ALCATEL
SPACE

HERSCHEL / PLANCK

EGSE INTERFACE Requirements Specification
H-P-1-ASPI-IS-0121

Product Code: 00000

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HERSCHEL/PLANCK	**DISTRIBUTION RECORD**		
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EXTERNAL DISTRIBUTION		**INTERNAL DISTRIBUTION**	
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ALENIA	**X**		
		Clt Documentation	**Orig.**

ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORDS*

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS *§ : CHANGE RECORD*		REDACTEUR *AUTHOR*
01	07/Nov/01	First issue.		
02	04/June/02	H-P-ASPI-CR-0123 H-P-ASPI-CR-0124		B.DUBOIS
03	18/June/02	H-P-ASPI-CR-0156 H-P-ASPI-CR-0157		B.DUBOIS
3.1	18/June/02	H-P-ASPI-CR-0259 H-P-ASPI-CR-0260		B.DUBOIS
4.0	10/April/03	H-P-ASPI-CR-0390 H-P-ASPI-CR-0391		B.DUBOIS
4.1	14/12/04	Updated version according to :		B.DUBOIS
		Par 2.2	Reference document added	
		Table 8	Source part field set to '000' bin	
		Table 9	Type and sub-type for RC packet is (8,4)	
		Table 10	Application data for RC packet : FunctionID, Act_ID, SID and optional parameter	
		Table 11	ACKRC messages are also applicable to H.IEGSE	
		Par 4.3	All RC are defined in SCOE's Reference Documents (par 2.2)	
		Par 4.3.2.2	Req deleted : there is no RC for HFI IEGSE	
		Par 4.3.2.3	Req deleted : there is no RC for LFI IEGSE	
		IFRQT-0563	Possibility for Sub-contractor to use sub-type (5,2) and (5,3) for asynchronous RM Event Packets	
		IFRQT-0563	Source data field for Event Packet modified to be compliant with PS-ICD. Refer to Fax H-P-ASP-LT-5167	
		Par 4.6.3	All RM are defined in SCOE's Reference Documents (par 2.2)	
		Par 4.6.3.2	No dedicated RM messages for ACMS quick Load, Optical Stimuli and Stimuli feedback.	
		IFRQT-0803	RC Packet Identifier parameter is 2 bytes length	
		IFRQT-0804	Addition of the optional parameter ACKRC (1,2)	
		IFRQT-0808	Correction of the length of TC (1,1) PIPE message	
		IFRQT-0808-3	Addition of the optional parameter ACKTC (1,2)	
		IFRQT-0809-1	TC Report : Insertion of 12 bytes forced to 0 in source data field in order to be compliant with PS-ICD [S4]. Fax H-P-ASP-LT-5167	
		Table 15	LAN configuration updated	
		IFRQT-0820	Format for RC and RM delivery	
		IFRQT-0870	Req deleted : No Herschel Stimuli SCOE	
		IFRQT-0882	TBC statement confirmed	
		IFRQT-0888-3	Position allocation for ACMS SCOE is [920-939]	

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS *§ : CHANGE RECORD*		REDACTEUR *AUTHOR*
		IFRQT-0888-11	Req not applicable for Cryo SCOE	
		IFRQT-0888-12	Req not applicable for Cryo SCOE	
		IFRQT-0900	Req deleted : no Quick Load SW IF for CDMU SCOE	
		IFRQT-0940	Electrical IF for TT&C SCOE added	
		IFRQT-1080	Req deleted : No Herschel Stimuli SCOE	

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1 SCOPE

The purpose of this document is to establish, in a single document, and in an unambiguous way, the interface definitions that are used by the different EGSE constituents (Platform and Instrument), to communicate between each other.

This document is composed of two main parts :

- **§ 4 - EGSE INTERNAL INTERFACE REQUIREMENTS** describes the communication protocol used between CCS and all EGSE's item in order to emit commands and receive data.
  RC and RM mean Remote Commanding/Remote Monitoring of SCOE's and Front Ends by the CCS, different from Satellite TC and TM.
  RC and RM paragraphs are split according to the LAN used to transmit data (SCOE/DFE LAN or IS LAN).

- **§ 5 - EGSE EXTERNAL INTERFACE REQUIREMENTS** describes all electrical characteristics :
  - between each EGSE and the UUT (SVM, PLM, Spacecraft)
  - between EGSE item (ex : TT&C SCOE TM/TC DFE)

Nota : All TBD's to be defined during phase B.

