JUNO

JIRAM Ground Segment

EGSE & PDS Converter
Software Requirements Specification

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ACRONYMS

CCSDS	The Consultative Committee for Space Data Systems
CFDP	CCSDS File Delivery Protocol
CODMAC	Committee on Data Management and Computation
DMAS	Data Management and Storage
DSN	Deep Space Network
EPP	Engineering Product Process
FDM	DSN'S File Delivery Manager
FGICD	Flight Ground Interface Control Document
GDS	Ground Data System
GUI	Graphical User Interface
ICD	Interface Control Document
IDP	Instrument Data Packet
JPL	Jet Propulsion Laboratory
JSOC	Juno Science Operations Center (at SwRI, Texas)
MIPL	Multi-mission Image Processing Laboratory
NASA	National Aeronautics and Space Administration
ODL	Object Data Language
PDS	Planetary Data System
SAS	Science Analysis Subsystem (Part of Juno's GDS)
SCLK	Spacecraft Clock
SFDU	Standard Formatted Data Unit
SIS	Software Interface Specification document
SwRI	Southwest Research Institute.
TBD	To Be Determined

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DOCUMENT CHANGE LOG

Issue	Date	Pages/Paragraphs affected	Reason for change

APPLICABLE DOCUMENTS

The following documents at the latest issue in effect shall apply. These documents are herein referred as [AD-XX].

Id	*Document Number*	*Description*
[AD-01]	TBD	JIRAM_SIS_5gen.doc (EAICD)

REFERANCE DOCUMENTS

The following documents shall be used as reference background and support information. These documents are herein referred as [RD-XX].

Id	*Document Number*	*Description*
[RD-01]	SCI017	JUNO_RawSci_SIS_20100301-1_b_.pdf
[RD-02]	SCI019	JunoSIS_SCI019_20100227_b_.pdf
[RD-03]	JPL D-7669	Planetary Data System Standards Reference-StdRef_20090227_v3.8.pdf
[RD-04]	JIRAM-GAF-IC-001	JIRAM-GAF-IC-001_rev3_draft0_CICD.doc

1.1 SCOPE

This document provides the basic requirements for the design and development of the JIRAM Ground Segment EGSE and PDS Converter data Tool.

1.2 EGSE AND PDS CONVERTER TOOL OVERVIEW

The JIRAM Ground Segment EGSE and PDS Converter Tool implements data conversion and management algorithms and user interfaces in such a way to permit a user to generate, from a set of raw instrument and S/C data, the PDS-formatted EDR data product.

2 INTERFACE REQUIREMENTS

2.1 Data Product Overview

The Juno instrument science data are stored as binary files, with detached ASCII label files, which are used during transfer to remote sites. They are referred to as "SAS transfer labels", or just "transfer labels".
Additionally, a transaction log file from the upstream processors is available for every science data product. This transaction file is generated by the DSN process/subsystem FDM, and is a "pass through" for the SAS.
For every science product, the SAS receives three files. The instrument science data (CFDP file), ground meta data file produced by the DOM, and the DSN transaction log file. The SAS output is comprised of the original CFDP and DSN transaction log files, plus the SAS transfer label. These three files are collectively known as a "SAS product pack", or just the "product pack. The DOM Meta file is used for generation of the SAS transfer label, but it is not forwarded.

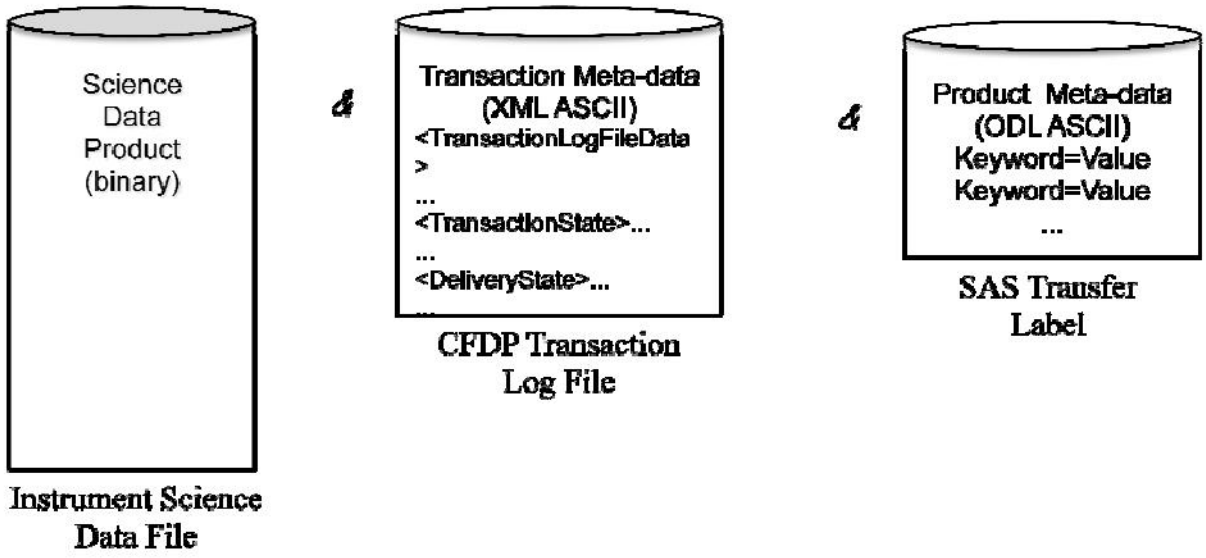


Figure 3 Raw Science Data Product Pack

1. Instrument teams should receive a total of 6 files for the 2 science data products for each data type. There are 3 files associated with each science data product;

<filename>.out	CFDP file containing raw science data (dummy data for most instruments for this test)
<filename>.dtl	DSN transaction log file
<filename>.lbl	SAS Transfer Label (*This may no longer be needed but is currently still part of the data product bundle sent)

2.1.1 NAMING CONVENTION

The naming convention for JIRAM scientific data is:

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*	*27*	*28*	*29*	*30*	*31*	*32*	*33*	*34*	*35*
s	c	-	i	i	o	o	o	o	o	o	o	o	-	y	Y	y	y	-	d	d	d	T	h	h	.	m	m	.	s	s	.	x	x	x

Figure 1 – Product naming diagram

Where:

1,2	Source identifier	ASCII representation of Hex value: 3D : Juno S/C (61 dec) 3F : Juno Sim or Test (63 dec)
4-13	Observation Id	

4,5	Instrument Data Type	ASCII representation of Hex value: 00 : Unused 01 : ASC Low Rate 02 : FGM Low Rate 03 : JADE High Rate 04 : JADE Low Rate 05 : JEDI_090 Low Rate 06 : JEDI_180 Low Rate 07 : JEDI_270 Low Rate **08 : JIRAM High Rate** 09 : JunoCam High Rate 0A : MWR Low Rate 0B : UVS High Rate 0C : Waves High Rate 0D : Waves Low Rate 0E - FF unused
6-13	Product Seq. Number	This field contains the 8-most significant decimal digits of SCLK, when the instrument starts transferring data for a given product to the S/C, with possible few milliseconds of lag. It is represented as ASCII-encoded Hex; It should not be used for scientific measurement of when data was collected. It is used as a unique identifier for a give data product.
15-31	Time Stamp	Time of completion of file re-creation by the DSN.
15-18	Year	Year
20-22	Day	Day of year
24,25	Hour	Hour of day (0..23)
27,28	Minutes	Minutes of hours (0..59)
30,31	Seconds	Seconds of minutes (0..59)

