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European Space Agency  
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Planetary Missions Division

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**ROSETTA-COSIMA**

To Planetary Science Archive Interface Control Document

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9 October. 2006	1.5, 2, 3,4.3	Dataset delivery scheme updated, geometry information added. All the labels updated
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19 March 2015		Update in the labels, delivery schedule

### TBD ITEMS

Section	Description

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# 1 Introduction

## 1.1 Purpose and Scope

The purpose of this EAICD (Experimenter to (Science) Archive Interface Control Document) is two fold. First it provides users of the the COSIMA instrument with a detailed description of the product and a description of how it was generated, including data sources and destinations. Secondly, it is the official interface between the COSIMA instrument team and Rosetta archiving authority.

## 1.2 Archiving Authorities

ESA's Planetary Science Archive (PSA).

## 1.3 Contents

This document describes the data flow of the COSIMA instrument on ROSETTA from the spacecraft until the insertion into the PSA for ESA. 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 further on.

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 archiving authority (Planetary Science Archive, ESA, RSSD, design team) and any potential user of the COSIMA data.

## 1.5 Applicable and Reference Documents

[AD-01] Planetary Data System Data Preparation Workbook, February 17, 1995, Version 3.1, JPL, D-7669, Part 1

[AD-02] Planetary Data System Standards Reference, August 1, 2003, Version 3.6, JPL, D-7669, Part 2

[AD-03] ROSETTA Archive Generation, Validation and Transfer Plan, October 6, 2005, RO-EST-PL-5011, Issue 2, Revision 2

[AD-04] Rosetta Time Handling, February 28, 2006, RO-EST-TN-3165, Issue 1, Revision 1

[RD-01] COSIMA User Manual, Version 3.7, 16 June 2010

[RD-02] Kissel et al.: "Kissel, J. et al., COSIMA - High resolution time-of-flight secondary ion mass spectrometer for the analysis of cometary dust particles onboard Rosetta, *Space Sci. Rev.*, 128(1-4), 823-867, doi:10.1007/s11214-006-9083-0, 2007

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[RD-09] Krueger, F.R.: "Dust Collector Materials for SIMS Analysis in Space", A Feasibility Study for CoMA, part 1, Aug. 1988, part 2, Jan. 1989, and part 3, Sept. 1989.

[RD-10] Krueger, F.R., A. Korth, and J. Kissel: "The Organic Matter of Comet Halley as Inferred by Joint Gas Phase and Solid Phase Analyses", Space Science Reviews 56, 167–175, 1991.

[RD-11] Mamyrin B.A., V.I. Karatyev, D.V. Shmikk, and V.A. Zagulin: "Mass-Reflectron - A New High-Resolution Nonmagnetic Time-of-Flight Mass-Spectrometer" Zh Eksp. i Teor. Fiz. 64, 82 or: Sov. Phys. JETP 37, No.1, July 1973.

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[RD-16] Varmuza K., W. Werther, F.R. Krueger, J. Kissel, E.R. Schmid: "Organic substances in cometary grains: Comparison of secondary ion mass spectral data and californium-252 plasma desorption data from reference compounds", Int. J. Mass Spectrom., 189, 79-92, 1999.

[RD-17] Varmuza K., Kissel J., Krueger F. R., Schmid E. R.: "Chemometrics and TOF-SIMS of organic compounds near a comet", in Advances in Mass Spectrometry, Gelpi E., Ed.; Wiley & Sons, Chichester, Vol. 15, p. 229-246, 2001.

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## 1.6 Acronyms and Abbreviations

ANCDR	Ancillary Data Record
COSIMA	Cometary Secondary Ion Mass Analyzer
DDS	Data Distribution System
ESA	European Space Agency
FM	Flight Model
FMI	Finnish Meteorological Institute
HVC	High Voltage Control
LVC	Low Voltage Control



MPS	Max-Planck-Institut für Sonnensystemforschung
PDS	Planetary Data System
PIS	Primary Ion Source
PIBS	Primary Ion Beam System
PDF	Portable Document Format
PSA	Planetary Science Archive
REFDR	Reformatted Data Record
RSDB	Rosetta Database
SIMS	Secondary Ion Mass Spectrometer
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TDC	Time-to-Digital Converter
TMU	Target Manipulator Unit
TOF	Time-Of-Flight
UTC	Universal Time Coordinated

## 1.7 Contact Names and Addresses

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

### 2.1 Scientific Objectives

The in situ chemical analysis of solids in space is among the tasks which are technically most difficult. There are two main reasons for that: With a few exceptions solids in space are not abundant, and secondly it is not easy to remove small samples from the solid into the vacuum for the analysis in a mass spectrometer.

For COSIMA the objects of interest are cometary dust particles, which are abundant, indeed, in the neighbourhood of the comet nucleus. It remains, however, to collect and bring the particles to the entrance of the spectrometer.

Most mass spectrometers need parts of the sample to be analyzed, to carry an electronic charge. The process of removing an ion from the specimen is then the critical feature of the method to be chosen.

The only mass spectrometric data on cometary dust particles available to date, come from the dust impact mass spectrometers PIA and PUMA on the GIOTTO and VEGA spacecrafts, respectively. While other, remote, or indirect methods allow measurements of collective properties of the cometary dust, the mass spectrometers allowed the analysis of individual particles (cf Kissel et al. 1986a+b). Since then we know unambiguously that each particle is an intimate mixture of a mineral core and ices, and simple as well as complex organic molecules. Since the impact velocity was large (>60 km/s) mostly atomic ions were formed and analyzed in the Halley case. In a first attempt, however, Kissel and Krueger (1987) found evidence for the chemical nature of the organic cometary material. It is clear that not a few well known molecules constitute the cometary organics, but rather some chemical classes, with each being represented by a large number of individual substances. Indeed, it seems, that all stable molecules compatible with the chemical environment are formed and even cross-linked between them.

COSIMA therefore needed to be based on a method which is readily available in laboratory, and which allows for tracing the ion directly to the molecular and structural form in which it was present in the solid. Since the size distribution of the dust particles is known (cf, Mazets et al. 1987, McDonnell et al. 1989) a reasonable ionizing beam focus should be achieved under the limitations of space instrumentation. Even though the method would be destructive, its sensitivity should be high enough to allow several analyses at different depths for one individual, say 20  $\mu\text{m}$  particle.

To satisfy all these requirements we choose the method of **Secondary Ion Mass Spectroscopy (SIMS)**. A fast primary ion, in this case  $^{115}\text{In}^+$  at 10 keV, impacts the sample and releases by desorption molecules of the material under test, of which typically 0.1 to 10 % are ionized, the so-called secondary ions. For sensitivity reasons, the analysis of a rather large mass range should be achieved simultaneously, which in turn leads to the type of a time-of-flight mass spectrometer. The mass resolution must be high enough to resolve isobaric ions, at least between atomic and molecular ions. The total ion mass should at least cover 3500 Da. In total, the COSIMA instrument has the following main functional hardware elements:

- the dust collector and target manipulator (TMU),
- COSISCOPE, a microscope CCD camera for target inspection,
- the primary ion source,
- the mass spectrometer including the ion extraction optics and the ion detector
- Electronics and computer.

It should be mentioned at this point, that COSIMA did profit from but is not identical to the earlier development of the CoMA instrument for the NASA mission CRAF (Zscheeg, 1992) which was canceled in 1992.

The entire development of COSIMA was challenged by the complexity of the cometary material which has to be expected. This has focused the goal of COSIMA on the identification of chemical classes and functional groups rather than the identification of individual substances. Consequently the system must have the capability to use the methods of chemometry to compress the raw data on board,

which helps to reduce the data volume without losing any of the chemical information.

There is also another important aspect for COSIMA, which comes from the rather long time the spacecraft travels from launch in 2004 until the core of the measurements takes place in 2014: Quite a large number of relevant results will be obtained from laboratory measurements with TOF SIMS, be it by the COSIMA team or be it in the published literature. In addition, NASA in its DISCOVERY program has several comet missions, which are expected to produce new, relevant data, before COSIMA enters its main analysis phase. Even if most of the flexibility is with the software involved, it is the hardware, which has to provide the resources necessary. Looking back at the fast development in the computer sector over the last ten years this alone is a demanding task, even without the complexity of an up to date analysis instrument.

The scientific return from COSIMA consists primarily of time-of-flight spectra supported by housekeeping data. In addition to this, a limited number of peaks presented as a peak list, may be available. The time-of-flight spectra are archived according to standard PDS rules. These spectra are calibrated to a preliminary mass scale by automatic software.

In addition to time-of-flight spectra, pictures of dust targets (substrates) taken by COSISCOPE camera, and lists of dust grains found on the targets, are also archived.

Operational history of each target substrate is given. The history contains information about substrate storage and expose periods, cleaning and heating actions, COSISCOPE camera images and grains lists and any spectra taken. The history product contains history from the moment substrates were installed in the COSIMA flight instrument.

## 2.2 Instrument sub-systems

COSIMA sub-systems are described in more detail in COSIMA paper [RD2]. Only a brief description is given here, as the paper can be found in ASCII and in PDF form from the DOCUMENT directory.

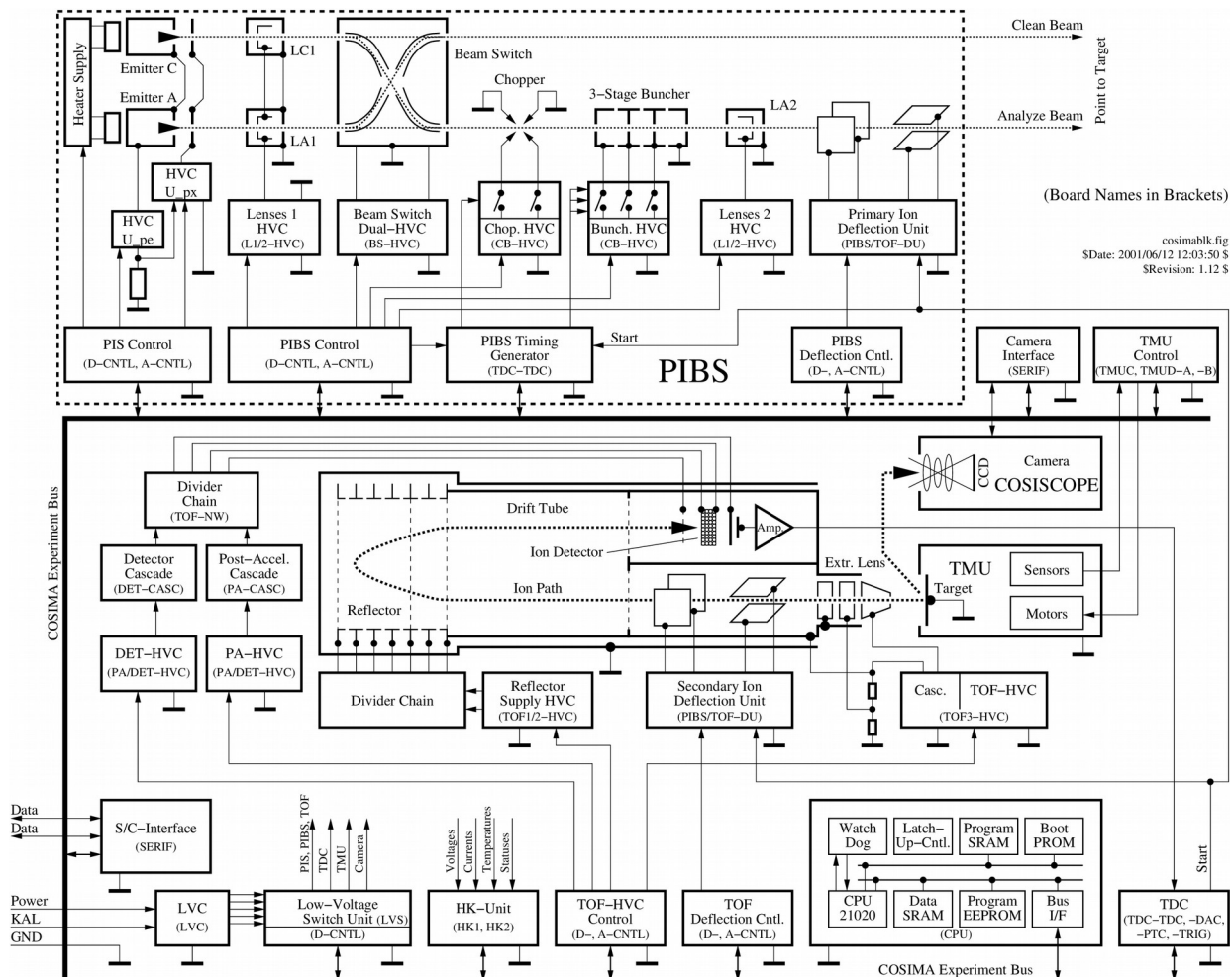


Figure 1: COSIMA subsystem figures schematics

## 2.2.1 TMU

The Target Manipulator Unit keeps track of, stores and moves dust collection substrates in the instrument. There are total of 24 target holders, each containing 3 substrates. The substrate itself is a 10\*10 millimeter plate, each having different chemical properties. The TMU can also be used to scan a substrate in front of an ion beam. The operation of the TMU is constrained by heat dissipation and is in general slow (tens of minutes per operation).

The substrates can have the following position identifications::

STORAGE, in target storage

IMAGE, substrate image

GRAINS, dust position list

PEAKS, peak list acquisition

SCAN, total count acquisition

SPECTRUM, spectrum acquisition

EXPOSE, exposed to the outside, still in TMU grasp

COLLECT, exposed to the outside

CLEAN, at beam cleaning position

HEAT, at chemistry (heating) station

In the substrate history, if the substrate is not in the STORAGE, EXPOSE, COLLECT or HEAT position, it is grasped by the TMU and usually moved to the analysis position for SPECTRUM, SCAN or PEAKS or in front of the COSISCOPE for IMAGE or GRAINS.

The 24 target holders are numbered with hexadecimal numbers from #C1 to #D8. The top substrate is marked with the number #100, the middle with #200 and the low with #300. The combination of these numbers give the substrate identification number used in the instrument commanding and data handling.

The substrates have the following properties:

#1C1	Palladium, black
#2C1	Platinum, deep black
#3C1	Platinum, deep black
#1C2	Silver, 73 micrometer thickness, blank with rectangular hole 3.5x3.5mm
#2C2	Silver, 69 micrometer thickness, blank with AgTe spot of about 3 mm size at center
#3C2	Gold, 17 micrometer thickness, olivine particles
#1C3	Gold, 8 micrometer thickness
#2C3	Gold, 15 micrometer thickness
#3C3	Gold, 20-30 micrometer thickness
#1C4	Palladium, black
#2C4	Silver, 14 micrometer thickness
#3C4	Gold, 12 micrometer thickness
#1C5	Platinum, light black,
#2C5	Platinum, deep black
#3C5	Gold, 13 micrometer thickness
#1C6	Platinum, deep black
#2C6	Platinum, deep black
#3C6	Gold, 8 micrometer thickness

#1C7	Silver, blank
#2C7	Silver, 21 micrometer thickness
#3C7	Gold, 15 micrometer thickness
#1C8	Platinum, deep black
#2C8	Platinum, deep black
#3C8	Gold, 20-30 micrometer thickness
#1C9	Gold, 5-8 micrometer thickness
#2C9	Gold, 5-8 micrometer thickness
#3C9	Gold, 11 micrometer thickness
#1CA	Gold, 5-8 micrometer thickness
#2CA	Gold, 16 micrometer thickness
#3CA	Silver, 10 micrometer thickness
#1CB	Gold, 17 micrometer thickness
#2CB	Gold, 14 micrometer thickness
#3CB	Gold, 20-30 micrometer thickness
#1CC	Silver, 21 micrometer thickness
#2CC	Silver, 21 micrometer thickness
#3CC	Silver, 24 micrometer thickness
#1CD	Gold, 5-8 micrometer thickness
#2CD	Gold, 14 micrometer thickness
#3CD	Gold, 20-30 micrometer thickness
#1CE	Gold, 5-8 micrometer thickness, Ag particles
#2CE	Gold, 11 micrometer thickness
#3CE	Gold, 20-30 micrometer thickness
#1CF	Gold, 8 micrometer thickness
#2CF	Gold, 12 micrometer thickness, Ag particles
#3CF	Gold, 20-30 micrometer thickness
#1D0	Gold, 20-30 micrometer thickness
#2D0	Gold, 20-30 micrometer thickness
#3D0	Gold, 20-30 micrometer thickness, Ag particles
#1D1	Silver, blank
#2D1	Gold, 13 micrometer thickness
#3D1	Gold, 13 micrometer thickness
#1D2	Gold, 8 micrometer thickness
#2D2	Gold, 8 micrometer thickness
#3D2	Silver, 30 micrometer thickness
#1D3	Silver, 10 micrometer thickness
#2D3	Silver, 10 micrometer thickness
#3D3	Silver, 32 micrometer thickness
#1D4	Platinum, sintered

#2D4	Platinum, deep black
#3D4	Platinum, deep black
#1D5	Platinum, deep black
#2D5	Silver, 22 micrometer thickness
#3D5	Silver, 21 micrometer thickness
#1D6	Platinum, deep black
#2D6	Palladium, black
#3D6	Platinum, deep black
#1D7	Silver, blank
#2D7	Platinum, sintered
#3D7	Platinum, sintered
#1D8	Silver, blank, square hole 3.5x3.5mm at center
#2D8	Silver, blank
#3D8	Gold, 8 micrometer thickness

Positions in the substrate are given in substrate coordinates, which have the origin at lower left corner and range from 0 to 10000 micrometers in both horizontal (X) and vertical (Y) direction.

### 2.2.2 COSISCOPE

COSISCOPE is a CCD camera that is used to take pictures of TMU target substrates and find dust grains on them. COSISCOPE returns CCD images and grain lists with dust grain coordinates, sizes and brightness properties. The gray image has a 10 bit depth with resolution of 1024\*1024 pixels and covers an area of 14\*14 millimeters.

The COSISCOPE pixel coordinates are converted to substrate coordinates, which have the origin at lower left corner and range from 0 to 10000 micrometers in both horizontal (X) and vertical (Y) direction.

### 2.2.3 Primary Ion Source (PIS)

The Primary Ion Source provides isotopically clean  $^{115}\text{In}^+$ . The ion source has a limited lifetime of nominally 2000 hours. After a long period of inactivity it may be difficult to start. The instrument contains two ion sources, both of which can be used. The startup of the PIS is slow (~ 0.5-1 hour). PIS has two ion sources, A (stands for 'Analyse') and C (stands for 'Clean'). A is primarily used for analysis operations, and C for cleaning operations.

### 2.2.4 Primary Ion Beam System (PIBS)

The Primary Ion Beam System focuses, bunches and deflects ions into periodic pulse trains to hit the dust grains to be analyzed. The beam thickness is less than 100  $\mu\text{m}$  and the pulse width a few ns. The PIBS can also be used to clean the target by a continuous beam. The instrument contains one analysis beam and one cleaning beam, each of which can use either ion source.

Ions from two emitters (A and C) can reach either of two positions: 'Analyze' or 'Clean', depending of the Beam Switch (BS) in the center. The focusing elements are electrically shared, as only one beam can be active at any time. Chopper and Bunchers (CB) provide the pulsed beam for analysis, the deflection plates (PX,PY) are used for steering the beam spot on the target.

On the analyse channel, a first lens LA1 (or LC1 in the backup configuration) gives an image of the emitter in the inlet plane of the CHOPPER, then the buncher compresses the ion beam into the short pulses required on the target. A second lens LA2 builds the final image on the target sample.

The other ion beam used for cleaning has a first lens LC1 (or LA1 in the backup configuration), which gives an image used by LC2 to build the final image on the target in the clean position. The ion beam for cleaning is not pulsed.

