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 CONCERT instrument.

The CONCERT 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 CONCERT 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 CONCERT 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_CONCERT.LBL	PDS label of EAICD_CONCERT.PDF
EAICD_CONCERT.PDF	CONCERT EAICD (this document)
LOGBOOK_ph.LBL	PDS label of file RORL_CN_LOGBOOK_ph.ASC
LOGBOOK_ph.ASC	Logbook of CONCERT operations during mission phase <i>ph</i>
RO-OCN-TN-3067.LBL	PDS label of file RO-OCN-TN-3067.PDF
RO-OCN-TN-3067.PDF	CONCERT commissioning report
RO-OCN-TN-3802.LBL	PDS label of file RO-OCN-TN-3802.PDF
RO-OCN-TN-3802.PDF	CONCERT In-flight operation test report
RO-OCN-TN-3825.LBL	PDS label of file RO-OCN-TN-3825.PDF
RO-OCN-TN-3825.PDF	CONCERT User Manual Orbiter & Lander
RO-OCN-TN-3850.LBL	PDS label of file RO-OCN-TN-3850.PDF
RO-OCN-TN-3850.PDF	CONCERT stop&start procedure description
RO-OCN-TN-3851.LBL	PDS label of file RO-OCN-TN-3851.PDF
RO-OCN-TN-3851.PDF	CONCERT operation requests
RO-OCN-TN-3852.LBL	PDS label of file RO-OCN-TN-3852.PDF
RO-OCN-TN-3852.PDF	CONCERT post hibernation commissioning test report
RO-OCN-TN-3866.LBL	PDS label of file RO-OCN-TN-3866.PDF
RO-OCN-TN-3866.PDF	CONCERT 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	CONCERT 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-EAR2-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 EAR2 V1.0
RO/RL-CAL-CONSERT-3-EAR3-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 EAR3 V1.0
RO/RL-CAL-CONSERT-3-MARS-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 MARS V1.0
RO/RL-CAL-CONSERT-3-CR2-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR2 V1.0
RO/RL-CAL-CONSERT-3-CR4A-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR4A V1.0
RO/RL-CAL-CONSERT-3-CR5-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 CR5 V1.0
RO/RL-CAL-CONSERT-3-PHC-V1.0	ROSETTA-ORBITER/ROSETTA-LANDER CAL CONSERT 3 PHC V1.0
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

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

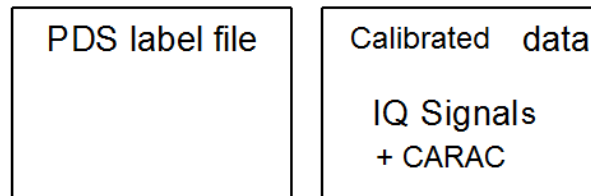
5.6 Data Product Design

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 global data product structure is shown below.



One experiment data file consists in identical tables:

- I/Q short signals (Lander only)
- I/Q long signals
- I/Q long compressed signals
- Carac table

The corresponding data product is organized as 5 or 7 TABLE objects using ROW_PREFIX_BYTES and ROW_SUFFIX_BYTES for defining the 3 parts:

I signal	Q signal...	CARAC Table	Record # 1
I signal	Q signal...	CARAC Table	Record # 2

...

The record structure is shown in annex 9 and 10



5.6.1.1 File Characteristics Data Elements

The PDS file characteristic data elements for CONCERT 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 CONCERT 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 = CONCERT
```

```
INSTRUMENT_NAME = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE  
TRANSMISSION"
```

```
INSTRUMENT_TYPE = "RADAR"
```

```
INSTRUMENT_MODE_ID = "PINGPONG"
```

```
INSTRUMENT_MODE_DESC = "CONCERT IN SOUNDING MODE"
```

Lander file:

```
INSTRUMENT_HOST_NAME = "ROSETTA-LANDER"
```

```
INSTRUMENT_HOST_ID = "RL"
```

```
INSTRUMENT_ID = CONCERT
```

```
INSTRUMENT_NAME = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE  
TRANSMISSION"
```