2.1.2 TELEMETRY FORMATS

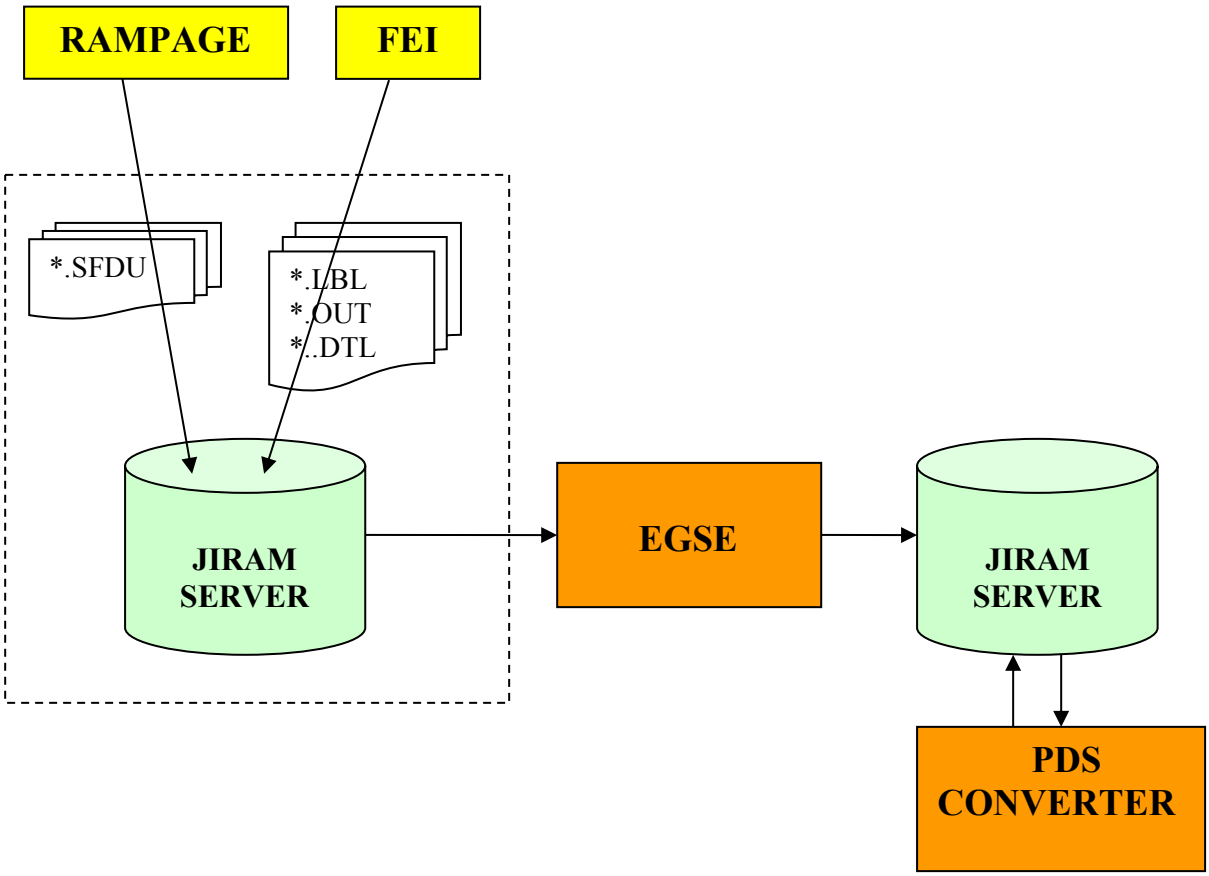
	1° SFDU header	2° CCSDS header	3° JIRAM packet	4° PAD
*85.SFDU *85.PKT *85.OUT Several packets each file	YES Length 150 byte First word = 4E4A	YES Lenght 11 byte First word = 0855	As JIRAM Length: same rules of JIRAM First word: 1111 or 2222 or 3333 or 4444 or 5555 depending by JIRAM telemetry sub type	If needed to make total byte count divisible by two. If present, it will be 0x00
*85.DAT Several packets each file	NO	YES Lenght 11 byte First word = 0855	As JIRAM Length: same rules of JIRAM First word: 1111 or 2222 or 3333 or 4444 or 5555 depending by JIRAM telemetry sub type	If needed to make total byte count divisible by two. If present, it will be 0x00
*86.OUT One packet each file	NO	NO	As JIRAM Length: same rules of JIRAM, it is variable, it is reported in the second word First word: AAAA	NO
*87.SFDU *87.PKT Several packets in one file	YES Length 150 byte First word = 4E4A	YES Lenght 19 byte First word = 0857	As JIRAM Length: same rules of JIRAM First word: BBBB	If needed to make total byte count divisible by two. If present, it will be 0x00
*87.DAT Several packets in one file	NO	YES Lenght 19 byte First word = 0857	As JIRAM Length: same rules of JIRAM First word: BBBB	If needed to make total byte count divisible by two. If present, it will be 0x00
*87.OUT Several packets in one file	NO	NO	As JIRAM Length: same rules of JIRAM First word: BBBB	

3 REQUIREMENTS EGSE

3.1 INTRODUCTION

3.2 ARCHITECTURAL REQUIREMENTS

The EGSE and PDS Converter Tool functional architecture can be partitioned in modules as described in the following functional block diagram.



The user interacts with the Tool by selecting a flown orbit for which all the required raw data are available. After retrieving the data from the Local Archive, the data are De-Formatted and converted in PDS format.

3.3 DETAILED REQUIREMENTS

3.3.1 TM SELECTION

This module shall enable the user to select

- a directory where all the input file are included
- a single file
- multiple files in the same directory

After selecting the orbit the program shall verify if data are completely, available in the Local Archive Server, before proceeding. In negative cases, the EDR processing cannot be performed.

3.3.2 EGSE

The De-Formatting module highlights the internal need to read and re-organise telemetries packets from the raw format.
A Raw Science Data Product comprises three files which are referred to collectively as a "product pack". These three files are the Instrument Science Data file, the CFDP Transaction Log file, and the SAS Transfer Label.
Details on the file format for the raw telemetry data are available in the next time.

3.3.3 EGSE CHECK

EGSE shall perform a consistent check between the commanded sequence and the received telemetry from JIRAM. INAF will provide to give a SASF table with these informations:

- **Acquisition:** acquisition name to be used as name for the new session
- **SCET Time (s):** start time of the session, to be compared with acquisition time inside the packets. When the first packet with a time higher than the table is found EGSE shall change session.
- **Mode/Submode:** JIRAM modality, to be compared with the mode/submode field inside the science packets. All the packets (APID 86 and APID 87) shall be checked. HEX value.