### 2.2.5 Time-Of-Flight Spectrometer (TOF)

The Time Of Flight spectrometer consists of an ion extraction part, an ion reflectron and a detector. The ion extraction section is equipped with deflection plates (TX, TY) to control which ions can reach the detector. The reflectron removes some energy dispersion of incident ions and improves the mass resolution of the instrument. The detector is of micro sphere type.

### 2.2.6 TDC

The Time to Digital Converter is a digital counter measuring the time of flight for each individual ion. The device is controlled by the onboard computer. The accumulated measurement represents the time-of-flight spectrum of COSIMA.

## 2.3 Data Handling Process

All PDS data products will be prepared at the Finnish Meteorological Institute (see chapter 1.7 for contact information). All data processing levels mentioned in this document are PSA-compliant, as defined in RO-EST-PL-5011.

Level 1a COSIMA data will be fetched from the Rosetta Data Distribution System (DDS) by FMI, where it will be processed to Level 2 (REFDR), and further to Level 3 products.

COSIMA Level 2 (REFDR) products are:

- Time-of-flight spectra, with automatically calibrated mass scale and relevant housekeeping data. Spectra can be of either Positive or Negative ions.
- Onboard calculated peak list and relevant housekeeping data. The spectrum is given as counts per integer mass lines, separated to organic and inorganic massed.
- Scan over substrate position or some measurement control parameter and relevant housekeeping data. The data is total counts of the events from the time-of-flight spectra for three possible mass/time ranges. The time range of the scan can contain spectra or peak list data.
- Substrate heating information.
- Substrate cleaning with the ion beam and the related housekeeping data.
- Substrate images. The images can be illuminated with either plus (right) side or minus (left) side led.
- Substrate dust grain feature (position, size, brightness) lists and relevant housekeeping data.
- Substrate history (auxiliary data)

The mass scale is calibrated with only two lines:

- positive mode
  - H or  $^{12}\text{C}$  for low masses
  - $^{115}\text{In}$  or  $^{107}\text{Ag}$  or  $^{109}\text{Ag}$  for high masses
- negative mode
  - H or CH for low masses
  - Cl or Br for high masses

There is no dead time correction nor background removal. The user should always check the calibration for any scientific analysis.

For the peak lists, the separation between organic and inorganic peaks is done according to the following formula:

Starting from the integer mass (M), the bin interval for the

- inorganic ions:  $M \cdot 1.0003 - \Delta m \dots M \cdot 1.0003$

- organic ions:  $M \pm 1.0003 \dots M \pm 1.0003 + \Delta m$

where  $\Delta m = 0.2$

For the calculated mass scale, a confidence number is calculated. This number is the procentual amount of counts inside the mass windows compared to the total counts. The mass window is defined as

$m \pm m^p \pm q$ , where

$p = \log(0.3/0.05)/\log(300/12)$

$q = 0.05 / (12^p)$

which gives mass  $12 \pm 0.05$  and mass  $300 \pm 0.3$ . If suitable peaks to establish the scale cannot be found, the confidence number is 0.0% and the mass scale is calculated from the default values.

In the products PDS header there is a label DATA\_QUALITY\_ID. This is "-1", when the mass scale is calculated by the software. In the future, when real comet dust spectra will be analyzed, the flag may change to inform, that the mass scale is established either by human or more advanced analysis software. When that happens, the product label will contain the description of the new flag values.

The HK data for the spectra and images is given in already calibrated form, without raw values. They can be used to check, if there's some instrument setup reason, why the spectrum signal to noise ratio or peak shape is as it is. The HK values don't contribute anything numerical to the spectrum mass scaling and are for background information only. The same goes with the image data.

**It should be pointed out, that an established mass scale is already an interpretation of the data and regardless of the flag, each data user should check the scale.**

## 2.4 Overview of Data Products

### 2.4.1 General

COSIMA contains 24 target holders, each having three different substrates for dust collection. From data analysis point of view, each substrate has different history. Each substrate can be exposed to dust, heated, imaged with COSISCOPE, and measured and cleaned by ion beam.

The data user should start the data analysis from the substrate history file stored in the substrate subdirectory in the data directory, The history files contain time ordered information from actions taken with the substrate in question. For exposure and storage there is only the time period. For the following products the archive pointer is given:

- time of flight ion spectrum. The main product of COSIMA, taken from a small area from the substrate surface. The preliminary mass scale is automatically generated with the equivalent software as onboard COSIMA for the peak list generation. For the comet phase data, the mass scale may also be established by a human or more advanced analysis software, case by case.
- peak list. The peak list is generated onboard COSIMA for integer mass lines for organic and inorganic masses separately. It may be used for pre-analysis of the grains, when full spectra would be too large to send due to operational and telemetry quota constrains
- scan. The measurement position or some measurement parameter is varied. The product is the total counts from the three possible time/mass ranges. During the scan COSIMA can also generate spectrum or peak data for each scan step value.
- image. The image is a COSISCOPE compressed image take from the whole substrate. The transmitted image may also contain only a subset of the image
- grain list. The COSISCOPE can detect individual dust grains from the substrate surface and provide them as a list with position, size and illumination characteristics.
- heat. The substrate is heated and the heat curve is available as the product.



- clean: The substrate is cleaned by the ion beam.

The relevant calibrated housekeeping data is provided together the data products for background information. They don't contribute anything numerical to the data products calibration.

During the ground calibration phase only few substrates were actively used for instrument calibration. These operations must be anyway used for background information in interpreting data during the comet phase.

Before the comet phase no real science is expected to be available from data.

Geometry information for the COSIMA products is not available. As the substrate exposure will take at least hours, often days, there is no simple way to tell, where the dust particles originate from. The data user should pick the exposure/collect period(s) from the substrate history file and make his/her own judgment. The time the individual spectrum or peak list product is made, has no connection to the time the dust particle is collected.

## 2.4.2 Software

### 2.4.2.1 Data processing software

An automatic script will retrieve data from the DDS and store it in an internal database. The housekeeping data will be plotted internally to check the general status of the instrument.

For PSA-compliant level 2 products generation (REFDR), data is retrieved from the internal database. The housekeeping data is calibrated with calibration coefficients stored in the RSDB, resulting in physical units. PDS data products are formed from mass spectra time series, parameter scan, substrate heating, substrate cleaning, COSISCOPE grain lists, COSISCOPE images, and calibrated housekeeping data. Peaks, images, and grain lists will need no additional calibration. In addition, target substrate history will be assembled as ancillary data products.

This software producing level 2 data from level 1b data stored in the internal database will be used only by the data producers and will not be archived.

Transformation of TOF spectra into mass spectra is done automatically with the equivalent software onboard the COSIMA instrument. See chapter 2.3.

### 2.4.2.2 Scientific analysis software

N/A. Data product files will be either ASCII TABLEs or FITS IMAGEs. For the FITS standard based images the DS9 software is recommend.

## 2.4.3 Documentation

The COSIMA instrument is extensively described in a paper "COSIMA, a High Resolution Time of Flight Spectrometer for Secondary Ion Mass Spectroscopy of Cometary Dust Particles" by Kissel et.al. [RD-02]. That paper together with this EAICD can be found from the DOCUMENT directory.

## 2.4.4 Derived and other Data Products

N/A

## 2.4.5 Ancillary Data Usage

The COSIMA instrument measures "off-line" in the sense that target assemblies are exposed independently of any spacecraft or COSIMA activity. For each target substrate, a list containing substrate history, including exposure time period, heating in the chemistry station, cleaning, analyzing and imaging is provided. The list is formatted as a table and stored in the same directory with the science products obtained from that substrate.

As stated in the 2.4.1, these history files are the starting point of the COSIMA data analysis.

### 3 Archive Format and Content

#### 3.1 Deliveries and Archive Volume Format

There will be only one dataset available at all times. For all the pre-comet phases, it will be named RO-CAL-COSIMA-3-Vx.y. For the comet phase, the dataset name will be changed to RO-C-COSIMA-3-Vx.y.

For each delivery, the new data is incremented to the old data and the major version number is incremented by one. This scheme is used to make sure, that the data user always have the full substrate history available. The history products are essential in the spectrum interpretation and are the recommed starting point for the data browsing. The following delivery schedule is expected:

dataset ID	coverage	date
RO-CAL-COSIMA-2-V1.0	Ground calibration, commissioning, first cruise phases. No mass scale available	2006
RO-CAL-COSIMA-3-V2.0	adds active checkout data up to PC8	2008
RO-CAL-COSIMA-3-V3.0	adds active checkout data up to hibernation	2010
RO-C-COSIMA-3-V1.0	adds comet prelanding data	end 2014
RO-C-COSIMA-3-V2.0	adds comet escort data	mid 2015
RO-C-COSIMA-3-V3.0	adds comet escort data	end 2015
RO-C-COSIMA-3-V4.0	adds comet escort data	mid 2016
RO-C-COSIMA-3-V5.0	adds final data	end 2016

The passive checkouts do not contribute much to the dataset, only one target is taken from the target storage and deposited back. No measurements are made.

The dataset is organized according to tree structure in the illustration 3.1.

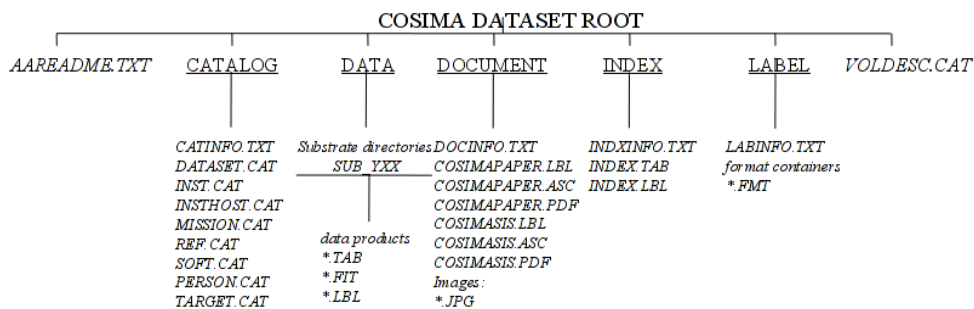


Illustration 3.1:

#### 3.2 Conventions

##### 3.2.1 Data Set ID Formation

Data set ID will be formed according to PDS standards and following the Rosetta Archive Plan (RO-EST-PL-5011). It will have the following components:

- Instrument host: RO
- Target: CAL for pre-flight data set, C for in-flight data set

- Instrument: COS
- Data processing level number, 3.
- Version number

The pre-comet dataset naming is thus starting from "RO-CAL-COSIMA-2-V1.0" and changed in the comet phase to names starting from "RO-C-COSIMA-3-V1.0"

### 3.2.2 Data Directory Naming Convention

/DATA directory be divided to subdirectories for each Cosima target substrate. The subdirectory names will be of format SUB\_YXX, where Y (1-3) is the substrate position in the target assembly, and XX is target assembly ID numbered from C1 to D8 hexadecimal. For example: SUB\_1C1, SUB\_2C1, etc. Substrate numbering is also explained in Chapter 4.1

### 3.2.3 Filenaming Convention COSIMA data products will be named as follows:

- Spectra: CS\_YXX\_YYYYMMDDThhmmss\_SP\_Z.TAB, where YXX is substrate code as defined above (chapter 3.2.2), and Z is either 'P' for positive or 'N' for negative ions.
- Peak lists: CS\_YXX\_YYYYMMDDThhmmss\_PK\_Z.TAB, where YXX and Z as above.
- Scan: CS\_YXX\_YYYYMMDDThhmmss\_SCAN.TAB, where YXX as above
- Heat: CS\_YXX\_YYYYMMDDThhmmss\_HEAT.TAB, where YXX as above
- Cleaning: CS\_YXX\_YYYYMMDDThhmmss\_CLEA.TAB, where YXX as above
- Cosiscope images of substrates: CS\_YXX\_YYYYMMDDThhmmss\_IM\_Z.FIT, where YXX as above, and Z is either 'P' for plus side led or 'M' for minus side led illumination.
- Grain lists: CS\_YXX\_YYYYMMDDThhmmss\_GR\_.TAB, where YXX as above.
- Housekeeping files: CS\_YXX\_YYYYMMDDThhmmss\_S\_HK.TAB (for spectra and peak lists), CS\_YXX\_YYYYMMDDThhmmss\_SCHK (for scan housekeeping), CS\_YXX\_YYYYMMDDThhmmss\_CLHK (for cleaning housekeeping) or CS\_YXX\_YYYYMMDDThhmmss\_G\_HK.TAB (for images and grain lists). YXX as above.
- Substrate history (ancillary data): CS\_YXX\_SUBSTRATE\_HIST.TAB

YYYYMMDDThhmmss is the date and time of operation start in UTC.

## 3.3 Standards Used in Data Product Generation

### 3.3.1 PDS Standards

PDS standard used is 3.6. All data processing levels mentioned in this document are PSA-compliant, as defined in RO-EST-PL-5011.

### 3.3.2 Time Standards

Time standard used is UTC. Time format is YYYY-MM-DDThh:mm:ss.

#### 3.3.2.1 Spacecraft Clock Count, OBT

The PDS keywords SPACECRAFT\_CLOCK\_START\_COUNT and SPACECRAFT\_CLOCK\_STOP\_COUNT refer to OBT as defined in [AD 04, Rosetta Time Handling, chapter 4.2]]

The header of the experiment telemetry source packets contains the data acquisition start time in OBT as 32 bit of unit seconds followed by 16 bit of fractional seconds (see section 2.3). OBT = 0 is at 2003-01-01-T00:00:00 UTC. The time resolution is  $2^{-16} = 1.53 \times 10^{-5}$  seconds.

The OBT 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  $2^{-16} = 1.53 \times 10^{-5}$  seconds and count from 0 to  $2^{10}-1 = 65535$ . E.g. in SPACECRAFT\_CLOCK\_START\_COUNT = "1/21983325.392" the 392 fractional seconds correspond to  $392 \times 2^{-16} = 0.00598$  decimal seconds.

The spacecraft clock could be reset during the mission (although this is not planned). This would imply a change of the zero point. The zero point of the OBT will be indicated by pre-pending the reset number (integer starting at 1) and a slash to the unit seconds, i.e. "1/" means OBT = 0 at 2003-01-01T00:00:00 UTC.

Examples:

SPACECRAFT\_CLOCK\_START\_COUNT = "1/21983325.39258"

SPACECRAFT\_CLOCK\_START\_COUNT = "1/21983325.392"

SPACECRAFT\_CLOCK\_STOP\_COUNT = "1/21983342"

### 3.3.3 Reference Systems

N/A

### 3.3.4 Other Applicable Standards

N/A

## 3.4 Data Validation

Formats will be checked with PSA Validation and Verification Tool.

The instrument data is validated according to the outline of the COSIMA proposal and the COSIMA instrument paper (Kissel et al, to be published in 2006 within the frame of the ROSETTA instrument papers). COSIMA consists of groups in France, Finland and Germany and Col's ins the US, Austria and The Netherlands. The COSIMA laboratory reference model is located at the Max-Planck-Institut for Solar System Research in Katlenburg-Lindau, Germany. The COSIMA instrument is operated by FMI in Helsinki, Finland and MPS in Lindau, Germany. The reference model is used for calibration and cross-reference measurements of the COSIMA flight model. The flight data will be analysed in a near time frame. Since COSIMA stores the original cometary samples, with this approach interesting samples can be screened again, e.g. with an improved count statistics. The science goals are achieved in the pre-comet rendezvous phase preparation with the reference model laboratory measurements and with the operational scenario of COSIMA in the comet orbiting phase of ROSETTA.

## 3.5 Content

### 3.5.1 Volume Set

1 volume will contain 1 COSIMA data set. Data set structure is defined in Chapter 3.1.

### 3.5.2 Data Set

COSIMA data will form one data set. It will contain time-of-flight spectra, peaks lists, target substrate images, grain lists and target history (ancillary data) obtained after the flight targets were installed in the flying instrument (XM).

The data set will be named according to PDS standards and following the Rosetta Archive Plan (RO-EST-PL-5011). Each component of the name will match the corresponding component of the data set ID.

Data set name components are:

- Instrument host: ROSETTA-ORBITER
- Target: CAL for pre-comet phase, 67P for comet phasedata sets
- Instrument name: COSIMA

- Data processing level, 3
- Version number

Example: "ROSETTA-ORBITER 67P COSIMA 3 V3.0"

### 3.5.3 Directories

#### 3.5.3.1 Root Directory

General archive description: AAREADME.TXT, VOLDESC.CAT

#### 3.5.3.2 Calibration Directory

N/A

#### 3.5.3.3 Catalog Directory

CATINFO.TXT

MISSION.CAT and INSTHOST.CAT from ESA – Mission and spacecraft descriptions.

INST.CAT – Instrument description

DATASET.CAT – Dataset description

REFERENCE.CAT - References

SOFTWARE.CAT - empty for COSIMA datasets.

PERSON.CAT – COSIMA contacts

TARGET.CAT – Target descriptions

#### 3.5.3.4 Index Directory

INDXINFO.TXT, INDEX.LBL and INDEX.TAB

#### 3.5.3.5 Browse Directory and Browse Files

N/A

#### 3.5.3.6 Geometry Directory

N/A

#### 3.5.3.7 Software Directory

N/A

#### 3.5.3.8 Gazetteer Directory

N/A

#### 3.5.3.9 Label Directory

LABINFO.TXT

Format containers (\*.FMT)

#### 3.5.3.10 Document Directory

COSIMASIS: This EAICD with detached labels and images in JPG format.

COSIMAPAPER: COSIMA instrument paper with detached labels and images in JPG format

#### 3.5.3.11 Extras Directory

N/A

### 3.5.3.12 Data Directory

See chapter 3.2.2.

## 4 Detailed Interface Specifications

### 4.1 Structure and Organization Overview

/DATA directory will be divided to sub-directories for each COSIMA target substrate. Names of these sub-directories will follow the scheme defined in chapter 3.2.2.

The target substrate code in the directory name consists of 3 alphanumeric characters. The last two characters represent hexadecimal code of the target substrate. There are 24 target assemblies, numbered C1-D8 (hex). Each assembly holds 3 substrates, resulting in total of 72 substrates. The first character in the code is a number defining the substrate position in the assembly. Possible numbers are 1,2 and 3 for top, middle and low substrate, respectively. Thus directory name SUB\_1C1 identifies that the data inside contains measurements of top substrate of target assembly C1. Other directories containing measurements of target assembly C1 are SUB\_2C1 and SUB\_3C1.

Data products will be stored in sub-directories SUB\_XYY. File naming of the data files is described in chapter 3.2.3. Each sub-directory SUB\_XYY will also include the history of that substrate. The history contains information about substrate storage and expose periods, cleaning and heating actions, COSISCOPE camera images and grains lists and any spectra taken. The history product contains history from the moment substrates were installed in the COSIMA flight instrument.

### 4.2 Data Sets, Definition and Content

See chapter 3.5.2.

### 4.3 Data Product Design

#### 4.3.1 Time-of flight spectrum product

##### 4.3.1.1 General description

COSIMA time-of-flight spectrum product has the following elements:

- Time-of-flight spectrum: event count series in ascii format.
- Event count: number of events in a time bin.
- Mass: calibrated mass for the time bin.