```
INSTRUMENT_TYPE = "RADAR"
```

```
INSTRUMENT_MODE_ID = "PINGPONG"
```

```
INSTRUMENT_MODE_DESC = "CONCERT 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 CONCERT orbiter sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
L_SN	The corresponding CONCERT 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 7.
TEMP_DIGI	Temperature (°C) on the orbiter instrument digital board. Conversion function from raw data given in appendix 7.
OCXO	Frequency (Hz) of the OCXO after the tuning phase. Conversion function from raw data given in appendix 7.
UTC	The corrected UTC timing of each sounding given as a character string.
CN_SECONDS	The relative number of seconds from CONCERT 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 CONCERT 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 CONCERT, this parameter have 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 CONCERT CALIBRATED ORBIT
                  ER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL I
                  S COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT CALIBRATED
                        ORBITER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIG
                        NAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT
                        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 CONCERT CALIBRATED ORBIT
                        ER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGN
                        AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT 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      = "CONCERT 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 CONCERT 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 CONCERT 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 CONCERT 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      = "CONCERT ORBITER OCXO STABILIZED FREQUENCY AFTER TUNING.
                    "
END_OBJECT         = COLUMN

OBJECT             = COLUMN
  NAME             = "QUALITY"
```



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

```
OBJECT        = COLUMN
NAME          = "UTC"
COLUMN_NUMBER = 7
DATA_TYPE     = TIME
START_BYTE    = 33
BYTES        = 19
DESCRIPTION   = "CONCERT UTC TIME OF THE SOUNDING. IT IS THE MID-TIME OF 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   = "CONCERT ON-BOARD TIME OF THE SOUNDING. THE VALUES ARE GIVEN AS A FLOATING-POINT NUMBER OF SECONDS FROM THE BEGINNING OF OPERATION."
END_OBJECT   = COLUMN
```

```
OBJECT        = COLUMN
NAME          = "GCW"
COLUMN_NUMBER = 9
DATA_TYPE     = IEEE_REAL
START_BYTE    = 60
BYTES        = 4
DESCRIPTION   = "CONCERT 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 CONCERT lander sounding number. A unique number starting at 0 and incremented by 1 identifies each sounding.
O_SN	The corresponding CONCERT 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 7.
TEMP_DIGI	Temperature (°C) on the lander instrument digital board. Conversion function from raw data given in appendix 7.
OCXO	Frequency (Hz) of the OCXO after the tuning phase. Conversion function from raw data given in appendix 7.
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. $I_{output} = I_{input}$ $Q_{output} = Q_{input} \times (1 + \epsilon) \quad \text{with } \epsilon \text{ equal to 5\%}$
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 CONCERT 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 CONCERT 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 CONCERT 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 CONCERT CALIBRATED
                   LANDER LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE
                   LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL
                   CONCERT 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 CONCERT CALIBRATED LANDE
                   R LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGN
                   AL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT 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   = "CONCERT 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 CONCERT 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 CONCERT 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 CONCERT 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    = "CONCERT 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    = "CONCERT LANDER GCW."
END_OBJECT    = COLUMN

OBJECT        = COLUMN
NAME          = "FRAMING"
COLUMN_NUMBER = 8
DATA_TYPE     = IEEE_REAL
START_BYTE    = 35
BYTES         = 8
DESCRIPTION    = "CONCERT 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)."
```

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

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

```
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 CONCERT 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 CONCERT 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     = "CONCERT 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 will be written at Level 4 delivery time



1 Appendix: structure of Lander/Orbiter CONCERT 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 /Xl 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 kfkf 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: <i>Raw file date</i>		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.	



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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 CONCERT en TIC MSW	NS	59,12/8	TM / 1	
55		LSW	NS	59,12/9	TM / 2	
56		Temps CONCERT 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		59,12/12 F	TM / 9F	
83	FRAM	Framing		0	TM / 9f	
84	Peak_P	Peak position		0	TM / 10F	
85	Ocxo	OXCXO 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 $\text{SQRT}(I^2 + Q^2)$		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).

3 Appendix: Example of Directory Listing of Data Set RO-RL-CAL-CONCERT-2-PDCS-V1.0

⁷ Zero for short signal , else TM



```
| -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
|
|                                     | -CONCERT_COMPRESSION_CODE.LBL
|                                     | -CONCERT_COMPRESSION_CODE.TAB
| -RO-RL-C-CONCERT-2-FSS-V1.0- |
|                                     | -DOCINFO.TXT
|                                     | -EAICD_CONCERT.LBL
|                                     | -EAICD_CONCERT.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
|
|                                     | -AOC.S.FMT
|                                     | -CN_AUX.FMT
| -LABEL----- | -CN_AUX.FMT~
|                                     | -LO_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 */

^LO_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-CONCERT-2-FSS-V1.0"
DATA_SET_NAME         = "ROSETTA-ORBITER/ROSETTA-LANDER 67P CONCERT
                        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         = CONCERT
INSTRUMENT_NAME       = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                        TRANSMISSION"
INSTRUMENT_TYPE       = "RADAR"
INSTRUMENT_MODE_ID    = "PINGPONG"
INSTRUMENT_MODE_DESC  = "CONCERT PERFORMS SOUNDING MEASUREMENTS AS
                        A TRANSPONDER. CONCERT ORBITER AND CONCERT 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 CONCERT
                        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 CONCERT
                        RADIO SOUNDING"

END_OBJECT           = COLUMN
END_OBJECT           = Q_TABLE

END
```