- **N. ACQs:** number of planned acquisition. Two checks shall be performed using this key. As First compare with the ACQ_NUMBER field inside the science packets. All the packets (APID 86 and APID 87) shall be checked. As second in order to verify if all the frames are received. In the case one acquisition is missing EGSE shall report which ACQ_COUNT is missing.
- **T_EXPO_I:** commanded exposure time for imaging detector. The number is reported in raw value. It has to be compared with the T_expo field of the science packets of the IMG channel
- **T_EXPO_S:** commanded exposure time for spectrometer detector. The number is reported in raw value. It has to be compared with the T_expo field of the science packets of the SPE channel

The file is in ASCII format and the format with fixed size (20 characters); the first row is title description further rows are field to be checked. The number of rows is not fixed.
The fields are aligned to the right and the fields are separated by 3 space.

The "EGSE" tool shall perform the checks on the file *.DTL (see the Appendix B) before to proceed with the TM processing. The records on which the EGSE shall perform are:

- `<RequestType>RECEIVE_REQUEST</RequestType>`
- `<TransactionState>FINISHED</TransactionState>`
- `<ConditionCode>NO_ERROR</ConditionCode>`
- `<DeliveryCode>DATA_COMPLETE</DeliveryCode>`

The possible values are "DATA_COMPLETE" that it indicates that all data from the original Science Data Product appears in the accompanying Raw Science Data file.
DATA_INCOMPLETE" indicates that some data from the original Science Data Product is missing from the accompanying Raw Science Data file. is present only if <TransactionState> is FINISHED

- `<FileStatus>FILE_RETAINED_SUCCESSFULLY</FileStatus>`

- `<DataSegmentReceived> <SegmentReceived StartByte="0" EndByte="5451"/> </DataSegmentReceived>`

This element appears once for a complete file, with StartByte="0" and EndByte=the position of the last byte; For partial files, this element may appear multiple times. Each occurrence indicates the start and end of valid (i.e. non fill) data.

EGSE shall check that for each *.DTL file is present the relevant *.OUT file with the same name but different extension.

The EGSE shall perform the following check during the packets reading and reports the occurred failure in the EGSE LOG:
• Missing packets: check of Packet sequence counter for each TM ID.
• Identical packets: check of identical packets in separate files and in this case the EGSE tool shall consider only one packets.
• File format not valid
• Wrong time: EGSE shall check that the time packets has the expected progressive order

In case of positive check the EGSE start with the TM processing, on the contrary in case of error at the end of the check of all files EGSE shall report to the user the founded error together the needed information for the error interpretation and shall give the possibility to stop the processor or to start with the planned activities.

4 REQUIREMENTS PDS CONVERTER

4.1 INTRODUCTION

4.1.1 DATA CONVERSION

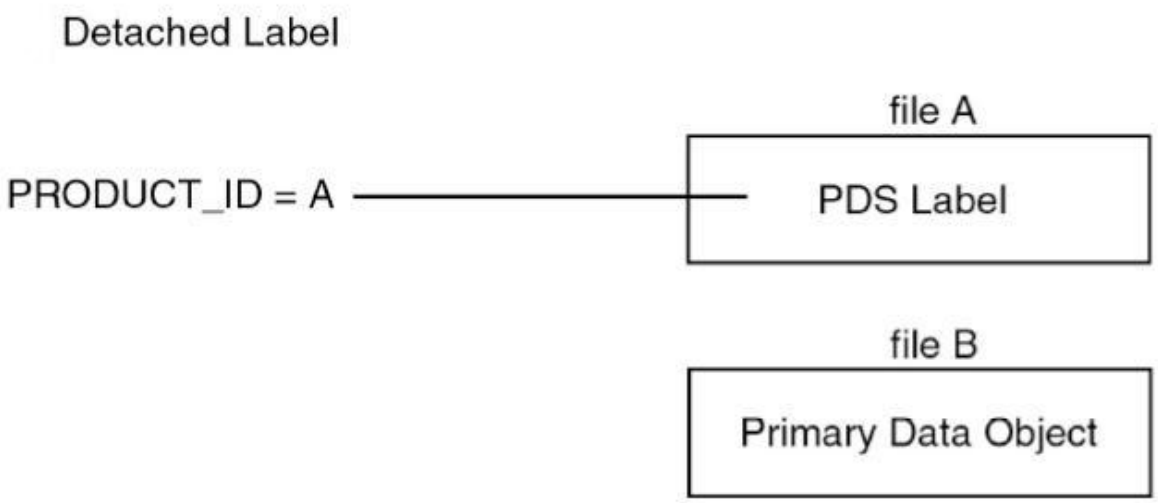
The purpose of the Data Conversion module is to concentrate the methods/algorithms used to convert raw telemetry data into other formats that will be used for PDS Generation.
Its role in the Tool architecture is act as a placeholder, or container, for the programmer's method that can be abstracted and that will be useful for a more convenient implementation of the next module.

4.1.2 PDS GENERATION

The PDS Generation module shall convert all the data belonging to the set related to the selected orbit into the PDS-formatter EDR data product.
Detailed specification for the EDR data product and the relevant file hierarchy and format are provided in next time.
The construction of the EDR data product is based on the definition of a file system sub-tree, which organises various kind of files: some related to the data themselves and some related to descriptions of the data and the parameters used by the instrument to generate the data.
For these reasons the data that are going to be part of the EDR structure are not only those derived by the Instrument and Spacecraft raw data files, but also those computed from SPK files related to so-called S/C Geometries
Data computed from SPK files include, between the others, the attitude quaternion of the S/C during each Mode. The PDS-formatted structure is built and stored locally.

JIRAM data are stored as IMAGE with detached PDS labels.

The PDS data product label is detached from the data and resides in a separate file which contains a pointer to the data product file. There is one detached label file for every data product file. The label file should have the same base name as its associated data file, but the extension .LBL .



The labels have stream record format, and line lengths of at most 80 characters (including the CR/LF line terminators).The carriage return and line feed (CR/LF) pair is the required line terminator for all PDS labels.
Each line in the label may be padded with space characters so that each line in the label has the same record length as the data file. In this case, the label line length may exceed the recommended 80 characters.
The directory contains instrument performance reports and engineering telemetry data tables relative to data in the current Data Set. It is organized into subdirectories named according to the same scheme used for subdirectories in the DATA directory .The reports themselves are in the form of detached-label Spreadsheet Data Objects. The file containing the corresponding detached label .LBL (see Appendix C)

```
PDS_VERSION_ID                    =
LABEL_REVISION_NOTE               =
                    .

/*FILE_CHARACTERISTICS*/
RECORD_TYPE                       =
RECORD_BYTES                      =
FILE_RECORDS                      =
FILE_NAME                         =
LABEL_RECORDS                     =

/* POINTERS TO DATA OBJECTS */
^IMAGE                            =

/* IDENTIFICATION DATA ELEMENTS */
DATA_SET_ID                       =
PRODUCT_ID                        =
PRODUCT_ ID                       =
SPACECRAFT_NAME                   =
INSTRUMENT_NAME                   =
TARGET_NAME                       =
START_TIME                        =
STOP_TIME                         =
.
.
PRODUCT  CREATION  TIME           =

/* GEOMETRY PARAMETERS */
                    .

/* DATA OBJECT DEFINITIONS */

/* DESCRIPTIVE DATA ELEMENTS */
…

END
```