##### 4.3.1.2 Label example

```
PDS_VERSION_ID           = PDS3
LABEL_REVISION_NOTE      = "V1.1"

/* FILE FORMAT */
RECORD_TYPE              = FIXED_LENGTH
RECORD_BYTES             = 30
FILE_RECORDS             = 131185
LABEL_RECORDS           = 112
/* POINTER TO DATA OBJECTS */
^SCALE_TABLE             = 113
^MASS_SPECTRUM_TABLE     = 114

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME                = "CS_2D8_20070927T182348_SP_P.TAB"
DATA_SET_ID              = "R0-CAL-COSIMA-3-V2.0"
DATA_SET_NAME            = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID               = "CS_2D8_20070927T182348_SP_P.TAB"
PRODUCT_CREATION_TIME    = 2008-11-12T09:15:39
PRODUCT_TYPE             = "REFDR"
PROCESSING_LEVEL_ID      = "3"
MISSION_ID               = "ROSETTA"
MISSION_NAME             = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME       = "EARTH SWING-BY 2"
INSTRUMENT_HOST_ID      = "R0"
INSTRUMENT_HOST_NAME     = "ROSETTA-ORBITER"
INSTRUMENT_ID           = "COSIMA"
```

```

INSTRUMENT_NAME           = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE           = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID        = "SPECTRUM"
INSTRUMENT_MODE_DESC      = "TIME OF FLIGHT MASS SPECTRUM MEASUREMENT"
TARGET_NAME                = "CALIBRATION"
TARGET_TYPE                = "CALIBRATION"
START_TIME                 = 2007-09-27T18:23:48
STOP_TIME                  = 2007-09-27T18:33:53
SPACECRAFT_CLOCK_START_COUNT = "1/0149538196.41251"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/0149538801.41245"
SC_SUN_POSITION_VECTOR     = "N/A"
SC_TARGET_POSITION_VECTOR  = "N/A"
SC_TARGET_VELOCITY_VECTOR  = "N/A"
SPACECRAFT_ALTITUDE        = "N/A"
SUB_SPACECRAFT_LATITUDE    = "N/A"
SUB_SPACECRAFT_LONGITUDE   = "N/A"
PRODUCER_ID                = "FMI"
PRODUCER_FULL_NAME         = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME  = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID            = -1
DATA_QUALITY_DESC          = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"
ROSETTA: COSIMA_SUBSTRATE_X = 5000
ROSETTA: COSIMA_SUBSTRATE_Y = 5000
ROSETTA: COSIMA_SPECTRUM_POL = "POSITIVE"
ROSETTA: COSIMA_SPECTRUM_SHOTS = 795091

OBJECT                      = SCALE_TABLE
NAME                        = SCALE
INTERCHANGE_FORMAT          = ASCII
ROWS                        = 1
COLUMNS                    = 3
ROW_BYTES                   = 30
^STRUCTURE                  = "COSIMA_SPECTRUM_PEAK_SCALE.FMT"
DESCRIPTION                  = "COSIMA PEAK LIST MASS SCALE"
END_OBJECT                  = SCALE_TABLE

OBJECT                      = MASS_SPECTRUM_TABLE
NAME                        = MASS_SPECTRUM
INTERCHANGE_FORMAT          = ASCII
ROWS                        = 131072
COLUMNS                    = 3
ROW_BYTES                   = 30
^STRUCTURE                  = "COSIMA_SPECTRUM_DATA.FMT"
DESCRIPTION                  = "COSIMA TIME OF FLIGHT MASS SPECTRUM"
END_OBJECT                  = MASS_SPECTRUM_TABLE

```

END

### COSIMA\_SPECTRUM\_PEAK\_SCALE.FMT

```

OBJECT                      = COLUMN
COLUMN_NUMBER               = 1
NAME                        = SCALE_A
DATA_TYPE                   = ASCII_REAL
START_BYTE                  = 1
BYTES                       = 10
FORMAT                      = "F10.2"
DESCRIPTION                  = "FACTOR A FROM THE TIME TO MASS FUNCTION
                               T = A * SQRT(M) + B"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
COLUMN_NUMBER               = 2
NAME                        = SCALE_B
DATA_TYPE                   = ASCII_REAL
START_BYTE                  = 12
BYTES                       = 10
FORMAT                      = "F10.2"
DESCRIPTION                  = "FACTOR B FROM THE TIME TO MASS FUNCTION
                               T = A * SQRT(M) + B"
END_OBJECT                  = COLUMN
OBJECT                      = COLUMN
COLUMN_NUMBER               = 3

```



```

NAME = SCALE_CONFIDENCE
DATA_TYPE = ASCII_REAL
START_BYTE = 23
BYTES = 5
FORMAT = "F5.1"
DESCRIPTION = "MASS SCALE CONFIDENCE LEVEL IN PROCENTS"
END_OBJECT = COLUMN

```

### COSIMA\_SPECTRUM\_DATA.FMT

```

OBJECT = COLUMN
COLUMN_NUMBER = 1
NAME = INDEX
DATA_TYPE = ASCII_INTEGER
START_BYTE = 1
BYTES = 6
FORMAT = "I6"
DESCRIPTION = "TIME OF FLIGHT TIME STEP INDEX.
              TIME STEP IS 0.000000001953125 SECONDS"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 2
NAME = MASS_COUNT
DATA_TYPE = ASCII_INTEGER
START_BYTE = 8
BYTES = 10
FORMAT = "I10"
DESCRIPTION = "TIME INTEGRAGED MASS COUNT AT THE TIME STEP"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 3
NAME = MASS_NUMBER
DATA_TYPE = ASCII_REAL
START_BYTE = 19
BYTES = 10
FORMAT = "F10.5"
DESCRIPTION = "CALIBRATED MASS NUMBER AT THE TIME STEP"
END_OBJECT = COLUMN

```

## 4.3.2 Peak list product

### 4.3.2.1 General Description

COSIMA peak list has the following elements:

- Instrument onboard calculated mass scale.
- Peak list for organic and inorganic masses

### 4.3.2.2 Label example

```

PDS_VERSION_ID = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 29
FILE_RECORDS = 446
LABEL_RECORDS = 115
/* POINTERS TO DATA OBJECTS */
^SCALE_TABLE = 116
^PEAK_TABLE = 117

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME = "CS_2D8_20070927T184705_PK_N.TAB"
DATA_SET_ID = "RO-CAL-COSIMA-3-V2.0"
DATA_SET_NAME = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID = "CS_2D8_20070927T184705_PK_N.TAB"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:40
PRODUCT_TYPE = "REFDR"

```

PROCESSING\_LEVEL\_ID = "3"  
 MISSION\_ID = "ROSETTA"  
 MISSION\_NAME = "INTERNATIONAL ROSETTA MISSION"  
 MISSION\_PHASE\_NAME = "EARTH SWING-BY 2"  
 INSTRUMENT\_HOST\_ID = "RO"  
 INSTRUMENT\_HOST\_NAME = "ROSETTA-ORBITER"  
 INSTRUMENT\_ID = "COSIMA"  
 INSTRUMENT\_NAME = "COMETARY SECONDARY ION MASS ANALYZER"  
 INSTRUMENT\_TYPE = "MASS SPECTROMETER"  
 INSTRUMENT\_MODE\_ID = "SPECTRUM"  
 INSTRUMENT\_MODE\_DESC = "TIME OF FLIGHT MASS SPECTRUM MEASUREMENT"  
 TARGET\_NAME = "CALIBRATION"  
 TARGET\_TYPE = "CALIBRATION"  
 START\_TIME = 2007-09-27T18:47:05  
 STOP\_TIME = 2007-09-27T18:57:10  
 SPACECRAFT\_CLOCK\_START\_COUNT = "1/0149539593.41237"  
 SPACECRAFT\_CLOCK\_STOP\_COUNT = "1/0149540198.41230"  
 SC\_SUN\_POSITION\_VECTOR = "N/A"  
 SC\_TARGET\_POSITION\_VECTOR = "N/A"  
 SC\_TARGET\_VELOCITY\_VECTOR = "N/A"  
 SPACECRAFT\_ALTITUDE = "N/A"  
 SUB\_SPACECRAFT\_LATITUDE = "N/A"  
 SUB\_SPACECRAFT\_LONGITUDE = "N/A"  
 PRODUCER\_ID = "FMI"  
 PRODUCER\_FULL\_NAME = "JOHAN SILEN"  
 PRODUCER\_INSTITUTION\_NAME = "FINNISH METEOROLOGICAL INSTITUTE"  
 DATA\_QUALITY\_ID = -1  
 DATA\_QUALITY\_DESC = "-1 = not checked"  
 ROSETTA: COSIMA\_SUBSTRATE\_ID = "2D8"  
 ROSETTA: COSIMA\_SUBSTRATE\_DESC = "Silver, blank"  
 ROSETTA: COSIMA\_SUBSTRATE\_X = 5000  
 ROSETTA: COSIMA\_SUBSTRATE\_Y = 5000  
 ROSETTA: COSIMA\_SPECTRUM\_POL = "NEGATIVE"  
 ROSETTA: COSIMA\_SPECTRUM\_SHOTS = 828459

OBJECT = SCALE\_TABLE  
 NAME = SCALE  
 INTERCHANGE\_FORMAT = ASCII  
 ROWS = 1  
 COLUMNS = 3  
 ROW\_BYTES = 29  
 ^STRUCTURE = "COSIMA\_SPECTRUM\_PEAK\_SCALE.FMT"  
 DESCRIPTION = "COSIMA PEAK LIST MASS SCALE"  
 END\_OBJECT = SCALE\_TABLE

OBJECT = PEAK\_TABLE  
 NAME = PEAK\_LIST  
 INTERCHANGE\_FORMAT = ASCII  
 ROWS = 330  
 COLUMNS = 3  
 ROW\_BYTES = 29  
 ^STRUCTURE = "COSIMA\_SPECTRUM\_PEAKS.FMT"  
 DESCRIPTION = "COSIMA SPECTRUM PEAK LIST"  
 END\_OBJECT = PEAK\_TABLE

END

COSIMA\_SPECTRUM\_PEAK\_SCALE.FMT

OBJECT = COLUMN  
 COLUMN\_NUMBER = 1  
 NAME = SCALE\_A  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 1  
 BYTES = 10  
 FORMAT = "F10.2"  
 DESCRIPTION = "FACTOR A FROM THE TIME TO MASS FUNCTION  
 T = A \* SQRT(M) + B"  
 END\_OBJECT = COLUMN  
 OBJECT = COLUMN  
 COLUMN\_NUMBER = 2  
 NAME = SCALE\_B  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 12  
 BYTES = 10

```

FORMAT          = "F10.2"
DESCRIPTION     = "FACTOR B FROM THE TIME TO MASS FUNCTION
                  T = A * SQRT(M) + B"
END_OBJECT     = COLUMN
OBJECT         = COLUMN
COLUMN_NUMBER  = 3
NAME          = SCALE_CONFIDENCE
DATA_TYPE     = ASCII_REAL
START_BYTE    = 23
BYTES        = 5
FORMAT       = "F5.1"
DESCRIPTION  = "MASS SCALE CONFIDENCE LEVEL IN PROCENTS"
END_OBJECT   = COLUMN

```

#### COSIMA\_SPECTRUM\_PEAKS.FMT

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 1
NAME           = INDEX
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 1
BYTES         = 5
FORMAT        = "I5"
DESCRIPTION    = "INTEGER MASS. IF HIGHER THAN 300, THEN THE
                  INTERVAL FROM PREVIOUS VALUE TO CURRENT
                  VALUE"
END_OBJECT     = COLUMN
OBJECT        = COLUMN
COLUMN_NUMBER  = 2
NAME          = INORGANIC_COUNT
DATA_TYPE     = ASCII_INTEGER
START_BYTE    = 7
BYTES        = 10
FORMAT       = "I10"
DESCRIPTION  = "INORGANIC PEAK HEIGHT COUNT. IF MASS INDEX
                  IS HIGHER THAN 300, THEN THE SUM OF
                  ORGANIC AND INORGANIC COUNTS FOR THE
                  INTERVAL FROM PREVIOUS INDEX"
END_OBJECT     = COLUMN
OBJECT        = COLUMN
COLUMN_NUMBER  = 3
NAME          = ORGANIC_COUNT
DATA_TYPE     = ASCII_INTEGER
START_BYTE    = 18
BYTES        = 10
FORMAT       = "I10"
DESCRIPTION  = "ORGANIC PEAK HEIGHT COUNT. IF MASS INDEX
                  IS HIGHER THAN 300, THEN THE SUM OF
                  INORGANIC AND ORGANIC COUNTS FOR THE
                  INTERVAL FROM PREVIOUS INDEX"
END_OBJECT     = COLUMN

```

### 4.3.3 *Time-of-flight spectrum housekeeping data product*

#### 4.3.3.1 General description

With each measured time-of-flight spectrum or peak list, housekeeping data is associated. The housekeeping product has the following elements:

- Voltages, currents and temperatures of the instrument during spectrum measurement
- TDC unit timing parameters
- TDC unit calibration results

Detailed contents of the elements are described in the label example below.

#### 4.3.3.2 Label example

```

PDS_VERSION_ID = PDS3
LABEL_REVISION_NOTE = "V1.1"

```

```

/* FILE FORMAT */
RECORD_TYPE           = FIXED_LENGTH
RECORD_BYTES         = 897
FILE_RECORDS         = 11
LABEL_RECORDS        = 5
/* POINTER TO DATA OBJECT */
^HK_TABLE             = 6
^TDC_TIMING_TABLE     = 7
^TDC_CALIBRATION_TABLE = 8

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME             = "CS_2D8_20070927T182348_S_HK.TAB"
DATA_SET_ID           = "R0-CAL-COSIMA-3-V2.0"
DATA_SET_NAME         = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID           = "CS_2D8_20070927T182348_S_HK"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:38
PRODUCT_TYPE         = "ANCDR"
PROCESSING_LEVEL_ID   = "6"
MISSION_ID           = "ROSETTA"
MISSION_NAME         = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME    = "EARTH SWING-BY 2"
INSTRUMENT_HOST_ID   = "R0"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"
INSTRUMENT_ID        = "COSIMA"
INSTRUMENT_NAME       = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE       = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID   = "SPECTRUM"
INSTRUMENT_MODE_DESC = "TIME OF FLIGHT MASS SPECTRUM MEASUREMENT"
TARGET_NAME          = "CALIBRATION"
TARGET_TYPE          = "CALIBRATION"
START_TIME           = 2007-09-27T18:23:48
STOP_TIME            = 2007-09-27T18:33:53
SPACECRAFT_CLOCK_START_COUNT = "1/0149538196.41251"
SPACECRAFT_CLOCK_STOP_COUNT   = "1/0149538801.41245"
SC_SUN_POSITION_VECTOR        = "N/A"
SC_TARGET_POSITION_VECTOR     = "N/A"
SC_TARGET_VELOCITY_VECTOR     = "N/A"
SPACECRAFT_ALTITUDE           = "N/A"
SUB_SPACECRAFT_LATITUDE       = "N/A"
SUB_SPACECRAFT_LONGITUDE      = "N/A"
PRODUCER_ID                   = "FMI"
PRODUCER_FULL_NAME            = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME     = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID               = -1
DATA_QUALITY_DESC             = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID   = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"
ROSETTA: COSIMA_SUBSTRATE_X    = 5000
ROSETTA: COSIMA_SUBSTRATE_Y    = 5000
ROSETTA: COSIMA_SPECTRUM_POL   = "POSITIVE"
ROSETTA: COSIMA_SPECTRUM_SHOTS = 795091

OBJECT                       = HK_TABLE
  NAME                       = HOUSEKEEPING
  INTERCHANGE_FORMAT         = ASCII
  ROWS                       = 1
  COLUMNS                   = 112
  ROW_BYTES                   = 897
  ^STRUCTURE                  = "COSIMA_SPECTRUM_HK.FMT"
  DESCRIPTION                 = "COSIMA SPECTRUM HOUSEKEEPING INFORMATION,
    INCLUDING VOLTAGES, CURRENTS AND
    TEMPERATURES"

END_OBJECT                   = HK_TABLE

OBJECT                       = TDC_TIMING_TABLE
  NAME                       = TDC_TIMING
  INTERCHANGE_FORMAT         = ASCII
  ROWS                       = 1
  COLUMNS                   = 7
  ROW_BYTES                   = 897
  ^STRUCTURE                  = "COSIMA_SPECTRUM_TDC_TIMING.FMT"
  DESCRIPTION                 = "TIME TO DIGITAL UNIT TIMING PARAMETERS"
END_OBJECT                   = TDC_TIMING_TABLE

```

```

OBJECT          = TDC_CALIBRATION_TABLE
NAME           = TDC_CALIBRATION
INTERCHANGE_FORMAT = ASCII
ROWS          = 4
COLUMNS      = 5
ROW_BYTES     = 897
^STRUCTURE    = "COSIMA_SPECTRUM_TDC_CALIB.FMT"
DESCRIPTION   = "TIME TO DIGITAL UNIT CALIBRATION RESULTS"
END_OBJECT    = TDC_CALIBRATION_TABLE

```

END

COSIMA\_SPECTRUM\_HK.FMT:

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 1
NAME           = "T_REF_MIN"
DATA_TYPE      = ASCII_REAL
START_BYTE    = 1
BYTES         = 7
UNIT          = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT        = "F7.1"
DESCRIPTION   = "T_REF TEMPERATURE MINIMUM AT REFERENCE POINT"
END_OBJECT    = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 2
NAME           = "T_REF_MEAN"
DATA_TYPE      = ASCII_REAL
START_BYTE    = 9
BYTES         = 7
UNIT          = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT        = "F7.1"
DESCRIPTION   = "T_REF TEMPERATURE MEAN AT REFERENCE POINT"
END_OBJECT    = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 3
NAME           = "T_REF_MAX"
DATA_TYPE      = ASCII_REAL
START_BYTE    = 17
BYTES         = 7
UNIT          = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT        = "F7.1"
DESCRIPTION   = "T_REF TEMPERATURE MAXIMUM AT REFERENCE POINT"
END_OBJECT    = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 4
NAME           = "T_REF_STD"
DATA_TYPE      = ASCII_REAL
START_BYTE    = 25
BYTES         = 7
UNIT          = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT        = "F7.1"
DESCRIPTION   = "T_REF TEMPERATURE STANDARD DEVIATION AT
REFERENCE POINT"
END_OBJECT    = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER  = 5
NAME           = "T_TDC_MIN"
DATA_TYPE      = ASCII_REAL
START_BYTE    = 33
BYTES         = 7
UNIT          = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT        = "F7.1"
DESCRIPTION   = "T_TDC TIME TO DIGITAL UNIT DELAY LINE TEMPERATURE
MINIMUM"

```

```

END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 6
  NAME              = "T_TDC_MEAN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 41
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "T_TDC TIME TO DIGITAL UNIT DELAY LINE TEMPERATURE
                     MEAN"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 7
  NAME              = "T_TDC_MAX"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 49
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "T_TDC TIME TO DIGITAL UNIT DELAY LINE TEMPERATURE
                     MAXIMUM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 8
  NAME              = "T_TDC_STD"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 57
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "T_TDC TIME TO DIGITAL UNIT DELAY LINE TEMPERATURE
                     STANDARD DEVIATION"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 9
  NAME              = "T_PIBS_MIN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 65
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "T_PIBS PRIMARY ION BEAM SYSTEM TEMPERATURE MINIMUM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 10
  NAME              = "T_PIBS_MEAN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 73
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "T_PIBS PRIMARY ION BEAM SYSTEM TEMPERATURE MEAN"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 11
  NAME              = "T_PIBS_MAX"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 81
  BYTES             = 7
  UNIT              = "DEGREE KELVIN"
  MISSING_CONSTANT  = 999.9
  FORMAT            = "F7.1"