2 DOCUMENTS

2.1 Standard Documents

Ref.	Reference of document	Title
S1	H-P-1-ASPI-SP-0110	Ground Support Equipment Applicability Matrix of ECSS-E-40B
S2	ESA-PSS-04-105	TM Packet Standard
S3	ESA-PSS-04-106	TC Packet Standard
S4	SCI-PT-IF-07527	Herschel/Planck Packet Structure Interface Control Document (PS-ICD)

2.2 Reference Documents

Ref.	Reference of document	Title
RD1	HSCDT-TN-017	Understanding of the Interfaces between the CCS and the Herschel Instrument EGSEs in the IST
RD2	H-P-SP-AI-0014	PCDU REQUIREMENT SPECIFICATION
RD3	H-P-SP-AI-0003	CDMU Hardware REQUIREMENT SPECIFICATION
RD4	H-P-SP-AI-0011	ACMS REQUIREMENT SPECIFICATION
RD5	H-P-1-SP-AI-0015	SAS REQUIREMENT SPECIFICATION
RD6	H-P-1-SP-AI-0022	Batteries REQUIREMENT SPECIFICATION
RD7	H-P-SP-AI-0012	X/X Band Transponder Specification
RD8	H-P-SP-AI-0023	RFDN Specification
RD9	H-P-SP-AI-0024	X Band LGA Specification
RD10	H-P-SP-AI-0025	X Band MGA Specification
RD11	HP-2-ASED-TN-0048	Description of the PLM-FM Cryo Control Instrumentation
RD12		ARIANE 5 User's Manual
RD13	S2K-MCS-ICD-0014-TOS-GCI	SCOS-2000 OBSM External Interfaces Control Document
RD14	H-P-SAT-IF-1003	PLM SCOE CCS Command and Data ICD
RD15	H-P-SAT-IF-1004	CDMU DFE CCS Command and Data ICD
RD16	H-P-SAT-IF-1008	TM/TC DFE CCS Command and Data ICD
RD17	H-P-SAT-IF-1009	CDMU SCOE CCS Command and Data ICD
RD18	H-P-4-DS-IC-005	ACMS SCOE CCS ICD
RD19	H-P-4-SIA-IC-2001	H P POWER SCOE ICD
RD20	H-P-4-SIA-IC-1001	H P TT&C SCOE ICD
RD21	HP-2-ABSP-IC-0002	Cryo PFM SCOE Internal & External ICD
RD22	PICC-ME-xx-yyy	Validation Plan for CCS – IEGSE Test sequence Commanding Interface
RD23	HP-4-TE-ID-8020	CCS External ICD

2.3 Applicable Documents

Ref.	Reference of document	Title
AD1	H-P-1-ASPI-SP-0045	EGSE General Requirements Specifications
AD2	H-P-1-ASPI-SP-0082	H-P System Database Specification
AD3	H-P-4-TE-ID-8020	CCS External Interface Control Document
AD4	NDIU3-DR-0001-GSY ROS-MOC-NDIU-0001-GSY RO-ESC-RS-5002	NDIU3 for ROSETTA SVT's Design Report (NDIU full) NDIU3 for ROSETTA SVT's User Manual (NDIU full) I/F ROSETTA Gateway – TM/TC FEE (NDIU lite)
AD6	H-P-1-ASPI-SP-0141	Naming convention
AD7	H-P-1-ASPI-SP-0027	General Design and Interface Requirements
AD8	SCI-PT-ICD-07418	Space/Ground Interface Control Document
AD9	H-P-1-ASPI-TN-0127	EGSE Quick Load/Dump Interfaces

2.4 Acronyms

Abbreviation	Signification
AIT	**A**ssembly, **I**ntegration and **T**est
BCE	**B**attery **C**harge **E**quipment
BER	**B**it **E**rror **R**ate
BHC	**B**loc **H**ouse **C**onsole
BOB	**B**reak **O**ut **B**ox
BPSK	**B**i **P**hase **S**hift **K**eying
CCS	**C**entral **C**heckout **S**ystem
CCSDS	**C**onsultative **C**ommittee for **S**pace **D**ata **S**ystems
CLCW	**C**ommand **L**ink **C**ontrol **W**ord
CLTU	**C**ommand **L**ink **T**ransmission **U**nit
COTE	**C**heck **O**ut **T**erminal **E**quipment
CUC	**C**CSDS **U**nsegmented time **C**ode
EGSE	**E**lectrical **G**round **S**upport **E**quipment
EMC	**E**lectro**M**agnetic **C**ompatibility
FEE	**F**ront **E**nd **E**quipment
HK	**H**ouse **K**eeping
HPSDB	**H**erschel/**P**lanck **S**ystem **D**ata**B**ase
IF or I/F	**I**nter**F**aces
JU	**J**unction **U**nit
LAN	**L**ocal **A**rea **N**etwork
MMI	**M**an **M**achine **I**nterface
MTBF	**M**ean **T**ime **B**etween **F**ailure[1]
MTTR	**M**ean **T**ime **T**o **R**epare[2]
MOC	**M**ission **O**peration **C**enter
NA	**N**on **A**pplicable
NDIU	**N**etwork **D**ata **I**nterface **U**nit
NRZ-L	**N**on **R**eturn to **Z**ero-**L**evel
NRZ-M	**N**on **R**eturn to **Z**ero-**M**ark
OBCP	**O**n-**b**oard **C**ontrol **P**rocedures
OBSW	**O**n **B**oard **S**oft**W**are
PIPE	**P**acket **I**nterface **P**rotocol for **E**GSE
RF	**R**adio **F**requency
SAS	**S**olar **A**rray **S**imulator
SCOE	**S**pecific **C**heck **O**ut **E**quipment
TAI	**T**emps **A**tomique **I**nternational
TBC	**T**o **B**e **C**onfirmed
TBD	**T**o **B**e **D**efined
TM/TC	**Tele**m**e**try & **Tele**c**e**ommand
UTC	**U**niversal **T**ime **C**oordinated
UUT	**U**nit **U**nder **T**est
VC	**V**irtual **C**hannels

[1] Average time between two breakdown of the system
[2] Average time before complete repair of the system

3 GENERAL DESCRIPTION

3.1 FUNCTIONAL DESCRIPTION

This document is applicable to each EGSE equipment used for system AIT.