- The Data acquired by JIRAM must be georeferenced for a correct interpretation and analysis. A small subset of the geometric parameters is also included in the label of the PDS data to be delivered.
- The values to be used for these keywords can be divided in two subgroups: "point" values (e.g., computed at a certain point in time during the acquisition) and "range" values (e.g., maxima and minima of some geometric parameters varying during the acquisition)

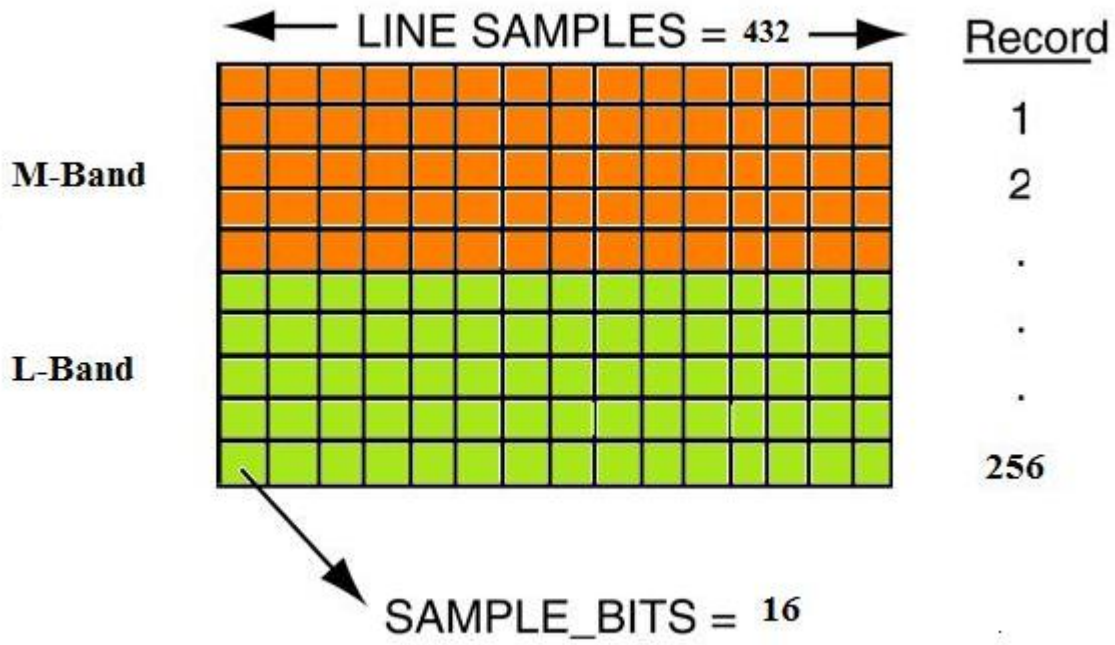
The tool will implement the procedures, provided by JIRAM team, to calculate all geometrical keywords, for this reason the tool shall be able to read the Spice Kernels.

JIRAM's data products are:

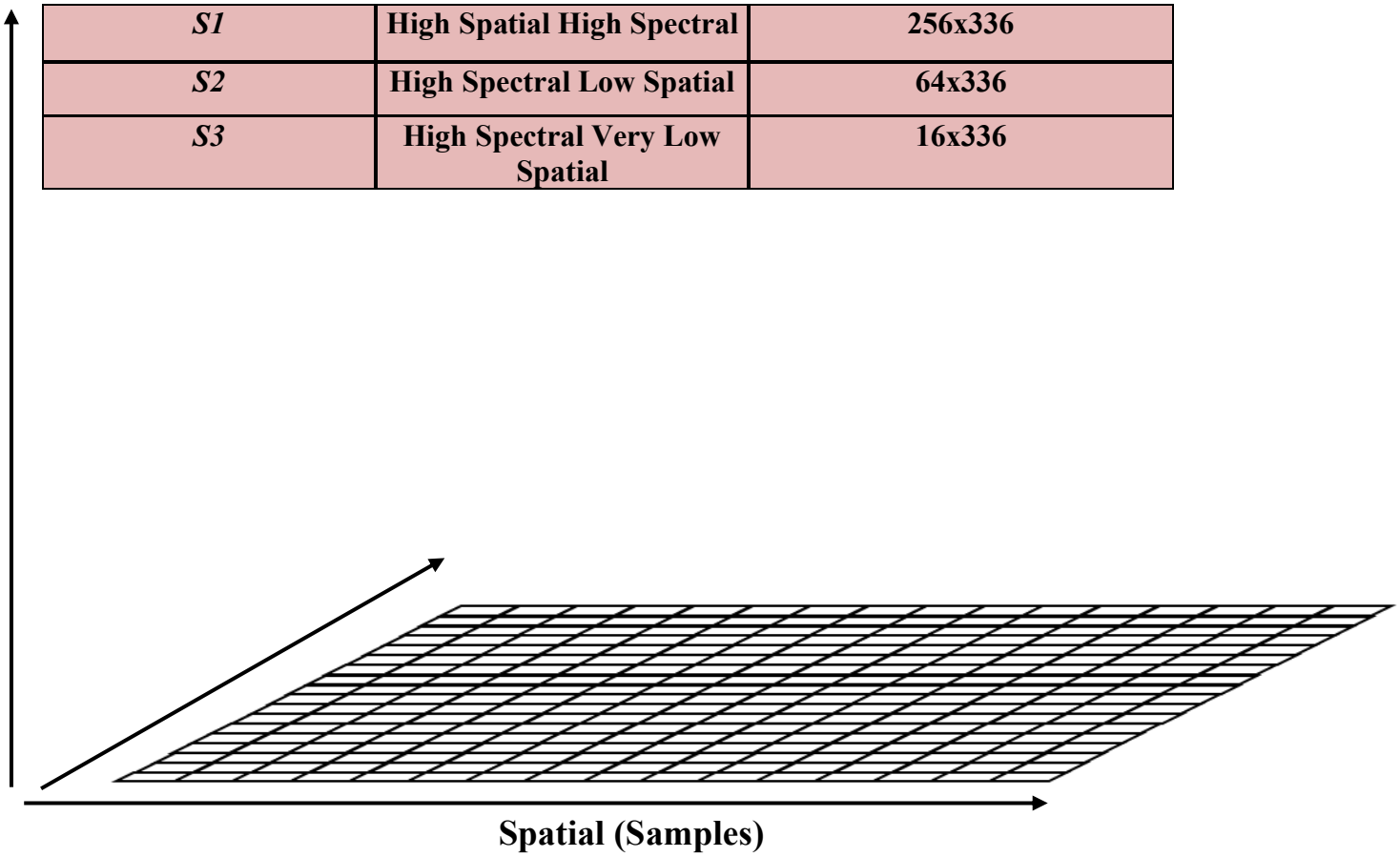
1. IMAGE
2. SPECTRAL IMAGE

We have three possible kind of images

I1	**Full Acquisition**	**256x432**
I2	**M-Band (Hot Spot)**	**128x432**
I3	**L-Band (Aurorae)**	**128x432**



S1	**High Spatial High Spectral**	**256x336**
S2	**High Spectral Low Spatial**	**64x336**
S3	**High Spectral Very Low Spatial**	**16x336**



for both the PDS object is the IMAGE

4.1.3 NAMING CONVENTION

JIRAM combines 2 data channels in one instrument: the IMAGER and SPECTROMETER. The data are named according to the suffix indicating the channel and the acquisition SC_CLOCK_START_COUNT (integer part). The naming convention is the following:

The name convention is JRM_*SSS_LLL_* SCTIME_VVV .IMG, where:

SSS : indicates the sensor, IMG or SPE for imager and spectrometer respectively
LLL : indicates the processing level, either EDR or RDR
SCTIME : is yyyydddThhmmss

- yyyy = year
- ddd = doy
- hh = hours
- mm = minutes
- ss = seconds

VVV : version

The corresponding detached label will be called
JRM_*SSS_LLL_* SCTIME_VVV .LBL

Scientific telemetries arrive with an header containing information necessary for the further processing and analysis of the data. The precise content of the header depends on the detector. Tables detailing this information are shown in Appendix C. This information is transferred in the log files, with corresponding detached labels.