```

```

DESCRIPTION = "T_PIBS PRIMARY ION BEAM SYSTEM TEMPERATURE MAXIMUM"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 12
NAME = "T_PIBS_STD"
DATA_TYPE = ASCII_REAL
START_BYTE = 89
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"
DESCRIPTION = "T_PIBS PRIMARY ION BEAM SYSTEM TEMPERATURE STANDARD
DEVIATION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 13
NAME = "T_LVC_MIN"
DATA_TYPE = ASCII_REAL
START_BYTE = 97
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"
DESCRIPTION = "T_LVC LOW VOLTAGE CONVERTER TEMPERATURE MINIMUM"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 14
NAME = "T_LVC_MEAN"
DATA_TYPE = ASCII_REAL
START_BYTE = 105
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"
DESCRIPTION = "T_LVC LOW VOLTAGE CONVERTER TEMPERATURE MEAN"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 15
NAME = "T_LVC_MAX"
DATA_TYPE = ASCII_REAL
START_BYTE = 113
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"
DESCRIPTION = "T_LVC LOW VOLTAGE CONVERTER TEMPERATURE MAXIMUM"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 16
NAME = "T_LVC_STD"
DATA_TYPE = ASCII_REAL
START_BYTE = 121
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"
DESCRIPTION = "T_LVC LOW VOLTAGE CONVERTER TEMPERATURE STANDARD
DEVIATION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 17
NAME = "T_CPU_MIN"
DATA_TYPE = ASCII_REAL
START_BYTE = 129
BYTES = 7
UNIT = "DEGREE KELVIN"
MISSING_CONSTANT = 999.9
FORMAT = "F7.1"

```

```

DESCRIPTION          = "T_CPU PROCESSOR TEMPERATURE MINIMUM"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 18
  NAME                = "T_CPU_MEAN"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 137
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_CPU PROCESSOR TEMPERATURE MEAN"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 19
  NAME                = "T_CPU_MAX"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 145
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_CPU PROCESSOR TEMPERATURE MAXIMUM"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 20
  NAME                = "T_CPU_STD"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 153
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_CPU PROCESSOR TEMPERATURE STANDARD DEVIATION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 21
  NAME                = "T_HVC_MIN"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 161
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_HVC MOTHERBOARD TEMPERATURE MINIMUM"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 22
  NAME                = "T_HVC_MEAN"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 169
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_HVC MOTHERBOARD TEMPERATURE MEAN"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 23
  NAME                = "T_HVC_MAX"
  DATA_TYPE         = ASCII_REAL
  START_BYTE         = 177
  BYTES              = 7
  UNIT               = "DEGREE KELVIN"
  MISSING_CONSTANT   = 999.9
  FORMAT             = "F7.1"
  DESCRIPTION        = "T_HVC MOTHERBOARD TEMPERATURE MAXIMUM"
END_OBJECT           = COLUMN

```



OBJECT = COLUMN  
COLUMN\_NUMBER = 24  
NAME = "T\_HVC\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 185  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T\_HVC MOTHERBOARD TEMPERATURE STANDARD DEVIATION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 25  
NAME = "V\_EL1\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 193  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_EL1 EXTRACTION LENS 1 VOLTAGE MINIMUM,  
IN THE TIME-OF-FLIGHT SECTION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 26  
NAME = "V\_EL1\_MEAN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 201  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_EL1 EXTRACTION LENS 1 VOLTAGE MEAN,  
IN THE TIME-OF-FLIGHT SECTION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 27  
NAME = "V\_EL1\_MAX"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 209  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_EL1 EXTRACTION LENS 1 VOLTAGE MAXIMUM,  
IN THE TIME-OF-FLIGHT SECTION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 28  
NAME = "V\_EL1\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 217  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_EL1 EXTRACTION LENS 1 VOLTAGE STANDARD DEVIATION,  
IN THE TIME-OF-FLIGHT SECTION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 29  
NAME = "V\_TOF1\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 225  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"

```

DESCRIPTION          = "V_TOF1 HIGH VOLTAGE CONVERTER 1 VOLTAGE MINIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 30
  NAME                = "V_TOF1_MEAN"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 233
  BYTES               = 7
  UNIT                = "VOLT"
  MISSING_CONSTANT   = 99999.9
  FORMAT              = "F7.1"
  DESCRIPTION         = "V_TOF1 HIGH VOLTAGE CONVERTER 1 VOLTAGE MEAN,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 31
  NAME                = "V_TOF1_MAX"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 241
  BYTES               = 7
  UNIT                = "VOLT"
  MISSING_CONSTANT   = 99999.9
  FORMAT              = "F7.1"
  DESCRIPTION         = "V_TOF1 HIGH VOLTAGE CONVERTER 1 VOLTAGE MAXIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 32
  NAME                = "V_TOF1_STD"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 249
  BYTES               = 7
  UNIT                = "VOLT"
  MISSING_CONSTANT   = 99999.9
  FORMAT              = "F7.1"
  DESCRIPTION         = "V_TOF1 HIGH VOLTAGE CONVERTER 1 VOLTAGE STANDARD
                        DEVIATION, IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 33
  NAME                = "V_TOF2_MIN"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 257
  BYTES               = 7
  UNIT                = "VOLT"
  MISSING_CONSTANT   = 99999.9
  FORMAT              = "F7.1"
  DESCRIPTION         = "V_TOF2 HIGH VOLTAGE CONVERTER 2 VOLTAGE MINIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 34
  NAME                = "V_TOF2_MEAN"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 265
  BYTES               = 7
  UNIT                = "VOLT"
  MISSING_CONSTANT   = 99999.9
  FORMAT              = "F7.1"
  DESCRIPTION         = "V_TOF2 HIGH VOLTAGE CONVERTER 2 VOLTAGE MEAN,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
  COLUMN_NUMBER      = 35
  NAME                = "V_TOF2_MAX"
  DATA_TYPE          = ASCII_REAL
  START_BYTE         = 273

```

```

BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_TOF2 HIGH VOLTAGE CONVERTER 2 VOLTAGE MAXIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 36
NAME                 = "V_TOF2_STD"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 281
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_TOF2 HIGH VOLTAGE CONVERTER 2 VOLTAGE STANDARD
                        DEVIATION, IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 37
NAME                 = "V_DT_MIN"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 289
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_DT DRIFT TUBE VOLTAGE MINIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 38
NAME                 = "V_DT_MEAN"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 297
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_DT DRIFT TUBE VOLTAGE MEAN,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 39
NAME                 = "V_DT_MAX"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 305
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_DT DRIFT TUBE VOLTAGE MAXIMUM,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 40
NAME                 = "V_DT_STD"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 313
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_DT DRIFT TUBE VOLTAGE STANDARD DEVIATION,
                        IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN

```

```

COLUMN_NUMBER      = 41
NAME               = "V_PA_MIN"
DATA_TYPE         = ASCII_REAL
START_BYTE        = 321
BYTES             = 7
UNIT              = "VOLT"
MISSING_CONSTANT  = 99999.9
FORMAT            = "F7.1"
DESCRIPTION       = "V_PA POST-ACCELERATION VOLTAGE MINIMUM,
                    IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT        = COLUMN

OBJECT             = COLUMN
COLUMN_NUMBER     = 42
NAME              = "V_PA_MEAN"
DATA_TYPE        = ASCII_REAL
START_BYTE       = 329
BYTES            = 7
UNIT             = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT           = "F7.1"
DESCRIPTION      = "V_PA POST-ACCELERATION VOLTAGE MEAN,
                    IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT       = COLUMN

OBJECT             = COLUMN
COLUMN_NUMBER     = 43
NAME              = "V_PA_MAX"
DATA_TYPE        = ASCII_REAL
START_BYTE       = 337
BYTES            = 7
UNIT             = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT           = "F7.1"
DESCRIPTION      = "V_PA POST-ACCELERATION VOLTAGE MAXIMUM,
                    IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT       = COLUMN

OBJECT             = COLUMN
COLUMN_NUMBER     = 44
NAME              = "V_PA_STD"
DATA_TYPE        = ASCII_REAL
START_BYTE       = 345
BYTES            = 7
UNIT             = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT           = "F7.1"
DESCRIPTION      = "V_PA POST-ACCELERATION VOLTAGE STANDARD DEVIATION,
                    IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT       = COLUMN

OBJECT             = COLUMN
COLUMN_NUMBER     = 45
NAME              = "V_DET_MIN"
DATA_TYPE        = ASCII_REAL
START_BYTE       = 353
BYTES            = 7
UNIT             = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT           = "F7.1"
DESCRIPTION      = "V_DET ION DETECTOR VOLTAGE MINIMUM,
                    IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT       = COLUMN

OBJECT             = COLUMN
COLUMN_NUMBER     = 46
NAME              = "V_DET_MEAN"
DATA_TYPE        = ASCII_REAL
START_BYTE       = 361
BYTES            = 7
UNIT             = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT           = "F7.1"
DESCRIPTION      = "V_DET ION DETECTOR VOLTAGE MEAN,

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                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 47
  NAME          = "V_DET_MAX"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 369
  BYTES        = 7
  UNIT         = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT       = "F7.1"
  DESCRIPTION  = "V_DET ION DETECTOR VOLTAGE MAXIMUM,
                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 48
  NAME          = "V_DET_STD"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 377
  BYTES        = 7
  UNIT         = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT       = "F7.1"
  DESCRIPTION  = "V_DET ION DETECTOR VOLTAGE STANDARD DEVIATION,
                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 49
  NAME          = "V_DX_TOF_MIN"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 385
  BYTES        = 7
  UNIT         = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT       = "F7.1"
  DESCRIPTION  = "V_DX_TOF X-DIRECTION DEFLECTION VOLTAGE MINIMUM,
                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 50
  NAME          = "V_DX_TOF_MEAN"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 393
  BYTES        = 7
  UNIT         = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT       = "F7.1"
  DESCRIPTION  = "V_DX_TOF X-DIRECTION DEFLECTION VOLTAGE MEAN,
                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 51
  NAME          = "V_DX_TOF_MAX"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 401
  BYTES        = 7
  UNIT         = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT       = "F7.1"
  DESCRIPTION  = "V_DX_TOF X-DIRECTION DEFLECTION VOLTAGE MAXIMUM,
                IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 52
  NAME          = "V_DX_TOF_STD"
  DATA_TYPE   = ASCII_REAL
  START_BYTE   = 409
  BYTES        = 7

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UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_DX_TOF X-DIRECTION DEFLECTION VOLTAGE STANDARD
              DEVIATION, IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 53
NAME = "V_DY_TOF_MIN"
DATA_TYPE = ASCII_REAL
START_BYTE = 417
BYTES = 7
UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_DY_TOF Y-DIRECTION DEFLECTION VOLTAGE MINIMUM,
              IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 54
NAME = "V_DY_TOF_MEAN"
DATA_TYPE = ASCII_REAL
START_BYTE = 425
BYTES = 7
UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_DY_TOF Y-DIRECTION DEFLECTION VOLTAGE MEAN,
              IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 55
NAME = "V_DY_TOF_MAX"
DATA_TYPE = ASCII_REAL
START_BYTE = 433
BYTES = 7
UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_DY_TOF Y-DIRECTION DEFLECTION VOLTAGE MAXIMUM,
              IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 56
NAME = "V_DY_TOF_STD"
DATA_TYPE = ASCII_REAL
START_BYTE = 441
BYTES = 7
UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_DY_TOF Y-DIRECTION DEFLECTION VOLTAGE STANDARD
              DEVIATION, IN THE TIME-OF-FLIGHT SECTION"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 57
NAME = "V_L1_MIN"
DATA_TYPE = ASCII_REAL
START_BYTE = 449
BYTES = 7
UNIT = "VOLT"
MISSING_CONSTANT = 99999.9
FORMAT = "F7.1"
DESCRIPTION = "V_L1 LENS 1 VOLTAGE MINIMUM,
              IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 58

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NAME                = "V_L1_MEAN"
DATA_TYPE           = ASCII_REAL
START_BYTE         = 457
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L1 LENS 1 VOLTAGE MEAN,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 59
NAME               = "V_L1_MAX"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 465
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L1 LENS 1 VOLTAGE MAXIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 60
NAME               = "V_L1_STD"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 473
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L1 LENS 1 VOLTAGE STANDARD DEVIATION,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 61
NAME               = "V_L2_MIN"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 481
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L2 LENS 2 VOLTAGE MINIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 62
NAME               = "V_L2_MEAN"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 489
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L2 LENS 2 VOLTAGE MEAN,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 63
NAME               = "V_L2_MAX"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 497
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_L2 LENS 2 VOLTAGE MAXIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"

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END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 64
  NAME              = "V_L2_STD"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 505
  BYTES             = 7
  UNIT              = "VOLT"
  MISSING_CONSTANT  = 99999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "V_L2 LENS 2 VOLTAGE STANDARD DEVIATION,
                     IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 65
  NAME              = "V_BS1_MIN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 513
  BYTES             = 7
  UNIT              = "VOLT"
  MISSING_CONSTANT  = 99999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "V_BS1 BEAM SWITCH 1 VOLTAGE MINIMUM,
                     IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 66
  NAME              = "V_BS1_MEAN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 521
  BYTES             = 7
  UNIT              = "VOLT"
  MISSING_CONSTANT  = 99999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "V_BS1 BEAM SWITCH 1 VOLTAGE MEAN,
                     IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 67
  NAME              = "V_BS1_MAX"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 529
  BYTES             = 7
  UNIT              = "VOLT"
  MISSING_CONSTANT  = 99999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "V_BS1 BEAM SWITCH 1 VOLTAGE MAXIMUM,
                     IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 68
  NAME              = "V_BS1_STD"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 537
  BYTES             = 7
  UNIT              = "VOLT"
  MISSING_CONSTANT  = 99999.9
  FORMAT            = "F7.1"
  DESCRIPTION       = "V_BS1 BEAM SWITCH 1 VOLTAGE STANDARD DEVIATION,
                     IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT          = COLUMN
OBJECT              = COLUMN
  COLUMN_NUMBER     = 69
  NAME              = "V_BS2_MIN"
  DATA_TYPE        = ASCII_REAL
  START_BYTE        = 545
  BYTES             = 7
  UNIT              = "VOLT"

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MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_BS2 BEAM SWITCH 2 VOLTAGE MINIMUM,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 70
NAME                  = "V_BS2_MEAN"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 553
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_BS2 BEAM SWITCH 2 VOLTAGE MEAN,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 71
NAME                  = "V_BS2_MAX"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 561
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_BS2 BEAM SWITCH 2 VOLTAGE MAXIMUM,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 72
NAME                  = "V_BS2_STD"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 569
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_BS2 BEAM SWITCH 2 VOLTAGE STANDARD DEVIATION,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 73
NAME                  = "V_CB1_MIN"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 577
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_CB1 BEAM CHOPPER POSITIVE VOLTAGE MINIMUM,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 74
NAME                  = "V_CB1_MEAN"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 585
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION           = "V_CB1 BEAM CHOPPER POSITIVE VOLTAGE MEAN,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 75
NAME                  = "V_CB1_MAX"

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DATA_TYPE           = ASCII_REAL
START_BYTE         = 593
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB1 BEAM CHOPPER POSITIVE VOLTAGE MAXIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 76
NAME               = "V_CB1_STD"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 601
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB1 BEAM CHOPPER POSITIVE VOLTAGE STANDARD
                    DEVIATION, IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 77
NAME               = "V_CB2_MIN"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 609
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB2 BEAM CHOPPER NEGATIVE VOLTAGE MINIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 78
NAME               = "V_CB2_MEAN"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 617
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB2 BEAM CHOPPER NEGATIVE VOLTAGE MEAN,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 79
NAME               = "V_CB2_MAX"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 625
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB2 BEAM CHOPPER NEGATIVE VOLTAGE MAXIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

OBJECT              = COLUMN
COLUMN_NUMBER      = 80
NAME               = "V_CB2_STD"
DATA_TYPE          = ASCII_REAL
START_BYTE         = 633
BYTES              = 7
UNIT               = "VOLT"
MISSING_CONSTANT   = 99999.9
FORMAT             = "F7.1"
DESCRIPTION        = "V_CB2 BEAM CHOPPER NEGATIVE VOLTAGE STANDARD
                    DEVIATION, IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT         = COLUMN

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OBJECT          = COLUMN
  COLUMN_NUMBER = 81
  NAME          = "V_DX_PIBS_MIN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 641
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION    = "V_DX_PIBS X-DIRECTION DEFLECTION VOLTAGE MINIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 82
  NAME          = "V_DX_PIBS_MEAN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 649
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION    = "V_DX_PIBS X-DIRECTION DEFLECTION VOLTAGE MEAN,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 83
  NAME          = "V_DX_PIBS_MAX"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 657
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION    = "V_DX_PIBS X-DIRECTION DEFLECTION VOLTAGE MAXIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 84
  NAME          = "V_DX_PIBS_STD"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 665
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION    = "V_DX_PIBS X-DIRECTION DEFLECTION VOLTAGE STANDARD
                    DEVIATION, IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 85
  NAME          = "V_DY_PIBS_MIN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 673
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION    = "V_DY_PIBS Y-DIRECTION DEFLECTION VOLTAGE MINIMUM,
                    IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 86
  NAME          = "V_DY_PIBS_MEAN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 681
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9

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FORMAT                = "F7.1"
DESCRIPTION            = "V_DY_PIBS Y-DIRECTION DEFLECTION VOLTAGE MEAN,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 87
NAME                  = "V_DY_PIBS_MAX"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 689
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION            = "V_DY_PIBS Y-DIRECTION DEFLECTION VOLTAGE MAXIMUM,
                        IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 88
NAME                  = "V_DY_PIBS_STD"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 697
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION            = "V_DY_PIBS Y-DIRECTION DEFLECTION VOLTAGE STANDARD
                        DEVIATION, IN THE PRIMARY ION BEAM SYSTEM"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 89
NAME                  = "V_TIP_MIN"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 705
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION            = "V_TIP TIP VOLTAGE MINIMUM,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 90
NAME                  = "V_TIP_MEAN"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 713
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION            = "V_TIP TIP VOLTAGE MEAN,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 91
NAME                  = "V_TIP_MAX"
DATA_TYPE             = ASCII_REAL
START_BYTE            = 721
BYTES                 = 7
UNIT                  = "VOLT"
MISSING_CONSTANT      = 99999.9
FORMAT                = "F7.1"
DESCRIPTION            = "V_TIP TIP VOLTAGE MAXIMUM,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT            = COLUMN

OBJECT                = COLUMN
COLUMN_NUMBER         = 92
NAME                  = "V_TIP_STD"
DATA_TYPE             = ASCII_REAL

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START\_BYTE = 729  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_TIP TIP VOLTAGE STANDARD DEVIATION,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 93  
NAME = "C\_TIP\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 737  
BYTES = 7  
UNIT = "MICROAMPERE"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "C\_TIP TIP CURRENT MINIMUM,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 94  
NAME = "C\_TIP\_MEAN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 745  
BYTES = 7  
UNIT = "MICROAMPERE"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "C\_TIP TIP CURRENT MEAN,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 95  
NAME = "C\_TIP\_MAX"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 753  
BYTES = 7  
UNIT = "MICROAMPERE"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "C\_TIP TIP CURRENT MAXIMUM,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 96  
NAME = "C\_TIP\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 761  
BYTES = 7  
UNIT = "MICROAMPERE"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "C\_TIP TIP VOLTAGE STANDARD DEVIATION,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 97  
NAME = "V\_EXT\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 769  
BYTES = 7  
UNIT = "VOLT"  
MISSING\_CONSTANT = 99999.9  
FORMAT = "F7.1"  
DESCRIPTION = "V\_EXT EXTRACTOR VOLTAGE MINIMUM,  
IN THE PRIMARY ION SOURCE"  
END\_OBJECT = COLUMN

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OBJECT          = COLUMN
  COLUMN_NUMBER = 98
  NAME          = "V_EXT_MEAN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 777
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION   = "V_EXT EXTRACTOR VOLTAGE MEAN,
                  IN THE PRIMARY ION SOURCE"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 99
  NAME          = "V_EXT_MAX"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 785
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION   = "V_EXT EXTRACTOR VOLTAGE MAXIMUM,
                  IN THE PRIMARY ION SOURCE"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 100
  NAME          = "V_EXT_STD"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 793
  BYTES         = 7
  UNIT          = "VOLT"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION   = "V_EXT EXTRACTOR VOLTAGE STANDARD DEVIATION,
                  IN THE PRIMARY ION SOURCE"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 101
  NAME          = "C_EXT_MIN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 801
  BYTES         = 7
  UNIT          = "MICROAMPERE"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION   = "C_EXT EXTRACTOR CURRENT MINIMUM,
                  IN THE PRIMARY ION SOURCE"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 102
  NAME          = "C_EXT_MEAN"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 809
  BYTES         = 7
  UNIT          = "MICROAMPERE"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"
  DESCRIPTION   = "C_EXT EXTRACTOR CURRENT MEAN,
                  IN THE PRIMARY ION SOURCE"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 103
  NAME          = "C_EXT_MAX"
  DATA_TYPE    = ASCII_REAL
  START_BYTE    = 817
  BYTES         = 7
  UNIT          = "MICROAMPERE"
  MISSING_CONSTANT = 99999.9
  FORMAT        = "F7.1"