This document is the interface control document which contains the interface description applicable to the EGSE constituents as designed for the Herschel/Planck Satellites.
Following communication paths between the CCS and the SCOE's are defined :

- Telemetry
- Telecommand
- SCOE Monitoring
- SCOE Commands

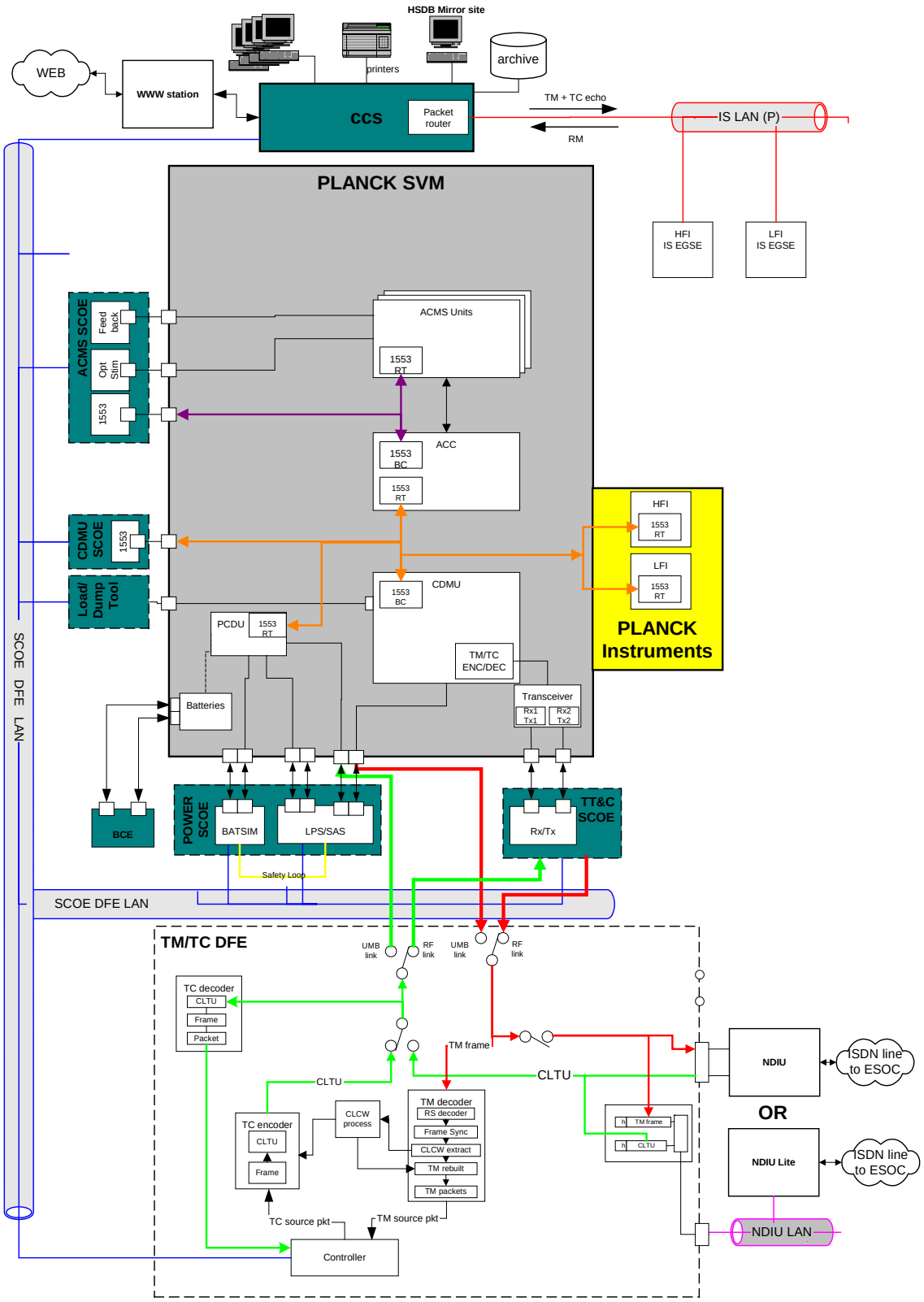


Figure 1 : Overview of the PLANCK EGSE architecture

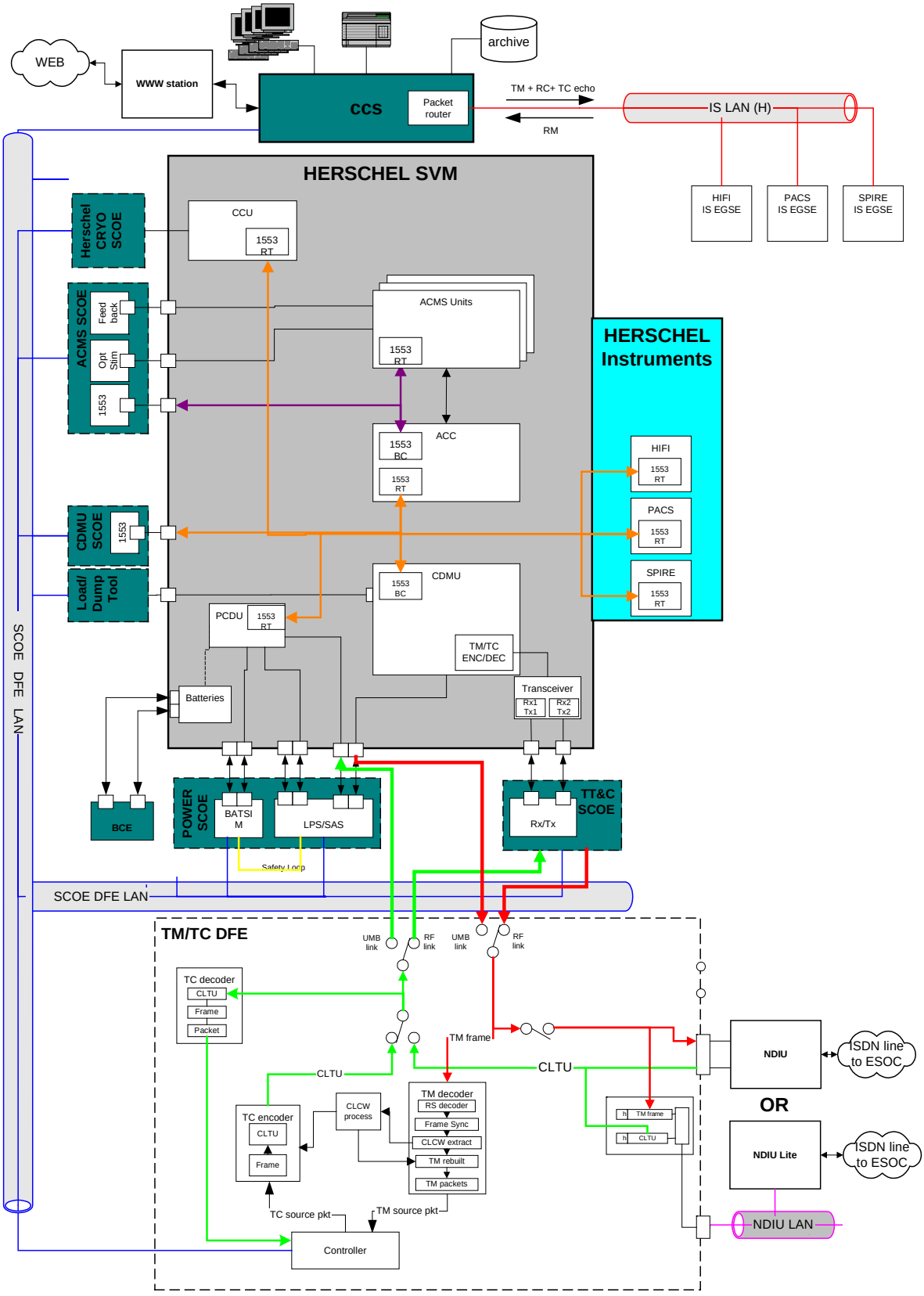


Figure 2 : Overview of the HERSCHEL EGSE architecture