The name convention followed by the log files is JRM_LOG_*SSS_LLL_* SCTIME_VVV .CSV, where:

SSS : indicates the sensor, IMG or SPE for imager and spectrometer respectively
LLL : indicates the processing level, either EDR or RDR
SCTIME : is yyyydddThhmmss

- yyyy = year
- ddd = doy
- hh = hours
- mm = minutes
- ss = seconds

VVV : version

The corresponding detached label will be called
JRM_LOG_*SSS_LLL_* SCTIME_VVV .LBL

4.1.4 STRUCTURE VIEWER

This module shall enable the user to explore the EDR sub-tree generated for the selected orbit and stored locally.
A simple text file viewer shall be also provided to permit a quick, visual, inspection of the generation process results.

4.1.5 PDS ARCHIVING

The PDS Archiving module shall permit the storage of the generated PDS-format EDR structure, for the selected orbit, into the Local Archive server.
The physical archiving will be performed by means of file transfers. The logic management of the file transfer, like the destination directory, and the possible management of the PDS structures are currently under evaluation.

4.1.6 DATA VALIDATION

Validation of data will be performed at different levels of detail and using different procedures. A dedicated tool, called EGSE, to verify the completeness of data received from the spacecraft.

Appendix A SAMPLE PDS label files (TBC)

This is only an example of what the transfer label may look like. An actual label, from an actual product, will replace this example when the new version becomes available.

All JIRAM instrument data files are accompanied by PDS label files, possessing the same names are the files they describe, but with the extension LBL. The basic content for these label files is as follows:

```
/* Label standards identifier */

PDS_VERSION_ID                      = PDS3
LABEL_REVISION_NOTE                 =

/* Identification data elements that apply to all referenced data files */

DATA_SET_NAME                       =
DATA_SET_ID                         =
PRODUCT_ID                          =
RELEASE_ID                          =
PRODUCT_TYPE                        = EDR
INSTRUMENT_HOST_ID                  =
INSTRUMENT_HOST_NAME                =
INSTRUMENT_ID                       =
INSTRUMENT_NAME                     =
INSTRUMENT_TYPE                     =


TARGET_NAME                         =
MISSION_PHASE_NAME                  =
ORBIT_NUMBER                        =
START_SUB_SPACECRAFT_LONGITUDE      =
START_SUB_SPACECRAFT_LATITUDE       =
STOP_SUB_SPACECRAFT_LONGITUDE       =
STOP_SUB_SPACECRAFT_LATITUDE        =
START_TIME                          =
STOP_TIME                           =
SPACECRAFT_CLOCK_START_COUNT        =
SPACECRAFT_CLOCK_STOP_COUNT         =
PRODUCT_CREATION_TIME               =
PRODUCT_VERSION_ID                  =
PRODUCT_VERSION_TYPE                =


COMMAND_FILE_NAME                   =
COMMAND_SEQUENCE_NUMBER             =
SEQUENCE_TITLE                      =
OBSERVATION_ID                      =

OBJECT                              = FILE


/* File characteristic data elements */
```

```
  RECORD_TYPE                        =
  RECORD_BYTES                       =
  FILE_RECORDS                       =


/* Data object pointers */

^SCIENCE_TELEMETRY_TABLE           =

/* Identification data elements */

  SOURCE_PRODUCT_ID                =


/* Descriptive data elements */

  INSTRUMENT_MODE_ID               =
  INSTRUMENT_MODE_DESC             =
  DATA_QUALITY_ID                  =
  DATA_QUALITY_DESC                =


/* File characteristic data elements */

  RECORD_TYPE                      = FIXED_LENGTH
  RECORD_BYTES                     =
  FILE_RECORDS                     =

/* Data object pointers */

  ^AUXILIARY_DATA_TABLE            =


/* Identification data elements */

  SPICE_FILE_NAME                  =

/* Data object definitions */

  OBJECT                           = AUXILIARY_DATA_TABLE

    INTERCHANGE_FORMAT             = BINARY
    COLUMNS                        =
    ROW_BYTES                      =
    ROWS                           =
    DESCRIPTION                    =
    ^STRUCTURE                     = "AUXILIARY.FMT"

  END_OBJECT                       = AUXILIARY_DATA_TABLE

END_OBJECT                         = FILE

END
```

Appendix B SAMPLE OF *.DTL FILE


```
<?xml version="1.0" encoding="UTF-8"?>
<TransactionLogFileData>
  <VersionId>1</VersionId>
  <TransDataSetId>JIRAM_HIGH_RATE</TransDataSetId>
  <Filename>3D-081442B267-2010-282T16.54.24.dtl</Filename>
  <MissionName>JUNO</MissionName>
  <MissionId>34</MissionId>
  <SpacecraftName>JUNO</SpacecraftName>
  <SpacecraftId>61</SpacecraftId>
  <ProductionCreationTime>2010-282T16:54:24.000</ProductionCreationTime>
  <RequestType>RECEIVE_REQUEST</RequestType>
  <CommonRequestData>
    <TransactionId>3D-081442B26700</TransactionId>
    <TransactionState>FINISHED</TransactionState>
    <ConditionCode>NO_ERROR</ConditionCode>
    <DeliveryCode>DATA_COMPLETE</DeliveryCode>
    <FileStatus>FILE_RETAINED_SUCCESSFULLY</FileStatus>
  </CommonRequestData>
  <SpecificRequestData>
    <ReceiveRequestData>
      <ReceiveRequestType>FDP_METADATA_RECV_CONTENT_TYPE</ReceiveRequestType>
      <CommonReceiveData>
        <DestinationFilename>3D-081442B267-2010-
282T16.54.24.out</DestinationFilename>
        <FileState>COMPLETE</FileState>
        <DeliveryProgress>5452</DeliveryProgress>
        <TotalFileSize>5452</TotalFileSize>
        <TotalBytesReceived>5452</TotalBytesReceived>
        <DataSegmentReceived>
          <SegmentReceived StartByte="0" EndByte="5451"/>
        </DataSegmentReceived>
      </CommonReceiveData>
      <SpecificReceiveData>
        <MetadataRecvContent>
          <MsgToUser>
            <MsgToUserLine>001442B1EF3B</MsgToUserLine>
          </MsgToUser>
        </MetadataRecvContent>
      </SpecificReceiveData>
    </ReceiveRequestData>
  </SpecificRequestData>
</TransactionLogFileData>
```