```

```

DESCRIPTION          = "C_EXT EXTRACTOR CURRENT MAXIMUM,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 104
NAME                 = "C_EXT_STD"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 825
BYTES                = 7
UNIT                 = "MICROAMPERE"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "C_EXT EXTRACTOR CURRENT STANDARD DEVIATION,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 105
NAME                 = "V_HEATER_MIN"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 833
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_HEATER HEATER VOLTAGE MINIMUM,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 106
NAME                 = "V_HEATER_MEAN"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 841
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_HEATER HEATER VOLTAGE MEAN,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 107
NAME                 = "V_HEATER_MAX"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 849
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_HEATER HEATER VOLTAGE MAXIMUM,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 108
NAME                 = "V_HEATER_STD"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 857
BYTES                = 7
UNIT                 = "VOLT"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "V_HEATER HEATER VOLTAGE STANDARD DEVIATION,
END_OBJECT           = COLUMN
                     IN THE PRIMARY ION SOURCE"

OBJECT               = COLUMN
COLUMN_NUMBER        = 109
NAME                 = "C_HEATER_MIN"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 865

```

BYTES = 7  
 UNIT = "AMPERE"  
 MISSING\_CONSTANT = 99999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "C\_HEATER HEATER CURRENT MINIMUM,  
 IN THE PRIMARY ION SOURCE"  
 END\_OBJECT = COLUMN

OBJECT = COLUMN  
 COLUMN\_NUMBER = 110  
 NAME = "C\_HEATER\_MEAN"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 873  
 BYTES = 7  
 UNIT = "AMPERE"  
 MISSING\_CONSTANT = 99999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "C\_HEATER HEATER CURRENT MEAN,  
 IN THE PRIMARY ION SOURCE"  
 END\_OBJECT = COLUMN

OBJECT = COLUMN  
 COLUMN\_NUMBER = 111  
 NAME = "C\_HEATER\_MAX"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 881  
 BYTES = 7  
 UNIT = "AMPERE"  
 MISSING\_CONSTANT = 99999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "C\_HEATER HEATER CURRENT MAXIMUM,  
 IN THE PRIMARY ION SOURCE"  
 END\_OBJECT = COLUMN

OBJECT = COLUMN  
 COLUMN\_NUMBER = 112  
 NAME = "C\_HEATER\_STD"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 889  
 BYTES = 7  
 UNIT = "AMPERE"  
 MISSING\_CONSTANT = 99999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "C\_HEATER HEATER CURRENT STANDARD DEVIATION,  
 IN THE PRIMARY ION SOURCE"  
 END\_OBJECT = COLUMN

COSIMA\_SPECTRUM\_TDC\_TIMING.FMT:

OBJECT = COLUMN  
 COLUMN\_NUMBER = 1  
 NAME = CHOPPER\_ON  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 1  
 BYTES = 9  
 UNIT = "NANOSECOND"  
 FORMAT = "F9.2"  
 DESCRIPTION = "TIME TO DIGITAL UNIT CHOPPER ON TIME"  
 END\_OBJECT = COLUMN  
 OBJECT = COLUMN  
 COLUMN\_NUMBER = 2  
 NAME = CHOPPER\_OFF  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 11  
 BYTES = 9  
 UNIT = "NANOSECOND"  
 FORMAT = "F9.2"  
 DESCRIPTION = "TIME TO DIGITAL UNIT CHOPPER OFF TIME"  
 END\_OBJECT = COLUMN  
 OBJECT = COLUMN  
 COLUMN\_NUMBER = 3  
 NAME = BUNCHER\_1\_ON  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 21



```

    BYTES = 9
    UNIT = "NANOSECOND"
    FORMAT = "F9.2"
    DESCRIPTION = "TIME TO DIGITAL UNIT BUNCHER 1 ON TIME"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 4
    NAME = BUNCHER_2_ON
    DATA_TYPE = ASCII_REAL
    START_BYTE = 31
    BYTES = 9
    UNIT = "NANOSECOND"
    FORMAT = "F9.2"
    DESCRIPTION = "TIME TO DIGITAL UNIT BUNCHER 2 ON TIME"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 5
    NAME = BUNCHER_3_ON
    DATA_TYPE = ASCII_REAL
    START_BYTE = 41
    BYTES = 9
    UNIT = "NANOSECOND"
    FORMAT = "F9.2"
    DESCRIPTION = "TIME TO DIGITAL UNIT BUNCHER 3 ON TIME"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 6
    NAME = PIBS_OFF
    DATA_TYPE = ASCII_REAL
    START_BYTE = 51
    BYTES = 9
    UNIT = "NANOSECOND"
    FORMAT = "F9.2"
    DESCRIPTION = "TIME TO DIGITAL UNIT PRIMARY ION BEAM
        SYSTEM OFF TIME"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 7
    NAME = TOF_OFF
    DATA_TYPE = ASCII_REAL
    START_BYTE = 61
    BYTES = 9
    UNIT = "NANOSECOND"
    FORMAT = "F9.2"
    DESCRIPTION = "TIME TO DIGITAL UNIT TIME OF FLIGHT UNIT
        OFF TIME"
END_OBJECT = COLUMN

```

COSIMA\_SPECTRUM\_TDC\_CALIB.FMT:

```

OBJECT = COLUMN
    COLUMN_NUMBER = 1
    NAME = TDC_CALIBRATION_OFFSET
    DATA_TYPE = ASCII_INTEGER
    START_BYTE = 1
    BYTES = 11
    UNIT = "SECOND"
    FORMAT = "I11"
    DESCRIPTION = "OFFSET IN SECONDS FROM THE START OF THE
        SPECTRUM MEASUREMENT"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 2
    NAME = TDC_DELAY_LINE
    DATA_TYPE = ASCII_INTEGER
    START_BYTE = 13
    BYTES = 3
    FORMAT = "I3"
    DESCRIPTION = "TIME TO DIGITAL UNIT DELAY LINE
        DAC CONTROL VALUE"
END_OBJECT = COLUMN
OBJECT = COLUMN
    COLUMN_NUMBER = 3
    NAME = TDC_CALIBRATION_MEAN

```

```

DATA_TYPE           = ASCII_INTEGER
START_BYTE         = 17
BYTES              = 5
FORMAT             = "I5"
DESCRIPTION        = "TIME TO DIGITAL UNIT CHANNEL
                     CALIBRATION MEAN"
END_OBJECT         = COLUMN
OBJECT             = COLUMN
COLUMN_NUMBER      = 4
NAME               = TDC_CALIBRATION_STD
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 23
BYTES             = 5
FORMAT           = "I5"
DESCRIPTION      = "TIME TO DIGITAL UNIT CHANNEL
                     CALIBRATION STANTARD DEVIATION"
END_OBJECT       = COLUMN
OBJECT           = COLUMN
COLUMN_NUMBER    = 5
NAME             = TDC_CHANNEL_DIFFERENCE
DATA_TYPE       = ASCII_INTEGER
START_BYTE      = 29
BYTES           = 95
ITEMS           = 16
ITEM_BYTES      = 5
ITEM_OFFSET     = 6
FORMAT         = "I6"
DESCRIPTION    = "TIME TO DIGITAL UNIT CHANNEL
                     DIFFERENCE FROM THE MEAN"
END_OBJECT     = COLUMN

```

#### 4.3.4 Scan data product

##### 4.3.4.1 General description

With each scan step, the following elements are given:

- total counts in the three time/mass ranges
- number of ion shots
- total counts
- substrate position
- time/mass range limits
- varied parameters, step values

Detailed contents of the elements are described in the label example below.

##### 4.3.4.2 Label example

```

PDS_VERSION_ID      = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE         = FIXED_LENGTH
RECORD_BYTES        = 153
FILE_RECORDS        = 19
LABEL_RECORDS       = 18
/* POINTER TO DATA OBJECTS */
^SCAN_TABLE         = 19

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME           = "CS_2D8_20100508T104500_SCAN.TAB"
DATA_SET_ID         = "R0-CAL-COSIMA-3-V3.0"
DATA_SET_NAME       = "ROSETTA-ORBITER CAL COSIMA 3 V3.0"
PRODUCT_ID          = "CS_2D8_20100508T104500_SCAN"
PRODUCT_CREATION_TIME = 2010-08-28T15:13:27
PRODUCT_TYPE        = "REFDR"
PROCESSING_LEVEL_ID = "3"
MISSION_ID          = "ROSETTA"
MISSION_NAME        = "INTERNATIONAL ROSETTA MISSION"

```

MISSION\_PHASE\_NAME = "CRUISE 5"  
INSTRUMENT\_HOST\_ID = "R0"  
INSTRUMENT\_HOST\_NAME = "ROSETTA-ORBITER"  
INSTRUMENT\_ID = "COSIMA"  
INSTRUMENT\_NAME = "COMETARY SECONDARY ION MASS ANALYZER"  
INSTRUMENT\_TYPE = "MASS SPECTROMETER"  
INSTRUMENT\_MODE\_ID = "SPECTRUM"  
INSTRUMENT\_MODE\_DESC = "TIME OF FLIGHT MASS SPECTRUM MEASUREMENT"  
TARGET\_NAME = "CALIBRATION"  
TARGET\_TYPE = "CALIBRATION"  
START\_TIME = 2010-05-08T10:45:00  
STOP\_TIME = 2010-05-08T10:59:19  
SPACECRAFT\_CLOCK\_START\_COUNT = "1/0231936259.28265"  
SPACECRAFT\_CLOCK\_STOP\_COUNT = "1/0231937118.28261"  
SC\_SUN\_POSITION\_VECTOR = "N/A"  
SC\_TARGET\_POSITION\_VECTOR = "N/A"  
SC\_TARGET\_VELOCITY\_VECTOR = "N/A"  
SPACECRAFT\_ALTITUDE = "N/A"  
SUB\_SPACECRAFT\_LATITUDE = "N/A"  
SUB\_SPACECRAFT\_LONGITUDE = "N/A"  
PRODUCER\_ID = "FMI"  
PRODUCER\_FULL\_NAME = "JOHAN SILEN"  
PRODUCER\_INSTITUTION\_NAME = "FINNISH METEOROLOGICAL INSTITUTE"  
DATA\_QUALITY\_ID = -1  
DATA\_QUALITY\_DESC = "-1 = not checked"  
ROSETTA: COSIMA\_SUBSTRATE\_ID = "2D8"  
ROSETTA: COSIMA\_SUBSTRATE\_DESC = "Silver, blank"  
ROSETTA: COSIMA\_SPECTRUM\_POL = "NEGATIVE"

OBJECT = SCAN\_TABLE  
NAME = SCAN\_DATA  
INTERCHANGE\_FORMAT = ASCII  
ROWS = 1  
COLUMNS = 17  
ROW\_BYTES = 153  
^STRUCTURE = "COSIMA\_SCAN\_DATA.FMT"  
DESCRIPTION = "COSIMA\_SCAN\_DATA"  
END\_OBJECT = SCAN\_TABLE

END

COSIMA\_SCAN\_DATA.FMT

OBJECT = COLUMN  
COLUMN\_NUMBER = 1  
NAME = WINDOW\_1\_COUNT  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 1  
BYTES = 11  
MISSING\_CONSTANT = -999999999  
FORMAT = "I11"  
DESCRIPTION = "COUNT OF THE EVENTS  
INSIDE THE FIRST TIME(MASS) WINDOW"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 2  
NAME = WINDOW\_2\_COUNT  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 13  
BYTES = 11  
MISSING\_CONSTANT = -999999999  
FORMAT = "I11"  
DESCRIPTION = "COUNT OF THE EVENTS  
INSIDE THE SECOND TIME(MASS) WINDOW"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 3  
NAME = WINDOW\_3\_COUNT  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 25  
BYTES = 11  
MISSING\_CONSTANT = -999999999

```

FORMAT          = "I11"
DESCRIPTION     = "COUNT OF THE EVENTS
                   INSIDE THE THIRD TIME(MASS) WINDOW"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 4
NAME           = SPECTRUM_SHOTS
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 37
BYTES         = 11
MISSING_CONSTANT = -999999999
FORMAT         = "I11"
DESCRIPTION     = "NUMBER OF INDIUM ION SHOTS USED"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 5
NAME           = TOTAL_COUNT
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 49
BYTES         = 11
MISSING_CONSTANT = -999999999
FORMAT         = "I11"
DESCRIPTION     = "TOTAL COUNT OF EVENTS DURING ACQUISITION"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 6
NAME           = SUBSTRATE_X
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 61
BYTES         = 5
UNIT           = "MICROMETER"
MISSING_CONSTANT = -9999
FORMAT         = "I5"
DESCRIPTION     = "SUBSTRATE X-COORDINATE IN MICROMETERS,
                   ZERO IS AT LEFT"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 7
NAME           = SUBSTRATE_Y
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 67
BYTES         = 5
UNIT           = "MICROMETER"
MISSING_CONSTANT = -9999
FORMAT         = "I5"
DESCRIPTION     = "SUBSTRATE Y-COORDINATE IN MICROMETERS,
                   ZERO IS AT BOTTOM"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 8
NAME           = WINDOW_1_START
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 73
BYTES         = 6
MISSING_CONSTANT = -1
FORMAT         = "I6"
DESCRIPTION     = "START BIN FOR THE FIRST TIME(MASS) WINDOW"
END_OBJECT     = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER  = 9
NAME           = WINDOW_1_STOP
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 80
BYTES         = 6
MISSING_CONSTANT = -1
FORMAT         = "I6"
DESCRIPTION     = "STOP BIN FOR THE FIRST TIME(MASS) WINDOW"
END_OBJECT     = COLUMN

```



```

                                FOR CLEANING
                                NO OPERATION"
END_OBJECT      = NOP
                  = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 15
  NAME          = OUTER_STEP
  DATA_TYPE   = ASCII_INTEGER
  START_BYTE   = 128
  BYTES        = 5
  MISSING_CONSTANT = -9999
  FORMAT       = "I5"
  DESCRIPTION  = "RAW VALUE OF THE PARAMETER STEP, SEE
                  MATCHING HK DATA FOR CALIBRATED VALUE"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 16
  NAME          = INNER_PARAMETER
  DATA_TYPE   = CHARACTER
  START_BYTE   = 135
  BYTES        = 10
  MISSING_CONSTANT = "UNKNOWN"
  FORMAT       = "A10"
  DESCRIPTION  = "THE VARIED PARAMETER DURING THE SCAN.
                  THE POSSIBLE VALUES ARE
                  TOF1      TIME OF FLIGHT 1 VOLTAGE
                  TOF2      TIME OF FLIGHT 2 VOLTAGE
                  TOF3      TIME OF FLIGHT 3 VOLTAGE
                  PA        POST ACCELERATION VOLTAGE
                  DET        DETECTOR VOLTAGE
                  DX_TOF    TOF X DEFLECTOR VOLTAGE
                  DY_TOF    TOF Y DEFLECTOR VOLTAGE
                  L1        PIBS LENS 1 VOLTAGE
                  L2        PIBS LENS 2 VOLTAGE
                  BS1       BEAM SWITCH 1 VOLTAGE
                  BS2       BEAM SWITCH 2 VOLTAGE
                  CB        CHOPPER BUNCHER VOLTAGE
                  DX_PIBS   PIBS X DEFLECTOR VOLTAGE
                  DY_PIBS   PIBS Y DEFLECTOR VOLTAGE
                  TMU_X     TMU X AXIS MOVEMENT
                  TMU_Y     TMU Y AXIS MOVEMENT
                  TMU_CLEAN_X TMU X AXIS MOVEMENT
                              FOR CLEANING
                  TMU_CLEAN_Y TMU Y AXIS MOVEMENT
                              FOR CLEANING
                  NOP
                  NO OPERATION"
END_OBJECT      = NOP
                  = COLUMN

OBJECT          = COLUMN
  COLUMN_NUMBER = 17
  NAME          = INNER_STEP
  DATA_TYPE   = ASCII_INTEGER
  START_BYTE   = 147
  BYTES        = 5
  MISSING_CONSTANT = -9999
  FORMAT       = "I5"
  DESCRIPTION  = "RAW VALUE OF THE PARAMETER STEP, SEE
                  MATCHING HK DATA FOR CALIBRATED VALUE"
END_OBJECT      = COLUMN

```

### 4.3.5 Scan housekeeping data product

#### 4.3.5.1 General description

With each scan step, housekeeping data is associated. The housekeeping product has the following elements:

- Voltages, currents and temperatures means of the instrument during spectrum measurement
- TDC unit timing parameters
- TDC unit calibration results

Detailed contents of the elements are described in the label example below.

#### 4.3.5.2 Label example

```
PDS_VERSION_ID           = PDS3
LABEL_REVISION_NOTE      = "V1.1"

/* FILE FORMAT */
RECORD_TYPE              = FIXED_LENGTH
RECORD_BYTES             = 897
FILE_RECORDS             = 10
LABEL_RECORDS           = 5
/* POINTER TO DATA OBJECT */
^HK_TABLE                = 6
^TDC_TIMING_TABLE        = 7
^TDC_CALIBRATION_TABLE   = 8

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME                = "CS_2D8_20100508T104500_SCHK.TAB"
DATA_SET_ID              = "RO-CAL-COSIMA-3-V3.0"
DATA_SET_NAME            = "ROSETTA-ORBITER CAL COSIMA 3 V3.0"
PRODUCT_ID               = "CS_2D8_20100508T104500_SCHK"
PRODUCT_CREATION_TIME    = 2010-08-28T15:13:27
PRODUCT_TYPE             = "ANCDR"
PROCESSING_LEVEL_ID      = "6"
MISSION_ID               = "ROSETTA"
MISSION_NAME             = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME       = "CRUISE 5"
INSTRUMENT_HOST_ID      = "RO"
INSTRUMENT_HOST_NAME    = "ROSETTA-ORBITER"
INSTRUMENT_ID           = "COSIMA"
INSTRUMENT_NAME         = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE         = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID      = "SPECTRUM"
INSTRUMENT_MODE_DESC    = "TIME OF FLIGHT MASS SPECTRUM MEASUREMENT"
TARGET_NAME             = "CALIBRATION"
TARGET_TYPE             = "CALIBRATION"
START_TIME               = 2010-05-08T10:45:00
STOP_TIME                = 2010-05-08T10:59:19
SPACECRAFT_CLOCK_START_COUNT = "1/0231936259.28265"
SPACECRAFT_CLOCK_STOP_COUNT = "1/0231937118.28261"
SC_SUN_POSITION_VECTOR   = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE     = "N/A"
SUB_SPACECRAFT_LATITUDE = "N/A"
SUB_SPACECRAFT_LONGITUDE = "N/A"
PRODUCER_ID             = "FMI"
PRODUCER_FULL_NAME      = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID         = -1
DATA_QUALITY_DESC       = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"
ROSETTA: COSIMA_SPECTRUM_POL = "NEGATIVE"

OBJECT                   = HK_TABLE
  NAME                   = HOUSEKEEPING
  INTERCHANGE_FORMAT     = ASCII
  ROWS                   = 1
  COLUMNS               = 112
  ROW_BYTES              = 897
  ^STRUCTURE             = "COSIMA_SPECTRUM_HK.FMT"
  DESCRIPTION            = "COSIMA SPECTRUM HOUSEKEEPING INFORMATION,
  INCLUDING VOLTAGES, CURRENTS AND
  TEMPERATURES"
END_OBJECT              = HK_TABLE

OBJECT                   = TDC_TIMING_TABLE
  NAME                   = TDC_TIMING
  INTERCHANGE_FORMAT     = ASCII
  ROWS                   = 1
  COLUMNS               = 7
  ROW_BYTES              = 897
```

```

^STRUCTURE           = "COSIMA_SPECTRUM_TDC_TIMING.FMT"
DESCRIPTION          = "TIME TO DIGITAL UNIT TIMING PARAMETERS"
END_OBJECT           = TDC_TIMING_TABLE

OBJECT               = TDC_CALIBRATION_TABLE
NAME                 = TDC_CALIBRATION
INTERCHANGE_FORMAT  = ASCII
ROWS                 = 3
COLUMNS             = 5
ROW_BYTES            = 897
^STRUCTURE           = "COSIMA_SPECTRUM_TDC_CALIB.FMT"
DESCRIPTION          = "TIME TO DIGITAL UNIT CALIBRATION RESULTS"
END_OBJECT           = TDC_CALIBRATION_TABLE
END

```

### 4.3.6 Heating data product

#### 4.3.6.1 General description

The substrate heating curve is given

Detailed contents of the elements are described in the label example below.