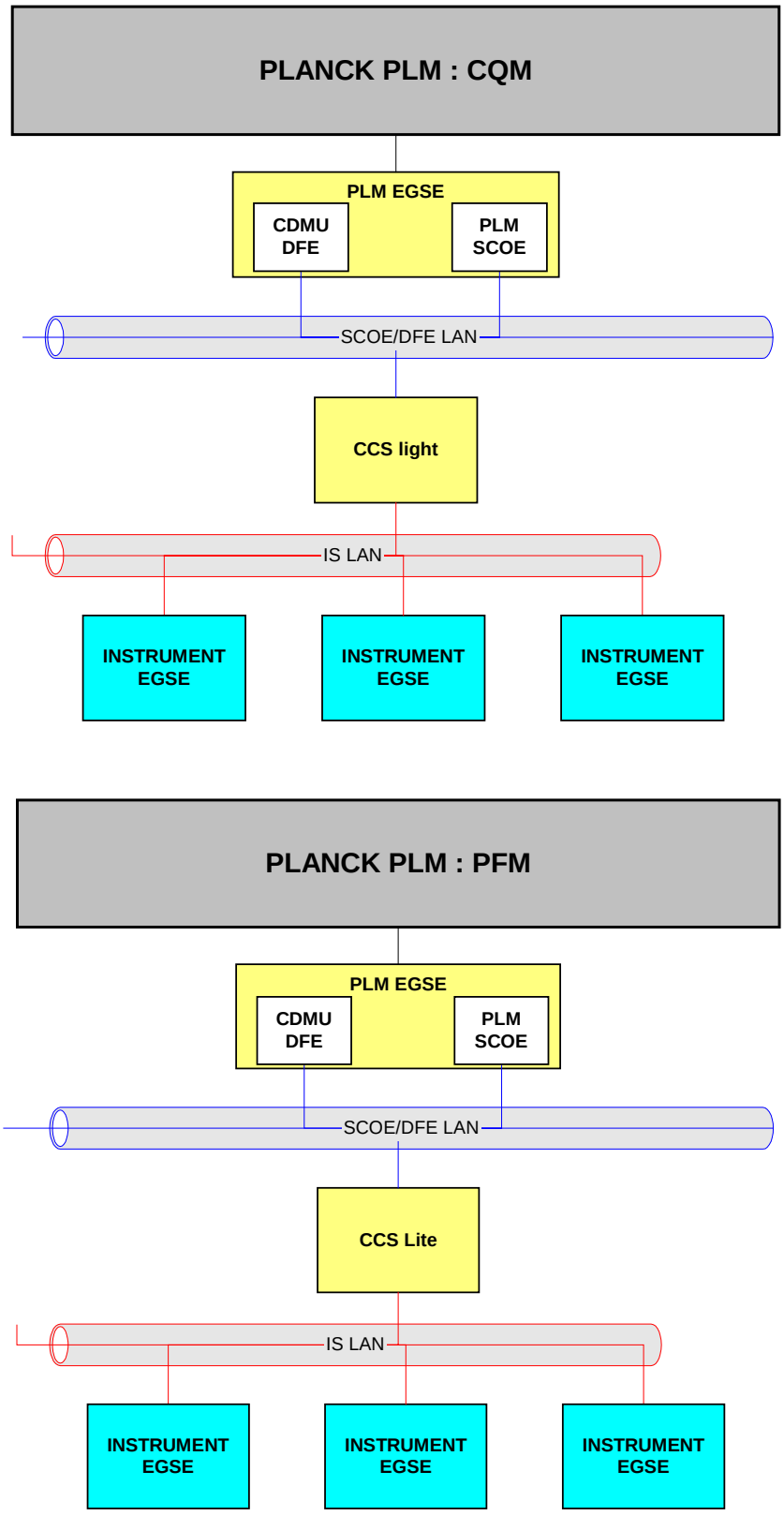


Figure 3 : EGSE PLANCK PLM Configuration

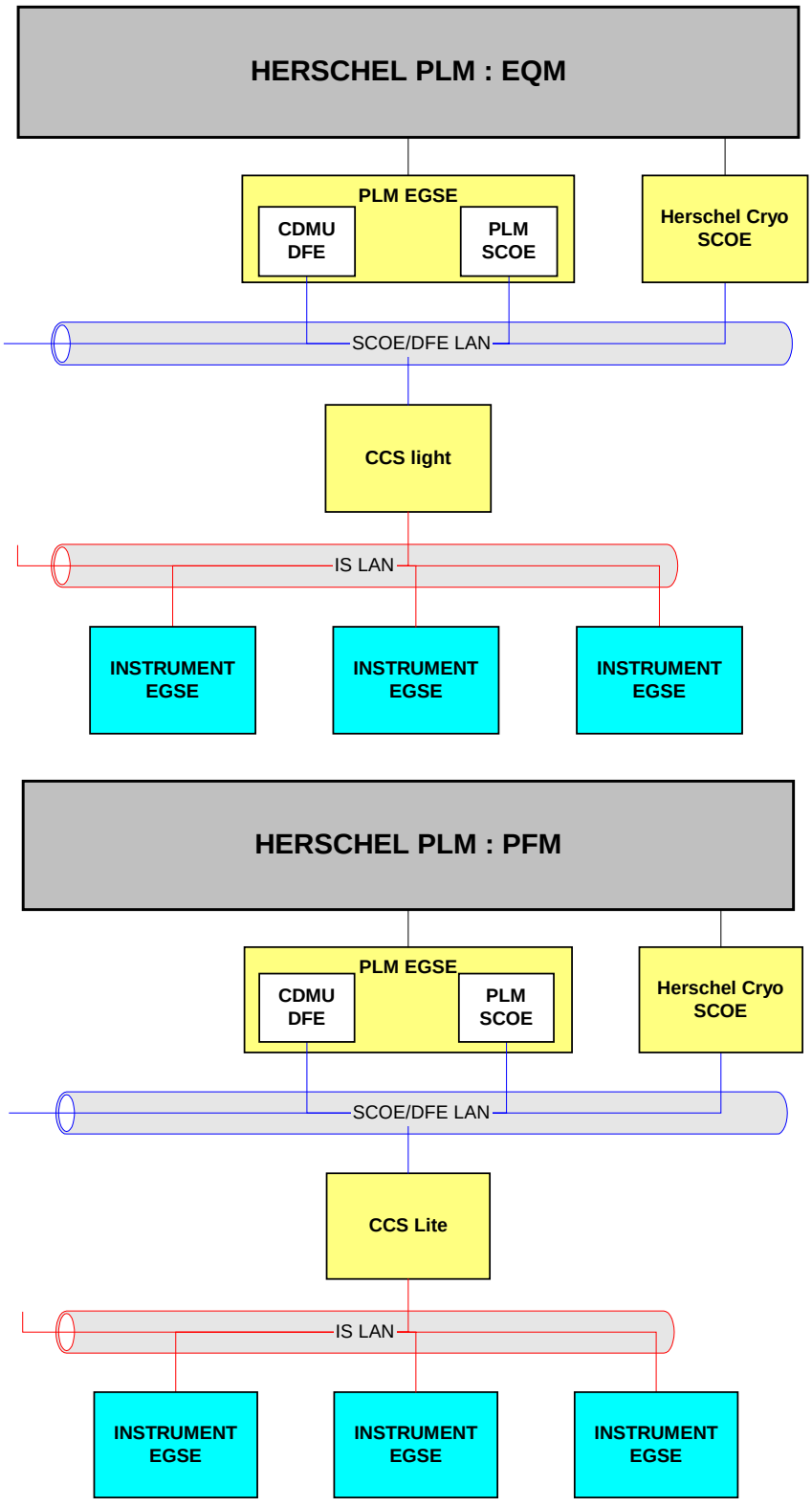