Appendix C SAMPLE OF LABEL *.LBL FILE CSV (TBC)

```
PDS_VERSION_ID                  = PDS3


RECORD_TYPE                     = STREAM
RECORD_BYTES                    =
FILE_RECORDS                    = 1


^SPREADSHEET                    = JRM_LOG_SSS_EDR_SCTIME.CSV


PRODUCT_ID                      = "JRM_LOG_SSS_EDR_SCTIME"
DATA_SET_ID                     =
PRODUCT_CREATION_TIME           = 2010-10-12T00:00:00

OBJECT                          = SPREADSHEET
  ROWS                          = 1
  ROW_BYTES                     =
  DESCRIPTION                   = "This spreadsheet contains
                                   information linked to the scientific data (HK)"
  FIELDS                        =
  FIELD_DELIMITER               = "COMMA"

OBJECT                          = FIELD
    NAME                        = "FILE NAME"
    DATA_TYPE                   = "CHARACTER"
    FIELD_NUMBER                = 1
    BYTES                       = 31
    FORMAT                      = "A31"
    DESCRIPTION                 = "Location-independent name of the file
                                   containing the current frame"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "SECONDS"
    DATA_TYPE                   = "CHARACTER"
    FIELD_NUMBER                = 1
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "Datation of TM production time"

END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "SUBSECONDS"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
```

```
    DESCRIPTION                 = "Datation of TM production time, subsecond"
  END_OBJECT                    = FIELD


  OBJECT                        = FIELD
    NAME                        = "COUNTER"
    DATA_TYPE                   = "ASCII_INTEGER"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      = "I5"
    DESCRIPTION                 = " TM sequence counter"
  END_OBJECT                    = FIELD                                          .

  OBJECT                        = FIELD
    NAME                        = "MODE"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "Current Mode"
  END_OBJECT                    = FIELD

  OBJECT                        = FIELD
    NAME                        = "SUBMODE"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Current Mode"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "ACQ_NUMBER"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      = "I5"
    DESCRIPTION                 = " Total number of acquisitions
      in the current session / sequence step Min=1;Max=65535"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "ACQ_COUNT"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Current acquisition number in the current session
                                Min=1; Max= ACQ_NUMBER "
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
```

```
    NAME                        = "ACQ_REPETITION"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Number of SC revolutions between
       two acquisitions Min=1; Max=255"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "ACQ_DURATION"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Acquisition Cycle duration  0 = use SC
    Dynamics else Min=27; Max=255; "
 END_OBJECT                     = FIELD

OBJECT                          = FIELD
    NAME                        = "SUBFRAME_NUMBER"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Total number of  sub-frames for
       current acquisition phase  Min=2; Max=6"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "SUBFRAME_COUNT"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Current sub-frame in the current acquisition
                Min=1; Max=6"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "DATATION"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Current sub-frame in the current
          Acquisition Min=1; Max=6"
 END_OBJECT                     = FIELD
```

```
OBJECT                          = FIELD
    NAME                        = "WARN_DATATION_STEP"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "
                 0 = OK
                 1 = Out of datation tolerance "
END_OBJECT                      = FIELD


OBJECT                          = FIELD
    NAME                        = "FRAME_ERROR_FLAG"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Flag used to signal there was a
       timeout error during the acquistion
       0=ACQ OK
       1=ACQ ERROR "
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
    NAME                        = "ACQ_TYPE"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Type of acquisition
           0 = Science
           1 = Double Science Frame 1
           2 = Double Science Frame 2
           3 = Background
           4 = Dark
           5 = Readout noise "
  END_OBJECT                    = FIELD

 OBJECT                         = FIELD
    NAME                        = "CHANNEL_ID"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =

DESCRIPTION                 = " Detector used for the current subframe
          0 = Spectrum IR
          1 = Image IR"
  END_OBJECT                    = FIELD
```

```
OBJECT                          = FIELD
    NAME                        = "COMP_STATUS"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Compression status of the current subframe
            0 = Not compressed data
            1 = Compressed data
            2 = Not compressed data due to error"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "SUBFRAME_TYPE"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Type of subframe
              0 = ImSubFrame = 128 x144 pixel
              1 = SpSubFrameF  = 128x112 pixel
              2 = SpSubFrameM  = 64x112 pixel
              3 = SpSubFrameS  = 16x112 pixel"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "ROW_BACK_SUBTRACTION"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "RICE subtraction
                0 = Subtraction disabled
                1 = Background subtraction on
                2 = Reference row  subtraction on"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "START_NOISY_BITS"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "It is the echo of SP_START_NOISY_BITS
                      Set to 0 in case of compression error or not compressed
              data or JPG compression"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "END_NOISY_BITS"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
```

```
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "It is the echo of SP_END_NOISY_BITS
                          Set to 0 in case of compression error or not
          compressed data or JPG compression"
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
    NAME                        = "CR_ROW"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Compression reference rows offset
                         It is the echo of  SP_CR_ROW Range 0..15
           Not valid in case of not compressed data or JPG compression"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "NOF_NOISY_BITS"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = "Number of used noisy bits
                     Set to 0 in case of compression error or not compressed
            data or JPG compression"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "MIN_PIXEL_JPEG"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Min value for the pixel in JPEG
            compression. Not used in RICE"
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
    NAME                        = "MAX_PIXEL_JPEG"
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Max value for the pixel in JPEG
            compression. Not used in RICE"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "TEXPO"
```

```
    DATA_TYPE                   = "S"
    FIELD_NUMBER                =
    BYTES                       =
    FORMAT                      =
    DESCRIPTION                 = " Expo time for the used detector
             Min=0; Max=65535 ;Res=0.2msec ;"
  END_OBJECT                    = FIELD

 OBJECT                         = FIELD
    NAME                        = "TDELAY"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Delay time for the used
             detector  Min=0 ;Max=65535; Res=0.2msec"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "SECONDS"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Datation of science and HK acquisition
        time (when the command of start acquisition is sent to the
        internal IF), second"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "SUBSECONDS"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Datation of science and HK acquisition time
              (when the command of start acquisition is sent
          to the internal IF), subseconds"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "NADIR_OFFSET"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Nadir offset angle (Deg/100)
           related to the current frame , calculated
by the sw (For example NADIR_OFFSET_1 + NADIR_DELTA)."
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
```

```
    NAME                        = "BKG_REPETION"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Period of Background acquisition
                Min=0; Max=50"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "EN_DIS_SUB"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Background subtraction
          enabled
                  0 = EN
                  1 = DIS"
END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "BKG_RN"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Type of background
                  0=BKG
                  1=RN
                  2=DARK"
END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "EN_DIS_DOU_SCI"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "0 = EN
                                    1= DIS"
END_OBJECT                      = FIELD

OBJECT                        = FIELD
    NAME                        = "WIN1_X"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " X coordinates of the SPE win or
       IMG L band win Min=0 Max 255 Res:1IDN = 1 pixel"
  END_OBJECT                    = FIELD
```

```
OBJECT                          = FIELD
    NAME                        = "WIN1_Y"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Y coordinates of the SPE win or
                IMG L band win Min=0 Max 255 Res:1IDN = 1pixel"
 END_OBJECT                     = FIELD

OBJECT                          = FIELD
    NAME                        = "WIN2_X"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " X coordinates of the IMG M band win, 0
             in the case of SPE Min=0 Max 255 Res:1IDN = 1pixel"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "WIN2_Y"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Y coordinates of the IMG M band win,
          0 in the case of SPE Min=0 Max 255 Res:1IDN = 1pixel "
END_OBJECT                      = FIELD


OBJECT                          = FIELD
    NAME                        = "DET_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Temperature for the used detector
                      Min=0; Max=16383;"
END_OBJECT                      = FIELD


OBJECT                          = FIELD
    NAME                        = "STATUS_DET"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Detector status
           0 = OFF
           1 = ON
```

```
            2 = AUTO
            3 = NA"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "STATUS_GAIN"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Gain status for the detector
                  0 = LOW
                  1 = HIGH"
END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "M_STATUS_LOOP_ERROR_FLAG"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Motor control loop error flag
                0 = OK
                1 = ERROR"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "M_STATUS_MOTOR_MODE"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Despinning mode, acquired from FPA
                    0 = POINT
                    1 = DE-SPIN"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "M_STATUS_MOTOR_POWER"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Motor power status
                  0 = Motor power off
                  1 = Motor power on"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "M_STATUS_ON_OFF"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
```

```
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Motor status
                                0 = Motor off
                                1 = Motor on"
  END_OBJECT                    = FIELD

OBJECT                          = FIELD
    NAME                        = "S_TELESCOPE_MIRROR_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Telescope mirror temperature
                        Min=0; Max=16383"
END_OBJECT                      = FIELD

OBJECT                        = FIELD
    NAME                        = "S_SLIT_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Slit temperature
                Min=0; Max=16383"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "S_SC_IF_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Interface with the S/C temperature
                          Min=0; Max=16383"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "S_COLD_RADIATOR_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Cold radiator temperature
                             Min=0; Max=16383"
  END_OBJECT                    = FIELD


OBJECT                          = FIELD
    NAME                        = "S_SPECTROMETER_MIRROR_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
```

```
    FORMAT                      = "A23"
    DESCRIPTION                 = "Spectrometer mirror temperature
                          Min=0; Max=16383"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "M_MOTOR_TS"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Motor temperature
                             Min=0; Max=16383"
 END_OBJECT                     = FIELD


OBJECT                          = FIELD
    NAME                        = "M_CAL_SOURCE_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Lamp 1 (main) temperature
                  Min=0; Max=16383"
 END_OBJECT                     = FIELD


OBJECT                          = FIELD
    NAME                        = "M_DIFFUSER_CAL_TEMP"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Calibration diffuser temperature
                 Min=0; Max=16383"
  END_OBJECT                    = FIELD


OBJECT                        = FIELD
    NAME                        = "M_MOTOR_START_POS"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Motor point/despin start position
                  Min = 0 (-12.85714286 opt. deg);
                  Max = 16380 (12.85086496 opt. deg) ;
                  Res: 0.00156948 deg (optical)"
END_OBJECT                      = FIELD

OBJECT                          = FIELD
    NAME                        = "LAMP_ID"
    DATA_TYPE                   = "TIME"
```

```
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Calibration Source ID
              0=Main ON
              1=Redundant ON
              2=Both ON
This is the echo of the TC_CALIBRATION devoted filed.
It’s a don’t care field if in SCI mode."
END_OBJECT                      = FIELD


OBJECT                        = FIELD
    NAME                        = "LAMP_GAIN_CURRENT_1"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = " Gain current for the main lamp.
     Min=0; Max=15 See RD3 It’s a valid filed only for the
     steps 3-4 of the CAL mode. It’s a don’t care field if in SCI mode and
     during the steps 1-2 and 5-6 of the CAL mode."
  END_OBJECT                    = FIELD


OBJECT                        = FIELD
    NAME                        = "LAMP_GAIN_CURRENT_2"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "Gain current for the redundant lamp.
        Min=0; Max=15 See RD3
        It’s a valid filed only for the steps 3-4 of
        the CAL mode. It’s a don’t care field if in SCI mode and
        during the steps 1-2 and 5-6 of the CAL mode"
  END_OBJECT                    = FIELD

OBJECT                        = FIELD
    NAME                        = "SUBFRAME_TOTAL_CHUNKS"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "UTC system format time corresponding
                                   to the SPACECRAFT ELAPSED TIME count"
  END_OBJECT                    = FIELD


OBJECT                        = FIELD
    NAME                        = "SUBFRAME_CURRENT_CHUNK"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
```

```
    FORMAT                      = "A23"
    DESCRIPTION                 = "UTC system format time corresponding
                                   to the SPACECRAFT ELAPSED TIME count"
  END_OBJECT                    = FIELD


OBJECT                        = FIELD
    NAME                        = "SUBFRAME_CHK_DATA_1"
    DATA_TYPE                   = "TIME"
    FIELD_NUMBER                = 2
    BYTES                       = 23
    FORMAT                      = "A23"
    DESCRIPTION                 = "UTC system format time corresponding
                                   to the SPACECRAFT ELAPSED TIME count"
  END_OBJECT                    = FIELD



END_OBJECT                      = SPREADSHEET

END
```