#### 4.3.6.2 Label example

```

PDS_VERSION_ID      = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 25
FILE_RECORDS         = 137
LABEL_RECORDS        = 125
/* POINTER TO DATA OBJECTS */
^HEATING_SETUP_TABLE = 126
^HEATING_TABLE       = 127

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME            = "CS_2D8_20090930T051206_HEAT.TAB"
DATA_SET_ID          = "RO-CAL-COSIMA-3-V2.0"
DATA_SET_NAME        = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID           = "CS_2D8_20090930T051206_HEAT"
PRODUCT_CREATION_TIME = 2010-07-18T09:23:10
PRODUCT_TYPE         = "REFDR"
PROCESSING_LEVEL_ID  = "3"
MISSION_ID           = "ROSETTA"
MISSION_NAME         = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME   = "EARTH SWING-BY 3"
INSTRUMENT_HOST_ID   = "RO"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"
INSTRUMENT_ID        = "COSIMA"
INSTRUMENT_NAME      = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE      = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID   = "CHEMISTRY"
INSTRUMENT_MODE_DESC = "SUBSTRATE HEATING"
TARGET_NAME          = "CALIBRATION"
TARGET_TYPE          = "CALIBRATION"
START_TIME           = 2009-09-30T05:12:06
STOP_TIME            = 2009-09-30T05:22:10
SPACECRAFT_CLOCK_START_COUNT = ""
SPACECRAFT_CLOCK_STOP_COUNT   = ""
SC_SUN_POSITION_VECTOR         = "N/A"
SC_TARGET_POSITION_VECTOR      = "N/A"
SC_TARGET_VELOCITY_VECTOR     = "N/A"
SPACECRAFT_ALTITUDE            = "N/A"
SUB_SPACECRAFT_LATITUDE       = "N/A"
SUB_SPACECRAFT_LONGITUDE      = "N/A"
PRODUCER_ID                    = "FMI"
PRODUCER_FULL_NAME             = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME     = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID                = -1
DATA_QUALITY_DESC              = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID    = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC  = "Silver, blank"

```



```

OBJECT          = HEATING_SETUP_TABLE
NAME            = HEATING_SETUP
INTERCHANGE_FORMAT = ASCII
ROWS           = 1
COLUMNS       = 1
ROW_BYTES      = 25
^STRUCTURE     = "COSIMA_HEATING_SETUP.FMT"
DESCRIPTION    = "COSIMA SUBSTRATE HEATING SETUP"
END_OBJECT     = HEATING_SETUP_TABLE

OBJECT          = HEATING_TABLE
NAME            = HEATING_POINTS
INTERCHANGE_FORMAT = ASCII
ROWS           = 12
COLUMNS       = 4
ROW_BYTES      = 25
^STRUCTURE     = "COSIMA_HEATING_DATA.FMT"
DESCRIPTION    = "COSIMA SUBSTRATE HEATING DATA POINTS"
END_OBJECT     = HEATING_TABLE

END

```

### COSIMA\_HEATING\_SETUP.FMT

```

OBJECT          = COLUMN
COLUMN_NUMBER   = 1
NAME            = HEAT_TIME
DATA_TYPE       = ASCII_INTEGER
START_BYTE     = 1
BYTES          = 11
MISSING_CONSTANT = -999999999
UNIT            = "SECOND"
FORMAT         = "I11"
DESCRIPTION    = "HEATING TIME IN SECONDS"
END_OBJECT     = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER   = 2
NAME            = HEAT_LEVEL
DATA_TYPE       = ASCII_INTEGER
START_BYTE     = 13
BYTES          = 1
MISSING_CONSTANT = 9
FORMAT         = "I1"
DESCRIPTION    = "HEAT_SETUP
                0 = 66 C
                1 = 77 C
                2 = 86 C
                3 = 94 C
                4 = 104 C
                5 = 113 C
                6 = 122 C
                7 = 132 C"
END_OBJECT     = COLUMN

```

### COSIMA\_HEATING\_DATA.FMT

```

OBJECT          = COLUMN
COLUMN_NUMBER   = 1
NAME            = TMU_2_TEMPERATURE
DATA_TYPE       = ASCII_REAL
START_BYTE     = 1
BYTES          = 5
MISSING_CONSTANT = 999.9
UNIT            = "KELVIN"
FORMAT         = "F5.1"
DESCRIPTION    = "T TMU2 TARGET MANIPULATOR TEMPERATURE
                AT THE CHEMISTRY(HEATING) STATION"
END_OBJECT     = COLUMN

```

```

OBJECT          = COLUMN
COLUMN_NUMBER   = 2
NAME            = TMU_1_TEMPERATURE
DATA_TYPE       = ASCII_REAL
START_BYTE     = 7

```

```

    BYTES = 5
    MISSING_CONSTANT = 999.9
    UNIT = "KELVIN"
    FORMAT = "F5.1"
    DESCRIPTION = "T_TMU1 TARGET MANIPULATOR TEMPERATURE
                  AT THE SUBSTRATE STORAGE"
END_OBJECT = COLUMN

OBJECT = COLUMN
  COLUMN_NUMBER = 3
  NAME = TMU_2_RAW_TEMPERATURE
  DATA_TYPE = ASCII_REAL
  START_BYTE = 13
  BYTES = 5
  MISSING_CONSTANT = 99999
  UNIT = "KELVIN"
  FORMAT = "I5"
  DESCRIPTION = "RAW T_TMU2 TARGET MANIPULATOR TEMPERATURE
                AT THE CHEMISTRY(HEATING) STATION"
END_OBJECT = COLUMN

OBJECT = COLUMN
  COLUMN_NUMBER = 4
  NAME = TMU_1_RAW_TEMPERATURE
  DATA_TYPE = ASCII_REAL
  START_BYTE = 19
  BYTES = 5
  MISSING_CONSTANT = 99999
  UNIT = "KELVIN"
  FORMAT = "I5"
  DESCRIPTION = "RAW T_TMU1 TARGET MANIPULATOR TEMPERATURE
                AT THE SUBSTRATE STORAGE"
END_OBJECT = COLUMN

```

### 4.3.7 Cleaning data product

#### 4.3.7.1 General description

The cleaning product contains the following elements:

- time used
- emitter tip current housekeeping data

Detailed contents of the elements are described in the label example below.

#### Label example

```

PDS_VERSION_ID = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 45
FILE_RECORDS = 131185
LABEL_RECORDS = 112
/* POINTER TO DATA OBJECTS */
^CLEANING_TABLE = 113

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME = "CS_2D8_20070927T182348_CLEA.TAB"
DATA_SET_ID = "RO-CAL-COSIMA-3-V2.0"
DATA_SET_NAME = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID = "CS_2D8_20070927T182348_CLEA.TAB"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:39
PRODUCT_TYPE = "REFDR"
PROCESSING_LEVEL_ID = "3"
MISSION_ID = "ROSETTA"
MISSION_NAME = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME = "EARTH SWING-BY 2"
INSTRUMENT_HOST_ID = "RO"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"

```

```

INSTRUMENT_ID           = "COSIMA"
INSTRUMENT_NAME        = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE        = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID     = "CLEANING"
INSTRUMENT_MODE_DESC   = "SUBSTRATE CLEANING WITH ION BEAM"
TARGET_NAME            = "CALIBRATION"
TARGET_TYPE            = "CALIBRATION"
START_TIME              = 2007-09-27T18:23:48
STOP_TIME               = 2007-09-27T18:33:53
SPACECRAFT_CLOCK_START_COUNT = "1/0149538196.41251"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/0149538801.41245"
SC_SUN_POSITION_VECTOR   = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE     = "N/A"
SUB_SPACECRAFT_LATITUDE = "N/A"
SUB_SPACECRAFT_LONGITUDE = "N/A"
PRODUCER_ID             = "FMI"
PRODUCER_FULL_NAME      = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID         = -1
DATA_QUALITY_DESC       = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"
ROSETTA: COSIMA_SUBSTRATE_X = 5000
ROSETTA: COSIMA_SUBSTRATE_Y = 5000

```

```

OBJECT                  = CLEANING_TABLE
  NAME                  = CLEANING
  INTERCHANGE_FORMAT    = ASCII
  ROWS                  = 1
  COLUMNS              = 5
  ROW_BYTES             = 45
  ^STRUCTURE            = "COSIMA_CLEANING.FMT"
  DESCRIPTION           = "COSIMA SUBSTRATE CLEANING"
END_OBJECT              = CLEANING_TABLE

```

END

### COSIMA\_CLEANING.FMT

```

OBJECT                  = COLUMN
  COLUMN_NUMBER         = 1
  NAME                  = CLEANING_TIME
  DATA_TYPE            = ASCII_INTEGER
  START_BYTE           = 1
  BYTES                 = 11
  MISSING_CONSTANT     = 9999999999
  UNIT                  = "SECOND"
  FORMAT                = "I11"
  DESCRIPTION           = "SUBSTRATE CLEANIG TIME WITH INDIUM BEAM"
END_OBJECT              = COLUMN

```

```

OBJECT                  = COLUMN
  COLUMN_NUMBER         = 2
  NAME                  = "C_TIP_MIN"
  DATA_TYPE            = ASCII_REAL
  START_BYTE           = 13
  BYTES                 = 7
  UNIT                  = "MICROAMPERE"
  MISSING_CONSTANT     = 99999.9
  FORMAT                = "F7.1"
  DESCRIPTION           = "C_TIP TIP CURRENT MINIMUM,
                          IN THE PRIMARY ION SOURCE"
END_OBJECT              = COLUMN

```

```

OBJECT                  = COLUMN
  COLUMN_NUMBER         = 3
  NAME                  = "C_TIP_MEAN"
  DATA_TYPE            = ASCII_REAL
  START_BYTE           = 21
  BYTES                 = 7
  UNIT                  = "MICROAMPERE"
  MISSING_CONSTANT     = 99999.9
  FORMAT                = "F7.1"

```

```

DESCRIPTION          = "C_TIP TIP CURRENT MEAN,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 4
NAME                 = "C_TIP_MAX"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 29
BYTES                = 7
UNIT                 = "MICROAMPERE"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "C_TIP TIP CURRENT MAXIMUM,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 5
NAME                 = "C_TIP_STD"
DATA_TYPE            = ASCII_REAL
START_BYTE           = 37
BYTES                = 7
UNIT                 = "MICROAMPERE"
MISSING_CONSTANT     = 99999.9
FORMAT               = "F7.1"
DESCRIPTION          = "C_TIP TIP VOLTAGE STANDARD DEVIATION,
                        IN THE PRIMARY ION SOURCE"
END_OBJECT           = COLUMN

```

#### 4.3.8 Cleaning housekeeping data product

##### 4.3.8.1 General description

With each cleaning operation housekeeping data is associated. The housekeeping product has the following elements:

- Voltages, currents and temperatures of the instrument during spectrum measurement

Detailed contents of the elements are described in the label example below.

##### 4.3.8.2 Label example

```

PDS_VERSION_ID      = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE          = FIXED_LENGTH
RECORD_BYTES         = 897
FILE_RECORDS         = 11
LABEL_RECORDS        = 5
/* POINTER TO DATA OBJECT */
^HK_TABLE            = 6

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME            = "CS_2D8_20070927T182348_CLHK.TAB"
DATA_SET_ID          = "R0-CAL-COSIMA-3-V2.0"
DATA_SET_NAME        = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID           = "CS_2D8_20070927T182348_CLHK"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:38
PRODUCT_TYPE         = "ANCDR"
PROCESSING_LEVEL_ID  = "6"
MISSION_ID           = "ROSETTA"
MISSION_NAME         = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME   = "EARTH SWING-BY 2"
INSTRUMENT_HOST_ID   = "R0"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"
INSTRUMENT_ID        = "COSIMA"
INSTRUMENT_NAME      = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE      = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID   = "CLEANING"
INSTRUMENT_MODE_DESC = "SUBSTRATE CLEANING WITH ION BEAM"
TARGET_NAME          = "CALIBRATION"

```

```

TARGET_TYPE = "CALIBRATION"
START_TIME = 2007-09-27T18:23:48
STOP_TIME = 2007-09-27T18:33:53
SPACECRAFT_CLOCK_START_COUNT = "1/0149538196.41251"
SPACECRAFT_CLOCK_STOP_COUNT = "1/0149538801.41245"
SC_SUN_POSITION_VECTOR = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE = "N/A"
SUB_SPACECRAFT_LATITUDE = "N/A"
SUB_SPACECRAFT_LONGITUDE = "N/A"
PRODUCER_ID = "FMI"
PRODUCER_FULL_NAME = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID = -1
DATA_QUALITY_DESC = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"
ROSETTA: COSIMA_SUBSTRATE_X = 5000
ROSETTA: COSIMA_SUBSTRATE_Y = 5000

OBJECT = HK_TABLE
NAME = HOUSEKEEPING
INTERCHANGE_FORMAT = ASCII
ROWS = 1
COLUMNS = 112
ROW_BYTES = 897
^STRUCTURE = "COSIMA_SPECTRUM_HK.FMT"
DESCRIPTION = "COSIMA SPECTRUM HOUSEKEEPING INFORMATION,
INCLUDING VOLTAGES, CURRENTS AND
TEMPERATURES"

END_OBJECT = HK_TABLE

```

### 4.3.9 COSISCOPE image product

#### 4.3.9.1 General description

COSISCOPE image contains an image of target substrate in FITS format. P or M in the end of the product ID corresponds to the led illumination from Plus side (right) or Minus side (left).

#### 4.3.9.2 Label example

```

PDS_VERSION_ID = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 2880
FILE_RECORDS = 730
/* POINTER TO DATA OBJECTS */
^COSISCOPE_FITS_HEADER = ("CS_2D8_20080722T171038_IM_M.LBL",1<BYTES>)
^COSISCOPE_FITS_IMAGE = ("CS_2D8_20080722T171038_IM_M.LBL",2881<BYTES>)

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME = "CS_2D8_20080722T171038_IM_M.LBL"
DATA_SET_ID = "RO-CAL-COSIMA-3-V2.0"
DATA_SET_NAME = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID = "CS_2D8_20080722T171038_IM_M"
PRODUCT_CREATION_TIME = 2010-07-18T09:22:20
PRODUCT_TYPE = "REFDR"
PROCESSING_LEVEL_ID = "3"
MISSION_ID = "ROSETTA"
MISSION_NAME = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME = "STEINS FLY-BY"
INSTRUMENT_HOST_ID = "RO"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"
INSTRUMENT_ID = "COSIMA"
INSTRUMENT_NAME = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID = "IMAGE"
INSTRUMENT_MODE_DESC = "COSISCOPE IMAGING"
TARGET_NAME = "CALIBRATION"
TARGET_TYPE = "CALIBRATION"

```

```

START_TIME = 2008-07-22T17:10:38
STOP_TIME = 2008-07-22T17:14:16
SPACECRAFT_CLOCK_START_COUNT = ""
SPACECRAFT_CLOCK_STOP_COUNT = ""
SC_SUN_POSITION_VECTOR = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE = "N/A"
SUB_SPACECRAFT_LATITUDE = "N/A"
SUB_SPACECRAFT_LONGITUDE = "N/A"
PRODUCER_ID = "FMI"
PRODUCER_FULL_NAME = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID = -1
DATA_QUALITY_DESC = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"

OBJECT = COSISCOPE_FITS_HEADER
  BYTES = 2880
  HEADER_TYPE = FITS
  INTERCHANGE_FORMAT = BINARY
  RECORDS = 1
  DESCRIPTION = "COSISCOPE FITS IMAGE HEADER"
END_OBJECT = COSISCOPE_FITS_HEADER

OBJECT = COSISCOPE_FITS_IMAGE
  LINES = 1024
  LINE_SAMPLES = 1024
  SAMPLE_TYPE = MSB_INTEGER
  SAMPLE_BITS = 16
  AXIS_ORDER_TYPE = "FIRST_INDEX_FASTEST"
  LINE_DISPLAY_DIRECTION = "UP"
  SAMPLE_DISPLAY_DIRECTION = "RIGHT"
  MISSING_CONSTANT = -1
  DESCRIPTION = "COSISCOPE FITS IMAGE OF THE SUBSTRATE"
END_OBJECT = COSISCOPE_FITS_IMAGE

END

```

#### 4.3.10 COSISCOPE dust grain list product

##### 4.3.10.1 General description

COSISCOPE dust grain list can be associated with a Cosiscope image product, or it can be self-standing. Dust grain list product contains a list of dust grains (also called features) found on a target substrate.