Figure 4 : EGSE HERSCHEL PLM Configuration

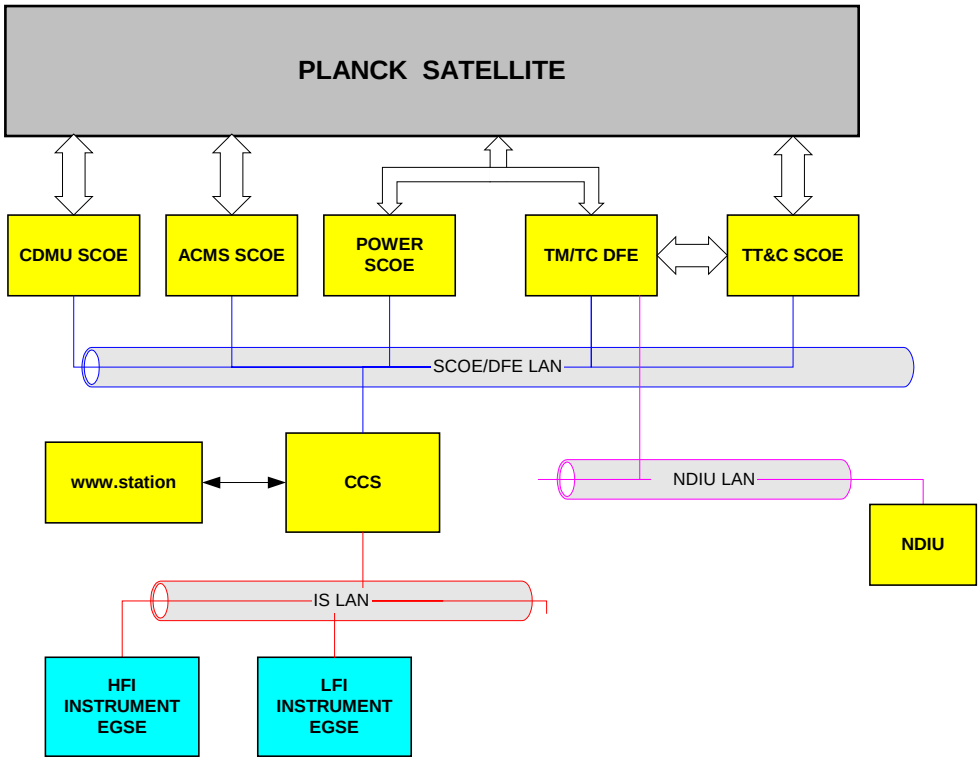


Figure 5 : EGSE PLANCK S/C Configuration

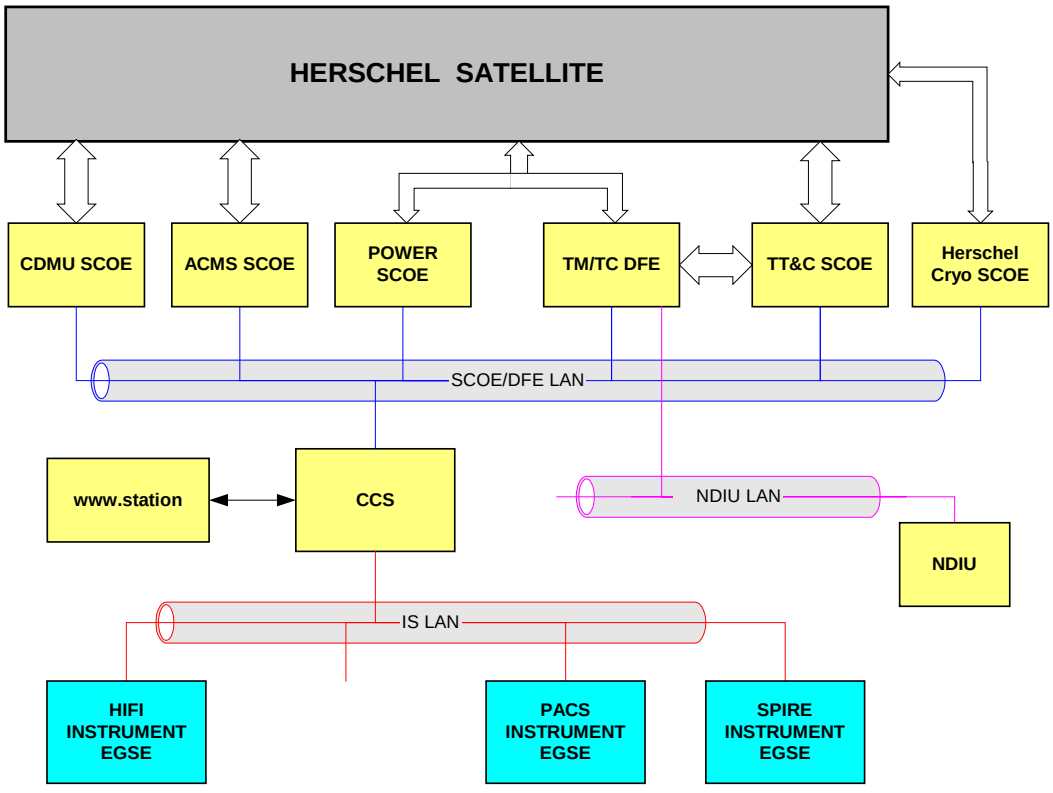