Appendix D Housekeeping

Function	**This packet provides the SCI and CAL data via HSSL (nominal)**			
DW (16 bits)	**Field**	**Size (bit)**	**Format**	**Description**
	PRIVATE HEADER			
01	ID	16	Uint16	See Table 8.2
02	LENGTH	16	Uint16	36932 (Maximum size)
03 04	SECONDS	32	Uint32	Datation of TM production time, second See 8.1 for description
05	SUBSECONDS	16	Uint16	Datation of TM production time, subsecond
06	COUNTER	16	Uint16	TM sequence counter
07 H	MODE	8	Uint8	Current Mode
07 L	SUBMODE	8	Uint8	Current Submode
	ACQ DATA			
08	ACQ_NUMBER	16	Uint16	Total number of acquisitions in the current session/sequence step Min=1; Max=65535
09	ACQ_COUNT	16	Uint16	Current acquisition number in the current session Min=1; Max= ACQ_NUMBER
10 H	ACQ_REPETITION	8	Uint8	Number of SC revolutions between two acquisitions Min=1; Max=255
10 L	ACQ_DURATION	8	Uint 8	Acquisition Cycle duration 0 = use SC Dynamics Else Min=27; Max=255; Res: 1DN= 1sec
11	SUBFRAME_NUMBER	16	Uint16	Total number of sub-frames for current acquisition phase Min=2; Max=6
12 bit 15-13	SUBFRAME_COUNT	3	Enum	Current sub-frame in the current acquisition Min=1; Max=6
12 bit 12	DATATION	1	Enum	0=external (nominal) 1=internal (recovery)
12 bit 11	WARN_DATATION_STEP	1	Enum	0= OK 1=Out of datation tolerance
12 bit 10	FRAME_ERROR_FLAG	1	Enum	Flag used to signal there was a timeout error during the acquistion 0=ACQ OK