##### 4.3.10.2 Label template

```

PDS_VERSION_ID = PDS3
LABEL_REVISION_NOTE = "V1.0"

/* FILE FORMAT */
RECORD_TYPE = FIXED_LENGTH
RECORD_BYTES = 37
FILE_RECORDS = 6542
LABEL_RECORDS = 78
/* POINTER TO DATA OBJECT */
^FEATURE_TABLE = 79

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME = "CS_2D8_20070927T175457_GR__.TAB"
DATA_SET_ID = "R0-CAL-COSIMA-3-V2.0"
DATA_SET_NAME = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID = "CS_2D8_20070927T175457_GR__"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:37
PRODUCT_TYPE = "REFDR"
PROCESSING_LEVEL_ID = "3"
MISSION_ID = "ROSETTA"
MISSION_NAME = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME = "EARTH SWING-BY 2"
INSTRUMENT_HOST_ID = "R0"

```

```

INSTRUMENT_HOST_NAME      = "ROSETTA-ORBITER"
INSTRUMENT_ID            = "COSIMA"
INSTRUMENT_NAME          = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE          = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID       = "IMAGE"
INSTRUMENT_MODE_DESC     = "COSISCOPE IMAGING"
TARGET_NAME              = "CALIBRATION"
TARGET_TYPE              = "CALIBRATION"
START_TIME               = 2007-09-27T17:54:57
STOP_TIME                = 2007-09-27T17:55:20
SPACECRAFT_CLOCK_START_COUNT = "1/0149536465.41269"
SPACECRAFT_CLOCK_STOP_COUNT  = "1/0149536488.41269"
SC_SUN_POSITION_VECTOR    = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE       = "N/A"
SUB_SPACECRAFT_LATITUDE   = "N/A"
SUB_SPACECRAFT_LONGITUDE  = "N/A"
PRODUCER_ID              = "FMI"
PRODUCER_FULL_NAME        = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID          = -1
DATA_QUALITY_DESC        = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID   = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"

OBJECT                   = FEATURE_TABLE
  NAME                   = FEATURES
  INTERCHANGE_FORMAT     = ASCII
  ROWS                   = 6464
  COLUMNS               = 6
  ROW_BYTES              = 37
  ^STRUCTURE             = "COSISCOPE_GRAINS.FMT"
  DESCRIPTION            = "COSISCOPE GENERATED LIST OF PROMINENT
                           FEATURES IN THE SUBSTRATE IMAGE. THE
                           SUBSTRATE HAS AREA OF 10000X10000
                           MICROMETERS."

END_OBJECT              = FEATURE_TABLE

END

```

COSISCOPE\_GRAINS.FMT:

```

OBJECT                   = COLUMN
  COLUMN_NUMBER          = 1
  NAME                   = X_LEFT
  DATA_TYPE             = ASCII_INTEGER
  START_BYTE            = 1
  BYTES                  = 6
  UNIT                   = "MICROMETER"
  FORMAT                 = I6
  DESCRIPTION            = "FEATURE LOWER LEFT X-COORDINATE"
END_OBJECT              = COLUMN
OBJECT                  = COLUMN
  COLUMN_NUMBER          = 2
  NAME                   = Y_BOTTOM
  DATA_TYPE             = ASCII_INTEGER
  START_BYTE            = 8
  BYTES                  = 6
  UNIT                   = "MICROMETER"
  FORMAT                 = I6
  DESCRIPTION            = "FEATURE LOWER LEFT Y-COORDINATE"
END_OBJECT              = COLUMN
OBJECT                  = COLUMN
  COLUMN_NUMBER          = 3
  NAME                   = X_RIGHT
  DATA_TYPE             = ASCII_INTEGER
  START_BYTE            = 15
  BYTES                  = 6
  UNIT                   = "MICROMETER"
  FORMAT                 = I6
  DESCRIPTION            = "FEATURE UPPER RIGHT X-COORDINATE"
END_OBJECT              = COLUMN
OBJECT                  = COLUMN

```

```

COLUMN_NUMBER      = 4
NAME               = Y_TOP
DATA_TYPE         = ASCII_INTEGER
START_BYTE       = 22
BYTES            = 6
UNIT             = "MICROMETER"
FORMAT          = I6
DESCRIPTION      = "FEATURE UPPER RIGHT Y-COORDINATE"
END_OBJECT       = COLUMN
OBJECT          = COLUMN
COLUMN_NUMBER    = 5
NAME            = QUALITY_PX
DATA_TYPE      = ASCII_INTEGER
START_BYTE    = 29
BYTES        = 3
FORMAT      = I3
MISSING_CONSTANT = 0
DESCRIPTION = "FEATURE QUALITY FROM +X-SIDE LED
ILLUMINATION. THE QUALITY FROM 0 TO 255
IS MAINLY RELATED TO THE CONTRAST FROM
THE BACKGROUND"
END_OBJECT     = COLUMN
OBJECT        = COLUMN
COLUMN_NUMBER  = 6
NAME          = QUALITY_MX
DATA_TYPE    = ASCII_INTEGER
START_BYTE  = 33
BYTES      = 3
FORMAT    = I3
MISSING_CONSTANT = 0
DESCRIPTION = "FEATURE QUALITY FROM -X-SIDE LED
ILLUMINATION. THE QUALITY FROM 0 TO 255
IS MAINLY RELATED TO THE CONTRAST FROM
THE BACKGROUND"
END_OBJECT    = COLUMN

```

#### 4.3.11 COSISCOPE housekeeping product

##### 4.3.11.1 General information

With each Cosicope grain list, housekeeping data is associated. If the grain list has a corresponding Cosicope image, the housekeeping data applies also to that image. The Cosicope housekeeping product has the following elements:

- Cosicope temperatures
- Substrate positioning information
- Imaging information

Detailed description of the Cosicope housekeeping product is given in the label example.

##### 4.3.11.2 Label example

```

PDS_VERSION_ID      = PDS3
LABEL_REVISION_NOTE = "V1.0"
RELEASE_ID          = 0001
REVISION_ID         = 0000

/* FILE FORMAT */
RECORD_TYPE        = FIXED_LENGTH
RECORD_BYTES      = 334
FILE_RECORDS      = 10
LABEL_RECORDS     = 9
/* POINTER TO DATA OBJECT */
^COSISCOPE_HK_TABLE = 10

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME          = "CS_2D8_20070927T175457_G_HK.TAB"
DATA_SET_ID       = "R0-CAL-COSIMA-3-V2.0"
DATA_SET_NAME     = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID       = "CS_2D8_20070927T175457_G_HK"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:37
PRODUCT_TYPE     = "ANCDR"

```



PROCESSING\_LEVEL\_ID = "6"  
 MISSION\_ID = "ROSETTA"  
 MISSION\_NAME = "INTERNATIONAL ROSETTA MISSION"  
 MISSION\_PHASE\_NAME = "EARTH SWING-BY 2"  
 INSTRUMENT\_HOST\_ID = "RO"  
 INSTRUMENT\_HOST\_NAME = "ROSETTA-ORBITER"  
 INSTRUMENT\_ID = "COSIMA"  
 INSTRUMENT\_NAME = "COMETARY SECONDARY ION MASS ANALYZER"  
 INSTRUMENT\_TYPE = "MASS SPECTROMETER"  
 INSTRUMENT\_MODE\_ID = "IMAGE"  
 INSTRUMENT\_MODE\_DESC = "COSISCOPE IMAGING"  
 TARGET\_NAME = "CALIBRATION"  
 TARGET\_TYPE = "CALIBRATION"  
 START\_TIME = 2007-09-27T17:54:57  
 STOP\_TIME = 2007-09-27T17:55:20  
 SPACECRAFT\_CLOCK\_START\_COUNT = "1/0149536465.41269"  
 SPACECRAFT\_CLOCK\_STOP\_COUNT = "1/0149536488.41269"  
 SC\_SUN\_POSITION\_VECTOR = "N/A"  
 SC\_TARGET\_POSITION\_VECTOR = "N/A"  
 SC\_TARGET\_VELOCITY\_VECTOR = "N/A"  
 SPACECRAFT\_ALTITUDE = "N/A"  
 SUB\_SPACECRAFT\_LATITUDE = "N/A"  
 SUB\_SPACECRAFT\_LONGITUDE = "N/A"  
 PRODUCER\_ID = "FMI"  
 PRODUCER\_FULL\_NAME = "JOHAN SILEN"  
 PRODUCER\_INSTITUTION\_NAME = "FINNISH METEOROLOGICAL INSTITUTE"  
 DATA\_QUALITY\_ID = -1  
 DATA\_QUALITY\_DESC = "-1 = not checked"  
 ROSETTA: COSIMA\_SUBSTRATE\_ID = "2D8"  
 ROSETTA: COSIMA\_SUBSTRATE\_DESC = "Silver, blank"

OBJECT = COSISCOPE\_HK\_TABLE  
 NAME = COSISCOPE\_HOUSEKEEPING  
 INTERCHANGE\_FORMAT = ASCII  
 ROWS = 1  
 COLUMNS = 55  
 ROW\_BYTES = 334  
 ^STRUCTURE = "COSISCOPE\_HK.FMT"  
 DESCRIPTION = "COSISCOPE HOUSEKEEPING INFORMATION"  
 END\_OBJECT = COSISCOPE\_HK\_TABLE

END

COSISCOPE\_HK.FMT:

OBJECT = COLUMN  
 COLUMN\_NUMBER = 1  
 NAME = "T1\_SCOPE\_MIN"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 1  
 BYTES = 7  
 UNIT = "DEGREE KELVIN"  
 MISSING\_CONSTANT = 999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "T1\_SCOPE COSISCOPE TEMPERATURE MINIMUM AT CAMERA"  
 END\_OBJECT = COLUMN

OBJECT = COLUMN  
 COLUMN\_NUMBER = 2  
 NAME = "T1\_SCOPE\_MEAN"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 9  
 BYTES = 7  
 UNIT = "DEGREE KELVIN"  
 MISSING\_CONSTANT = 999.9  
 FORMAT = "F7.1"  
 DESCRIPTION = "T1\_SCOPE COSISCOPE TEMPERATURE MEAN AT CAMERA"  
 END\_OBJECT = COLUMN

OBJECT = COLUMN  
 COLUMN\_NUMBER = 3  
 NAME = "T1\_SCOPE\_MAX"  
 DATA\_TYPE = ASCII\_REAL  
 START\_BYTE = 17

BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T1\_SCOPE COSISCOPE TEMPERATURE MAXIMUM AT CAMERA"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 4  
NAME = "T1\_SCOPE\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 25  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T1\_SCOPE COSISCOPE TEMPERATURE STANDARD DEVIATION  
AT CAMERE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 5  
NAME = "T3\_SCOPE\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 33  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T3\_SCOPE COSISCOPE TEMPERATURE MINIMUM AT CDPU"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 6  
NAME = "T3\_SCOPE\_MEAN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 41  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T3\_SCOPE COSISCOPE TEMPERATURE MEAN AT CDPU"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 7  
NAME = "T3\_SCOPE\_MAX"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 49  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T3\_SCOPE COSISCOPE TEMPERATURE MAXIMUM AT CDPU"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 8  
NAME = "T3\_SCOPE\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 57  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T3\_SCOPE COSISCOPE TEMPERATURE STANDARD DEVIATION  
AT CDPU"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 9  
NAME = "T4\_SCOPE\_MIN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 65

BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T4\_SCOPE COSISCOPE TEMPERATURE MINIMUM AT OPTICS"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 10  
NAME = "T4\_SCOPE\_MEAN"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 73  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T4\_SCOPE COSISCOPE TEMPERATURE MEAN AT OPTICS"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 11  
NAME = "T4\_SCOPE\_MAX"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 81  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T4\_SCOPE COSISCOPE TEMPERATURE MAXIMUM AT OPTICS"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 12  
NAME = "T4\_SCOPE\_STD"  
DATA\_TYPE = ASCII\_REAL  
START\_BYTE = 89  
BYTES = 7  
UNIT = "DEGREE KELVIN"  
MISSING\_CONSTANT = 999.9  
FORMAT = "F7.1"  
DESCRIPTION = "T4\_SCOPE COSISCOPE TEMPERATURE STANDARD DEVIATION  
AT OPTICS"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 13  
NAME = MODE  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 97  
BYTES = 1  
FORMAT = "I1"  
DESCRIPTION = "0 = ONLY GRAINS INFORMATION,  
1 = ONE OR TWO COMPRESSED IMAGES ARE ALSO  
GENERATED DEPENDING ON THE COMMAND WORD"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 14  
NAME = CCD\_CLEAN  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 99  
BYTES = 1  
FORMAT = "I1"  
DESCRIPTION = "NUMBER OF ADDITIONAL CLEAN IMAGES WHICH HAVE BEEN  
PROGRAMMED TO GET RID OF ACCUMULATED CHARGES ON  
THE CCD. NOMINAL IS 0 FROM -20 CELSIUS DEGREE TO  
+25 CELSIUS DEGREE OPERATING TEMPERATURE"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 15  
NAME = DARK  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 101

```

BYTES = 1
FORMAT = "I1"
DESCRIPTION = "0=NO DARK CURRENT SUBTRACTION,
1=DARK CURRENT SUBTRACTION
THIS PARAMETER DEFINES WHETHER A DARK CURRENT IMAGE
WAS TO BE SUBTRACTED FROM THE COSISCOPE IMAGE
BEFORE THE IMPLEMENTATION OF THE GRAIN SEARCH
ALGORITHM AND (IF REQUIRED BY THE COMMAND)
THE TRANSMISSION OF THE IMAGE(S)"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 16
NAME = DETECTION
DATA_TYPE = ASCII_INTEGER
START_BYTE = 103
BYTES = 1
FORMAT = "I1"
DESCRIPTION = "0 = GRAINS ARE SEARCHED FOR AS POSITIVE ALBEDO
CONTRASTS
1 = EACH LINE (TOWARDS THE LED) IS FIRST
DIFFERENTIATED, THEN GRAINS ARE SEARCHED FOR
AS PEAKS IN THE DIFFERENTIALS"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 17
NAME = THRESHOLD
DATA_TYPE = ASCII_INTEGER
START_BYTE = 105
BYTES = 1
FORMAT = "I1"
DESCRIPTION = "THE DETECTION LEVEL (0 TO 7) DEFINE THE FACTOR
ABOVE THE BACKGROUND, WHICH CONSTITUTES A DETECTION
FOR VALUES 1 TO 7 FACTORS 5,6,7,8,10,12,16.
A VALUE OF 0 GENERATES A TEST IMAGE WHICH IS
PROCESSED NOMINALLY."
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 18
NAME = PACKING
DATA_TYPE = ASCII_INTEGER
START_BYTE = 107
BYTES = 1
FORMAT = "I1"
DESCRIPTION = "IMAGE COMPRESSION MODE (0 TO 3)
0: BIT-PACKING (10 BITS / PIXELS)
1: REVERSIBLE COMPRESSION
2: WAVELET COMPRESSION, 1 BIT/PIXEL
3: WAVELET COMPRESSION, 2 BITS/PIXEL"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 19
NAME = MINUS_X_LED
DATA_TYPE = ASCII_INTEGER
START_BYTE = 109
BYTES = 1
FORMAT = "I1"
DESCRIPTION = "0,1,2,4 =NO -X LED USED, 3,5,6,7=-X LED USED"
END_OBJECT = COLUMN

OBJECT = COLUMN
COLUMN_NUMBER = 20
NAME = PLUS_X_LED
DATA_TYPE = ASCII_INTEGER
START_BYTE = 111
BYTES = 1
FORMAT = "I1"
DESCRIPTION = "0,1,2,4=NO +X LED USED, 3,5,6,7=+X LED USED"
END_OBJECT = COLUMN

OBJECT = COLUMN

```

```

COLUMN_NUMBER      = 21
NAME               = PLUS_X_LED_ACQ_TIME
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 113
BYTES             = 5
UNIT              = "MILLISECOND"
FORMAT            = "I5"
DESCRIPTION        = "PLUS X LED ACQUISITION TIME IN MS, DEFAULT 300 MS"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 22
NAME              = MINUS_X_LED_ACQ_TIME
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 119
BYTES             = 5
UNIT              = "MILLISECOND"
FORMAT            = "I5"
DESCRIPTION        = "MINUS X LED ACQUISITION TIME IN MS, DEFAULT 300 MS"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 23
NAME              = PLUS_X_LED_BIAS
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 125
BYTES             = 3
FORMAT            = "I3"
DESCRIPTION        = "PLUS X LED BIAS"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 24
NAME              = MINUS_X_LED_BIAS
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 129
BYTES             = 3
FORMAT            = "I3"
DESCRIPTION        = "MINUS X LED BIAS"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 25
NAME              = PLUS_X_LED_GAIN
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 133
BYTES             = 3
FORMAT            = "I3"
DESCRIPTION        = "PLUS X LED GAIN"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 26
NAME              = MINUS_X_LED_GAIN
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 137
BYTES             = 3
FORMAT            = "I3"
DESCRIPTION        = "MINUS X LED GAIN"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 27
NAME              = PLUS_X_CAL_QUALITY
DATA_TYPE         = ASCII_INTEGER
START_BYTE        = 141
BYTES             = 5
FORMAT            = "I5"
MISSING_CONSTANT  = 43960
DESCRIPTION        = "PLUS X LED CALIBRATION STRIP POSITION QUALITY"
END_OBJECT

OBJECT            = COLUMN
COLUMN_NUMBER     = 28

```

```

NAME                = PLUS_X_AX
DATA_TYPE           = ASCII_INTEGER
START_BYTE          = 147
BYTES               = 5
FORMAT              = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION         = "PLUS X LED A DOT X POSITION"
END_OBJECT

OBJECT              = COLUMN
COLUMN_NUMBER       = 29
NAME                = PLUS_X_AY
DATA_TYPE           = ASCII_INTEGER
START_BYTE          = 153
BYTES               = 5
FORMAT              = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION         = "PLUS X LED A DOT Y POSITION"
END_OBJECT

OBJECT              = COLUMN
COLUMN_NUMBER       = 30
NAME                = PLUS_X_BX
DATA_TYPE           = ASCII_INTEGER
START_BYTE          = 159
BYTES               = 5
FORMAT              = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION         = "PLUS X LED B DOT X POSITION"
END_OBJECT

OBJECT              = COLUMN
COLUMN_NUMBER       = 31
NAME                = PLUS_X_BY
DATA_TYPE           = ASCII_INTEGER
START_BYTE          = 165
BYTES               = 5
FORMAT              = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION         = "PLUS X LED B DOT Y POSITION"
END_OBJECT

OBJECT              = COLUMN
COLUMN_NUMBER       = 32
NAME                = PLUS_X_LABEL
DATA_TYPE           = ASCII_INTEGER
START_BYTE          = 171
BYTES               = 5
FORMAT              = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION         = "PLUS X LED SUBSTRATE LABEL
                    THE SUBSTRATE ID:S MATCH THE SUBSTRATE LABELS
                    IN THE REFERENCE STRIP WITH THE FOLLOWING TABLE:
                    1C1 = 63
                    2C1 = 95
                    3C1 = 111
                    1C2 = 119
                    2C2 = 123
                    3C2 = 125
                    1C3 = 126
                    2C3 = 159
                    3C3 = 175
                    1C4 = 183
                    2C4 = 187
                    3C4 = 189
                    1C5 = 190
                    2C5 = 207
                    3C5 = 215
                    1C6 = 219
                    2C6 = 221
                    3C6 = 222
                    1C7 = 231
                    2C7 = 235
                    3C7 = 237"

```

1C8 = 238  
2C8 = 243  
3C8 = 245  
1C9 = 246  
2C9 = 249  
3C9 = 250  
1CA = 252  
2CA = 287  
3CA = 303  
1CB = 311  
2CB = 315  
3CB = 317  
1CC = 318  
2CC = 335  
3CC = 343  
1CD = 347  
2CD = 349  
3CD = 350  
1CE = 359  
2CE = 363  
3CE = 365  
1CF = 366  
2CF = 371  
3CF = 373  
1D0 = 374  
2D0 = 377  
3D0 = 378  
1D1 = 380  
2D1 = 399  
3D1 = 407  
1D2 = 411  
2D2 = 413  
3D2 = 414  
1D3 = 423  
2D3 = 427  
3D3 = 429  
1D4 = 430  
2D4 = 435  
3D4 = 437  
1D5 = 438  
2D5 = 441  
3D5 = 442  
1D6 = 444  
2D6 = 455  
3D6 = 459  
1D7 = 461  
2D7 = 462  
3D7 = 467  
1D8 = 469  
2D8 = 470  
3D8 = 473"