5 Appendix: Example of Concert 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 */

^LO_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-CONCERT-2-FSS-V1.0"
DATA_SET_NAME            = "ROSETTA-ORBITER/ROSETTA-LANDER 67P CONCERT
                          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            = CONCERT
INSTRUMENT_NAME          = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                          TRANSMISSION"
INSTRUMENT_TYPE          = "RADAR"
INSTRUMENT_MODE_ID       = "PINGPONG"
INSTRUMENT_MODE_DESC     = "CONCERT PERFORMS SOUNDING MEASUREMENTS AS
                          A TRANSPONDER. CONCERT ORBITER AND CONCERT 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 CONCERT
                          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 CONCERT
                          RADIO SOUNDING"
    END_OBJECT          = COLUMN
END_OBJECT             = Q_TABLE

END
```



6 Appendix: Example of Concert 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-CONCERT-2-MARS-V1.0"
DATA_SET_NAME            = "ROSETTA-ORBITER MARS CONCERT 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              = CONCERT
INSTRUMENT_NAME            = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
TRANSMISSION"
INSTRUMENT_TYPE            = "RADAR"
INSTRUMENT_MODE_ID         = "PINGPONG"
INSTRUMENT_MODE_DESC       = "CONCERT 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



7 Appendix: CONCERT ADC raw units (ADC_COUNTS) to physical units conversion

7.1 Temperature

The temperature in degrees Celsius T_{C} are calculated from ADC raw data T_{ADC} using the following formula:

$$\text{For } T_{\text{ADC}} < 196, \quad T_{\text{C}} = 1940 - 10 * T_{\text{ADC}}$$

$$\text{For } T_{\text{ADC}} \geq 196, \quad T_{\text{C}} = -0.00075 * (T_{\text{ADC}} - 188) ^ 3 - 0.05 * (T_{\text{ADC}} - 188) ^ 2 - 2.4 * (T_{\text{ADC}} - 188) - 1$$

7.2 Frequency

The CONCERT 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 CONCERT Flight Model Orbiter (FMO) DAC calibration tests.

Table 4: CONCERT 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



8 Appendix: CONCERT Matched Filter

The CONCERT 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 CONCERT 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 CONCERT_COMPRESSION_CODE.TAB.

9 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 CONCERT 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 CONCERT 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 CONCERT CALIBRATED LANDER LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT CALIBRATED LANDER LONG SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT CALIBRATED LANDER LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT SIGNAL."

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 CONCERT CALIBRATED LANDER LONG SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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



10 Appendix: Example of Concert 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 CONCERT CALIBRATED ORBIT
                  ER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIGNAL I
                  S COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 CONCERT CALIBRATED
                  ORBITER SIGNAL. THIS SIGNAL IS COMPRESSED. THE LONG SIG
                  NAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT
                  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 CONCERT CALIBRATED ORBITER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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 = 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 CONCERT CALIBRATED ORBITER SIGNAL. THIS SIGNAL IS NOT COMPRESSED. THE LONG SIGNAL IS COMPOSED OF 255 SAMPLES AND IS THE FULL CONCERT 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



11 Appendix: Example of Concert 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-CONCERT-3-CR2-V1.0"
DATA_SET_NAME         = "ROSETTA-ORBITER/ROSETTA-LANDER CAL CONCERT 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          = CONCERT
INSTRUMENT_NAME        = "COMET NUCLEUS SOUNDING EXPERIMENT BY RADIOWAVE
                        TRANSMISSION"
INSTRUMENT_TYPE        = "RADAR"
INSTRUMENT_MODE_ID     = "PINGPONG"
INSTRUMENT_MODE_DESC   = "CONCERT PERFORMS SOUNDING MEASUREMENTS AS A
                        TRANSPONDER. CONCERT ORBITER AND CONCERT 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            = "CONCERT 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
```



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12 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.



12.1 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).

12.1.1 Level 2

CN ORBITER 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	



12.1.2 Level 3

CN ORBITER 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	



12.2 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).

12.2.1 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	



12.2.2 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	



12.3 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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