				1=ACQ ERROR
12 bit 9-7	ACQ_TYPE	3	Enum	Type of acquisition 0 = Science 1 = Double Science Frame 1 2 = Double Science Frame 2 3 = Background 4= Dark 5= Readout noise
12 bit 6	CHANNEL_ID	1	Enum	Detector used for the current subframe 0 = Spectrum IR 1 = Image IR
12 bit 5-4	COMP_STATUS	2	Enum	Compression status of the current subframe 0 = Not compressed data 1 = Compressed data 2 = Not compressed data due to error
12 bit 3-2	SUBFRAME_TYPE	3	Enum	Type of subframe 0 = ImSubFrame = 128 x144 pixel 1 = SpSubFrameF = 128x112 pixel 2 = SpSubFrameM = 64x112 pixel 3 = SpSubFrameS = 16x112 pixel
12 bit 1-0	ROW_BACK_SUBTRACTION	2	Enum	RICE subtraction 0= Subtraction disabled 1= Background subtraction on 2= Reference row subtraction on
13 bit 15-12	START_NOISY_BITS	4	Uint4	It is the echo of SP_START_NOISY_BITS Set to 0 in case of compression error or not compressed data or JPG compression
13 bit 11-8	END_NOISY_BITS	4	Uint4	It is the echo of SP_END_NOISY_BITS Set to 0 in case of compression error or not compressed data or JPG compression
13 bit 7-4	CR_ROW	4	Uint4	Compression reference rows offset It is the echo of SP_CR_ROW Range 0..15 Not valid in case of not compressed data or JPG compression
13 bit 3-0	NOF_NOISY_BITS	4	Uint4	Number of used noisy bits Set to 0 in case of compression error or not compressed data or JPG compression
14	MIN_PIXEL_JPEG	16	Uint16	Max value for the pixel in JPEG compression. Not used in RICE
15	MAX_PIXEL_JPEG	16	Uint16	Min value for the pixel in JPEG compression. Not used in RICE
16	TEXPO	16	Uint 16	Expo time for the used detector Min=0; Max=65535 ;Res=0.2msec ;

17	TDELAY	16	Uint 16	Delay time for the used detector Min=0 ;Max=65535; Res=0.2msec ;
	SCI DATA AND HK			
18 19	SECONDS	32	Uint32	Datation of science and HK acquisition time (when the command of start acquisition is sent to the internal IF), second
20	SUBSECONDS	16	Uint16	Datation of science and HK acquisition time (when the command of start acquisition is sent to the internal IF),, subsecond
21	NADIR_OFFSET	16	Iint16	Nadir offset angle (Deg/100) related to the current frame , calculated by the sw (For example NADIR_OFFSET_1 + NADIR_DELTA) See SR-6040.
22 Bit 15-8	BKG_REPETITION	8	Uint8	Period of Background acquisition Min=0; Max=50
22 Bit 7-6	EN_DIS_SUB	2	Enum	Background subtraction enabled 0=EN 1=DIS
22 Bit 5-3	BKG_RN	3	Enum	Type of background 0=BKG 1=RN 2=DARK
22 Bit 2-0	EN_DIS_DOU_SCI	3	Enum	0=EN 1=DIS
23H	WIN1_X	8	Uint8	X coordinates of the SPE win or IMG L band win Min=0 Max 255 Res:1IDN=1pixel
23L	WIN1_Y	8	Uint8	Y coordinates of the SPE win or IMG L band win Min=0 Max 255 Res:1IDN=1pixel
24H	WIN2_X	8	Uint8	X coordinates of the IMG M band win, 0 in the case of SPE Min=0 Max 255 Res:1IDN=1pixel
24L	WIN2_Y	8	Uint8	Y coordinates of the IMG M band win, 0 in the case of SPE Min=0 Max 255 Res:1IDN=1pixel
25	DET_TEMP	16	Uint16	Temperature for the used detector Min=0; Max=16383; Res: 1DN=TBD K
26 bit 15-13	STATUS_DET	3	Enum	Detector status 0=OFF 1=ON 2=AUTO 3=NA

26 bit 12	STATUS_GAIN	1	Enum	Gain status for the detector 0=LOW 1=HIGH
26 bit 11	M_STATUS_LOOP_ERROR_FLAG	1	Enum	Motor control loop error flag 0=OK 1=ERROR
26 bit 10	M_STATUS_MOTOR_MODE	1	Enum	Despinning mode, acquired from FPA 0=POINT 1=DE-SPIN
26 bit 9	M_STATUS_MOTOR_POWER	1	Enum	Motor power status 0=Motor power off 1=Motor power on
26 bit 8	M_STATUS_ON_OFF	1	Enum	Motor status 0=Motor off 1=Motor on
26	Spare	7		
27	S_TELESCOPE_MIRROR_TEMP	16	Uint16	Telescope mirror temperature Min=0; Max=16383; Res: See RD3
28	S_SLIT_TEMP	16	Uint16	Slit temperature Min=0; Max=16383; Res: 1DN=TBD K
29	S_SC_IF_TEMP	16	Uint16	Interface with the S/C temperature Min=0; Max=16383; Res: 1DN=TBD K
30	S_COLD_RADIATOR_TEMP	16	Uint16	Cold radiator temperature Min=0; Max=16383; Res: 1DN=TBD K
31	S_SPECTROMETER_MIRROR_TEMP	16	Uint16	Spectrometer mirror temperature Min=0; Max=16383; Res: See RD3
32	M_MOTOR_TS	16	Uint16	Motor temperature Min=0; Max=16383; Res: 1DN=TBD K
33	M_CAL_SOURCE_TEMP	16	Uint16	Lamp 1 (main) temperature Min=0; Max=16383; Res: 1DN=TBD K
34	M_DIFFUSER_CAL_TEMP	16	Uint16	Calibration diffuser temperature Min=0; Max=16383; Res: 1DN=TBD K
35	M_MOTOR_START_POS	16	Uint16	Motor point/despin start position Min=0 (-12.85714286 opt. deg); Max =16380 (12.85086496 opt. deg) ; Res: 0.00156948 deg (optical)
	CAL DATA			
36 bit 15-14	Lamp_ID	2	Enum	Calibration Source ID 0=Main ON 1=Redundant ON 2=Both ON This is the echo of the TC_CALIBRATION devoted filed. It's a don't care field if in SCI mode.

36 Bit 13 -8	Lamp_gain_current_1	6	Enum	Gain current for the main lamp. Min=0; Max=15 See RD3 It's a valid filed only for the steps 3-4 of the CAL mode. It's a don't care field if in SCI mode and during the steps 1-2 and 5-6 of the CAL mode.
36 bit 7-2	Lamp_gain_current_2	6	Enum	Gain current for the redundant lamp. Min=0; Max=15 See RD3 It's a valid filed only for the steps 3-4 of the CAL mode. It's a don't care field if in SCI mode and during the steps 1-2 and 5-6 of the CAL mode.
36 bit 1-0	Spare	2		
	SUBFRAME			
37	SUBFRAME_DATA_1	16	Int16	Subframe data word 1.
.....				
18468	SUBFRAME_DATA_18432	16	Int16	Subframe data word 18432 (Maximum size)