END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 33  
NAME = PLUS\_X\_SUBST\_QUALITY  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 177  
BYTES = 5  
FORMAT = "I5"  
MISSING\_CONSTANT = 43960  
DESCRIPTION = "PLUS X LED SUBSTRACE POSITION QUALITY"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 34  
NAME = PLUS\_X\_CX  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 183  
BYTES = 5  
FORMAT = "I5"  
MISSING\_CONSTANT = 43960  
DESCRIPTION = "PLUS X LED C DOT X POSITION"  
END\_OBJECT = COLUMN

```

OBJECT                = COLUMN
  COLUMN_NUMBER      = 35
  NAME                = PLUS_X_CY
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 189
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "PLUS X LED C DOT Y POSITION"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 36
  NAME                = PLUS_X_DX
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 195
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "PLUS X LED D DOT X POSITION"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 37
  NAME                = PLUS_X_DY
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 201
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "PLUS X LED D DOT Y POSITION"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 38
  NAME                = PLUS_X_TARGET_LABEL
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 207
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "PLUS X LED TARGET LABEL (N/A WITH FLIGHT TARGETS)"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 39
  NAME                = MINUS_X_CAL_QUALITY
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 213
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "MINUS X LED CALIBRATION STRIP POSITION QUALITY"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 40
  NAME                = MINUS_X_AX
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 219
  BYTES              = 5
  FORMAT             = "I5"
  MISSING_CONSTANT   = 43960
  DESCRIPTION        = "MINUS X LED A DOT X POSITION"
END_OBJECT

OBJECT                = COLUMN
  COLUMN_NUMBER      = 41
  NAME                = MINUS_X_AY
  DATA_TYPE         = ASCII_INTEGER
  START_BYTE        = 225
  BYTES              = 5
  FORMAT             = "I5"

```



```

MISSING_CONSTANT = 43960
DESCRIPTION      = "MINUS X LED A DOT Y POSITION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER   = 42
NAME            = MINUS_X_BX
DATA_TYPE       = ASCII_INTEGER
START_BYTE      = 231
BYTES           = 5
FORMAT          = "I5"
MISSING_CONSTANT = 43960
DESCRIPTION      = "MINUS X LED B DOT X POSITION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER   = 43
NAME            = MINUS_X_BY
DATA_TYPE       = ASCII_INTEGER
START_BYTE      = 237
BYTES           = 5
FORMAT          = "I5"
MISSING_CONSTANT = 43960
DESCRIPTION      = "MINUS X LED B DOT Y POSITION"
END_OBJECT      = COLUMN

OBJECT          = COLUMN
COLUMN_NUMBER   = 44
NAME            = MINUS_X_LABEL
DATA_TYPE       = ASCII_INTEGER
START_BYTE      = 243
BYTES           = 5
FORMAT          = "I5"
MISSING_CONSTANT = 43960
DESCRIPTION      = "MINUS X LED SUBSTRATE LABEL
THE SUBSTRATE ID:S MATCH THE SUBSTRATE LABELS
IN THE REFERENCE STRIP WITH THE FOLLOWING TABLE:
1C1 = 63
2C1 = 95
3C1 = 111
1C2 = 119
2C2 = 123
3C2 = 125
1C3 = 126
2C3 = 159
3C3 = 175
1C4 = 183
2C4 = 187
3C4 = 189
1C5 = 190
2C5 = 207
3C5 = 215
1C6 = 219
2C6 = 221
3C6 = 222
1C7 = 231
2C7 = 235
3C7 = 237
1C8 = 238
2C8 = 243
3C8 = 245
1C9 = 246
2C9 = 249
3C9 = 250
1CA = 252
2CA = 287
3CA = 303
1CB = 311
2CB = 315
3CB = 317
1CC = 318
2CC = 335
3CC = 343
1CD = 347

```

2CD = 349  
3CD = 350  
1CE = 359  
2CE = 363  
3CE = 365  
1CF = 366  
2CF = 371  
3CF = 373  
1D0 = 374  
2D0 = 377  
3D0 = 378  
1D1 = 380  
2D1 = 399  
3D1 = 407  
1D2 = 411  
2D2 = 413  
3D2 = 414  
1D3 = 423  
2D3 = 427  
3D3 = 429  
1D4 = 430  
2D4 = 435  
3D4 = 437  
1D5 = 438  
2D5 = 441  
3D5 = 442  
1D6 = 444  
2D6 = 455  
3D6 = 459  
1D7 = 461  
2D7 = 462  
3D7 = 467  
1D8 = 469  
2D8 = 470  
3D8 = 473"

END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 45  
NAME = MINUS\_X\_SUBST\_QUALITY  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 249  
BYTES = 5  
FORMAT = "I5"  
MISSING\_CONSTANT = 43960  
DESCRIPTION = "MINUS X LED SUBSTRACE POSITION QUALITY"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 46  
NAME = MINUS\_X\_CX  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 255  
BYTES = 5  
FORMAT = "I5"  
MISSING\_CONSTANT = 43960  
DESCRIPTION = "MINUS X LED C DOT X POSITION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 47  
NAME = MINUS\_X\_CY  
DATA\_TYPE = ASCII\_INTEGER  
START\_BYTE = 261  
BYTES = 5  
FORMAT = "I5"  
MISSING\_CONSTANT = 43960  
DESCRIPTION = "MINUS X LED C DOT Y POSITION"  
END\_OBJECT = COLUMN

OBJECT = COLUMN  
COLUMN\_NUMBER = 48  
NAME = MINUS\_X\_DX  
DATA\_TYPE = ASCII\_INTEGER

```

START_BYTE           = 267
BYTES                = 5
FORMAT               = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION          = "MINUS X LED D DOT X POSITION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 49
NAME                 = MINUS_X_DY
DATA_TYPE            = ASCII_INTEGER
START_BYTE           = 273
BYTES                = 5
FORMAT               = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION          = "MINUS X LED D DOT Y POSITION"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 50
NAME                 = MINUS_X_TARGET_LABEL
DATA_TYPE            = ASCII_INTEGER
START_BYTE           = 279
BYTES                = 5
FORMAT               = "I5"
MISSING_CONSTANT    = 43960
DESCRIPTION          = "MINUS X LED TARGET LABEL (N/A WITH FLIGHT TARGETS)"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 51
NAME                 = X_OFFSET
DATA_TYPE            = ASCII_REAL
START_BYTE           = 285
BYTES                = 9
UNIT                 = "MICROMETER"
FORMAT               = "F9.2"
DESCRIPTION          = "SUBSTRATE OFFSET IN X"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 52
NAME                 = Y_OFFSET
DATA_TYPE            = ASCII_REAL
START_BYTE           = 295
BYTES                = 9
UNIT                 = "MICROMETER"
FORMAT               = "F9.2"
DESCRIPTION          = "SUBSTRATE OFFSET IN Y"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 53
NAME                 = X_ORIGIN
DATA_TYPE            = ASCII_REAL
START_BYTE           = 305
BYTES                = 9
UNIT                 = "MICROMETER"
FORMAT               = "F9.2"
DESCRIPTION          = "SUBSTRATE ORIGIN X IN COSISCOPE FIELD OF VIEW"
END_OBJECT           = COLUMN

OBJECT               = COLUMN
COLUMN_NUMBER        = 53
NAME                 = Y_ORIGIN
DATA_TYPE            = ASCII_REAL
START_BYTE           = 315
BYTES                = 9
UNIT                 = "MICROMETER"
FORMAT               = "F9.2"
DESCRIPTION          = "SUBSTRATE ORIGIN Y IN COSISCOPE FIELD OF VIEW"
END_OBJECT           = COLUMN

OBJECT               = COLUMN

```

```

COLUMN_NUMBER      = 54
NAME               = ROTATION
DATA_TYPE         = ASCII_REAL
START_BYTE       = 325
BYTES            = 8
UNIT             = "DEGREE"
FORMAT          = "F8.4"
DESCRIPTION      = "SUBSTRATE ROTATION ANGLE"
END_OBJECT       = COLUMN

```

### 4.3.12 Substrate history ancillary product

#### 4.3.12.1 General description

Substrate history product contains information about substrate storage and expose periods, cleaning and heating actions, COSISCOPE camera images and grains lists and any spectra taken. The history product contains history from the moment substrates were installed in the COSIMA flight instrument.

#### 4.3.12.2 Label example

```

PDS_VERSION_ID      = PDS3
LABEL_REVISION_NOTE = "V1.1"

/* FILE FORMAT */
RECORD_TYPE        = FIXED_LENGTH
RECORD_BYTES      = 148
FILE_RECORDS      = 67
LABEL_RECORDS     = 18
/* POINTER TO DATA OBJECT */
^HISTORY_TABLE    = 19

/* GENERAL DATA DESCRIPTION PARAMETERS */
FILE_NAME          = "CS_2D8_SUBSTRATE_HIST.TAB"
DATA_SET_ID       = "RO-CAL-COSIMA-3-V2.0"
DATA_SET_NAME     = "ROSETTA-ORBITER CAL COSIMA 3 V2.0"
PRODUCT_ID        = "CS_2D8_SUBSTRATE_HIST"
PRODUCT_CREATION_TIME = 2008-11-12T09:15:54
PRODUCT_TYPE      = "ANCDR"
PROCESSING_LEVEL_ID = 6
MISSION_ID        = "ROSETTA"
MISSION_NAME      = "INTERNATIONAL ROSETTA MISSION"
MISSION_PHASE_NAME = "N/A"
INSTRUMENT_HOST_ID = "RO"
INSTRUMENT_HOST_NAME = "ROSETTA-ORBITER"
INSTRUMENT_ID     = "COSIMA"
INSTRUMENT_NAME   = "COMETARY SECONDARY ION MASS ANALYZER"
INSTRUMENT_TYPE   = "MASS SPECTROMETER"
INSTRUMENT_MODE_ID = "N/A"
INSTRUMENT_MODE_DESC = "N/A"
TARGET_NAME       = "CALIBRATION"
TARGET_TYPE       = "CALIBRATION"
START_TIME        = 2002-05-29T00:00:00
STOP_TIME         = 2008-07-24T00:00:00
SPACECRAFT_CLOCK_START_COUNT = "N/A"
SPACECRAFT_CLOCK_STOP_COUNT = "1/0175478364.35517"
SC_SUN_POSITION_VECTOR = "N/A"
SC_TARGET_POSITION_VECTOR = "N/A"
SC_TARGET_VELOCITY_VECTOR = "N/A"
SPACECRAFT_ALTITUDE = "N/A"
SUB_SPACECRAFT_LATITUDE = "N/A"
SUB_SPACECRAFT_LONGITUDE = "N/A"
PRODUCER_ID       = "FMI"
PRODUCER_FULL_NAME = "JOHAN SILEN"
PRODUCER_INSTITUTION_NAME = "FINNISH METEOROLOGICAL INSTITUTE"
DATA_QUALITY_ID   = -1
DATA_QUALITY_DESC = "-1 = not checked"
ROSETTA: COSIMA_SUBSTRATE_ID = "2D8"
ROSETTA: COSIMA_SUBSTRATE_DESC = "Silver, blank"

```

```

OBJECT          = HISTORY_TABLE
NAME           = SUBSTRATE_HISTORY
INTERCHANGE_FORMAT = ASCII
ROWS          = 49
COLUMNS      = 9
ROW_BYTES     = 148
^STRUCTURE    = "COSIMA_HISTORY.FMT"
DESCRIPTION    = "SUBSTRATE HISTORY"
END_OBJECT    = HISTORY_TABLE

END

```

COSIMA\_HISTORY.FMT:

```

OBJECT          = COLUMN
COLUMN_NUMBER   = 1
NAME           = UTC_START_DATE
DATA_TYPE      = DATE
START_BYTE     = 1
BYTES         = 19
FORMAT        = "A19"
DESCRIPTION    = "START TIME IN UTC"
END_OBJECT     = COLUMN
OBJECT         = COLUMN
COLUMN_NUMBER   = 2
NAME           = UTC_STOP_DATE
DATA_TYPE      = DATE
START_BYTE     = 21
BYTES         = 19
FORMAT        = "A19"
DESCRIPTION    = "STOP TIME IN UTC"
END_OBJECT     = COLUMN
OBJECT         = COLUMN
COLUMN_NUMBER   = 3
NAME           = TIME
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 41
BYTES         = 10
UNIT          = "SECOND"
MISSING_CONSTANT = -1
FORMAT        = "I10"
DESCRIPTION    = "TIME SPENT IN THE POSITION IN SECONDS"
END_OBJECT     = COLUMN
OBJECT         = COLUMN
COLUMN_NUMBER   = 4
NAME           = POSITION
DATA_TYPE      = CHARACTER
START_BYTE     = 53
BYTES         = 9
FORMAT        = "A9"
DESCRIPTION    = "POSITION, POSSIBLE VALUES ARE
                    STORAGE, in target storage
                    IMAGE, substrate image
                    GRAINS, dust position list
                    PEAKS, peak list acquisition
                    SCAN, total count acquisition
                    SPECTRUM, spectrum acquisition
                    EXPOSE, exposed to the outside
                    CLEAN, at beam cleaning position
                    CHEMISTRY, at heating station"
END_OBJECT     = COLUMN
OBJECT         = COLUMN
COLUMN_NUMBER   = 5
NAME           = X_COORDINATE
DATA_TYPE      = ASCII_INTEGER
START_BYTE     = 64
BYTES         = 5
UNIT          = "MICROMETER"
MISSING_CONSTANT = -1
FORMAT        = "I5"
DESCRIPTION    = "SUBSTRATE X-COORDINATE IN MICROMETERS,
                    ZERO IS AT LEFT"
END_OBJECT     = COLUMN
OBJECT         = COLUMN

```

```

COLUMN_NUMBER      = 6
NAME               = Y_COORDINATE
DATA_TYPE          = ASCII_INTEGER
START_BYTE         = 70
BYTES              = 5
UNIT               = "MICROMETER"
MISSING_CONSTANT   = -1
FORMAT             = "I5"
DESCRIPTION        = "SUBSTRATE Y-COORDINATE IN MICROMETERS,
                      ZERO IS AT BOTTOM"
END_OBJECT         = COLUMN
OBJECT             = COLUMN
  COLUMN_NUMBER    = 7
  NAME             = TIP_CURRENT
  DATA_TYPE       = ASCII_INTEGER
  START_BYTE       = 76
  BYTES            = 3
  MISSING_CONSTANT = -99
  FORMAT           = "I3"
  UNIT             = "MICROAMPERE"
  DESCRIPTION      = "INDIUM BEAM TIP CURRENT"
END_OBJECT         = COLUMN
OBJECT             = COLUMN
  COLUMN_NUMBER    = 8
  NAME             = SCIENCE_FILENAME
  DATA_TYPE       = CHARACTER
  START_BYTE       = 81
  BYTES            = 31
  FORMAT           = "A31"
  DESCRIPTION      = "SCIENCE DATA LABEL FILENAME"
END_OBJECT         = COLUMN
OBJECT             = COLUMN
  COLUMN_NUMBER    = 9
  NAME             = HOUSEKEEPING_FILENAME
  DATA_TYPE       = CHARACTER
  START_BYTE       = 115
  BYTES            = 31
  FORMAT           = "A31"
  DESCRIPTION      = "SCIENCE DATA RELATED HOUSEKEEPING LABEL
                      FILENAME"
END_OBJECT         = COLUMN

```

## 5 Appendix: Directory Listing of Data Set RO-CAL-COSIMA-3-V3.0

### TOP-LEVEL-DIRECTORY

```

|
| - AAREADME.TXT          This file
|
| - VOLDESC.CAT          Description of the data volume
|
| - [CATALOG]           The directory containing information
|                       about COSIMA calibration data set
|   |
|   | - CATINFO.TXT      Info about CATALOG directory contents
|   |
|   | - MISSION.CAT      Rosetta mission description, provided
|   |                   by Rosetta project
|   |
|   | - INSTHOST.CAT     Rosetta spacecraft description,
|   |                   provided by Rosetta project
|   |
|   | - INST.CAT         COSIMA instrument description
|   |
|   | - DATASET.CAT      Dataset description
|   |
|   | - SOFT.CAT         Software description. Empty for
|

```

- COSIMA datasets
- PERSON.CAT Dataset provider contact information
- REF.CAT References
- TARGET.CAT Target descriptions
- [DATA] The directory for instrument data products
  - [SUB\_YXX] Substrate YXX data products, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal
    - CS\_YXX\_SUBSTRATE\_HIST.TAB Substrate history product, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal
    - CS\_YXX\_YYYYMMDDTHHMSS\_SP\_Z.TAB Substrate spectrum, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHHMSS is the date. Z is either P for positive or N for negative spectrum.
    - CS\_YXX\_YYYYMMDDTHHMSS\_PK\_Z.TAB Substrate peak list, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHHMSS is the date. Z is either P for positive or N for negative peak list.
    - CS\_YXX\_YYYYMMDDTHHMSS\_S\_HK.TAB Substrate spectrum or peak list housekeeping data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHHMSS is the date.
    - CS\_YXX\_YYYYMMDDTHHMSS\_SCAN.TAB Substrate scan data, where Y is substrate target holder position

1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.

- CS\_YXX\_YYYYMMDDTHMMSS\_SCHK.TAB  
Substrate scan housekeeping data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.
- CS\_YXX\_YYYYMMDDTHMMSS\_HEAT.TAB  
Substrate heating data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.
- CS\_YXX\_YYYYMMDDTHMMSS\_CLEA.TAB  
Substrate cleaning data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.
- CS\_YXX\_YYYYMMDDTHMMSS\_CLHK.TAB  
Substrate cleaning housekeeping data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.
- CS\_YXX\_YYYYMMDDTHMMSS\_GR\_\_.TAB  
Substrate grain list, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.
- CS\_YXX\_YYYYMMDDTHMMSS\_IM\_Z.FIT  
Substrate FITS-format image, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done



in hexadecimal. YYYYMMDDTHMMSS is the date. ZZ is either P for right (plus) side led or M (minus) for left side led illumination.

- CS\_YXX\_YYYYMMDDTHMMSS\_G\_HK.TAB  
Substrate grain list or image housekeeping data, where Y is substrate target holder position 1=top, 2=middle, 3=bottom. XX is target holder ID number, range from C1 to D8, where counting is done in hexadecimal. YYYYMMDDTHMMSS is the date.

- [DOCUMENT] The directory for documentation

- DOCINFO.TXT Info about DOCUMENT directory contents
- COSIMASIS.ASC COSIMA PDS interface description in ASCII format
- COSIMASIS.PDF COSIMA PDS interface description in PDF format
- COSIMASISXXX.JPG COSIMA PDS interface description figures for ASCII version, XXX is gives the figure number in the form 001, 002
- COSIMAPAPER.ASC COSIMA instrument paper in ASCII format
- COSIMAPAPER.PDF COSIMA instrument paper in PDF format
- COSIMAPAPERXXX.JPG COSIMA instrument paper images in JPG format.

- [INDEX] The directory for index files

- INDEX.LBL A PDS detached label describing INDEX.TAB
- INDEX.TAB Tabular summary of the data files
- INDXINFO.TXT Info about INDEX directory contents

- [LABEL] The directory for formatting files used by the attached labels

- LABINFO.TXT Info about LABEL directory contents
- COSIMA\_HISTORY.FMT Substrate history column object definitions
- COSIMA\_SPECTRUM\_DATA.FMT Spectrum column object

definitions

- COSIMA\_SPECTRUM\_HK.FMT Spectrum housekeeping statistics column object definitions
- COSIMA\_SPECTRUM\_PEAKE.FMT Spectrum peak data column object definitions
- COSIMA\_SPECTRUM\_PEAK\_SCALE.FMT Spectrum peak data scaling column object definitions
- COSIMA\_SPECTRUM\_TDC\_CALIB.FMT Spectrum time to digital unit temperature calibration result column object definitions
- COSIMA\_SPECTRUM\_TDC\_TIMING.FMT Spectrum time to digital unit timing setup column object definitions
- COSIMA\_CLEANING.FMT Substrate cleaning column object definitions
- COSIMA\_HEATING\_DATA.FMT Substrate heating data column object definitions
- COSIMA\_HEATING\_SETUP.FMT Substrate heating setup column object definitions
- COSIMA\_SCAN\_DATA.FMT Substrate scan column object definitions
- COSISCOPE\_GRAINS.FMT Cosiscope grain search result column object definitions
- COSISCOPE\_HK.FMT Cosiscope housekeeping statistics column object definitions