Figure 6 : EGSE HERSCHEL S/C Configuration

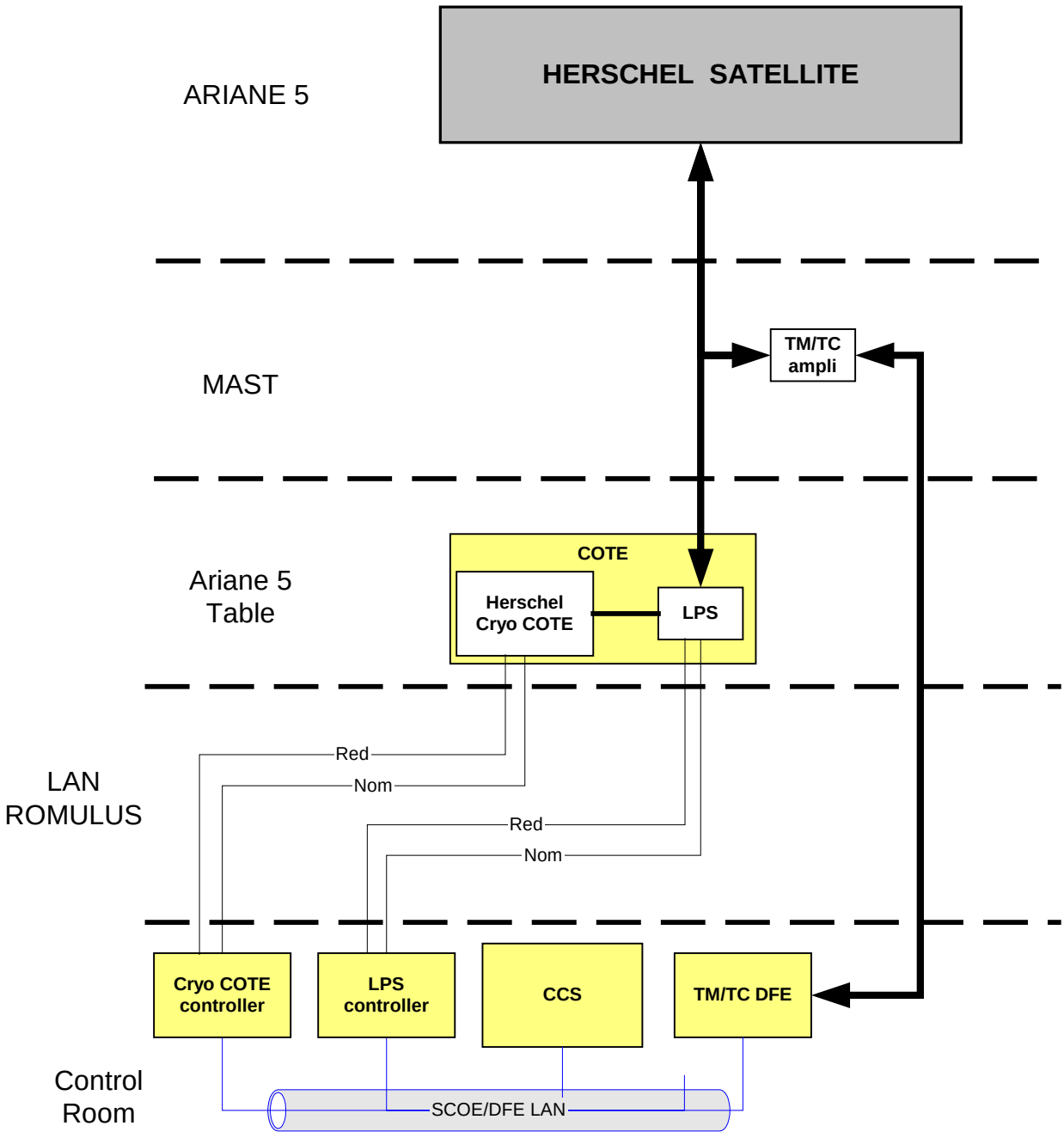


Figure 7 : HERSCHEL EGSE Launch Configuration

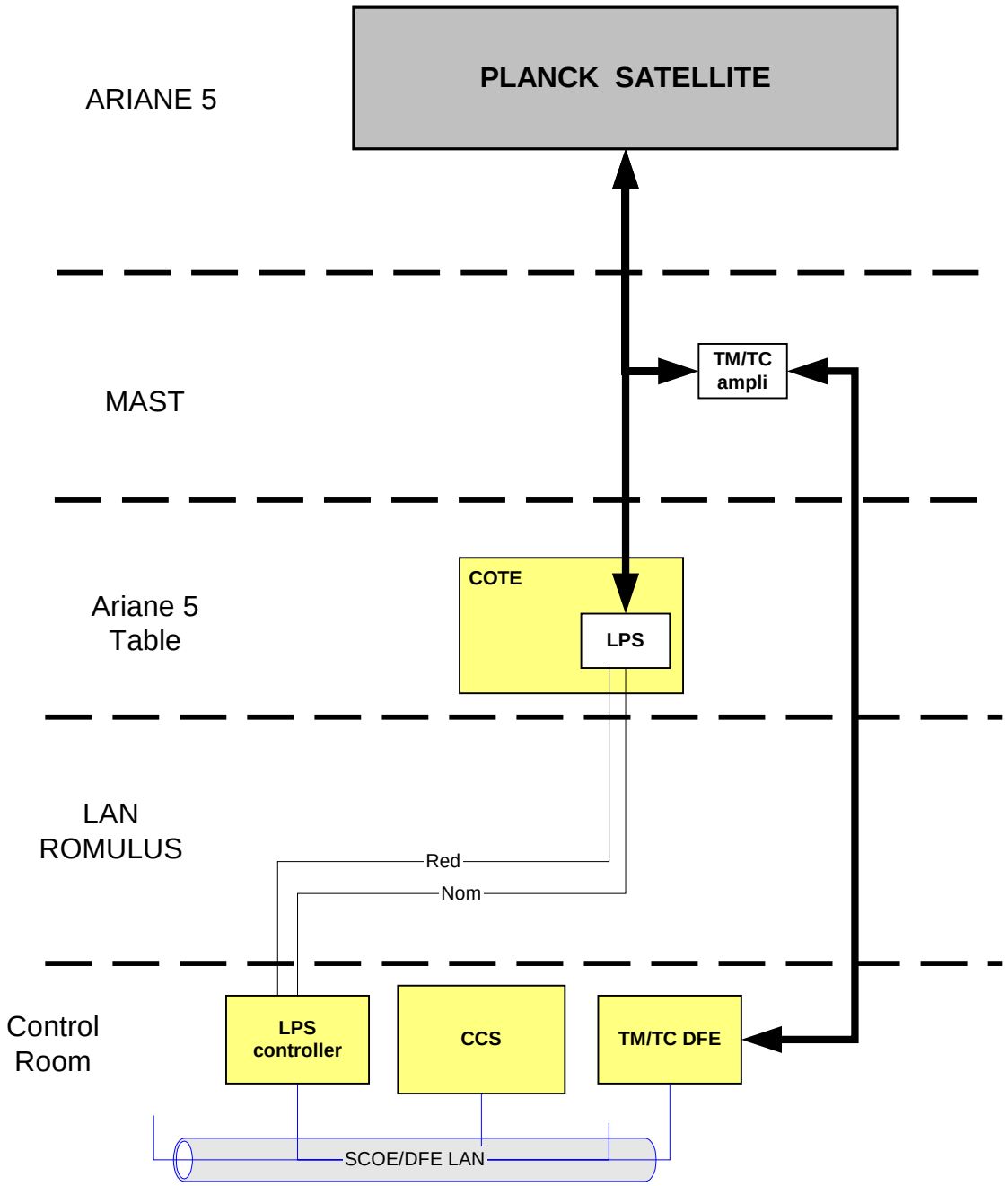
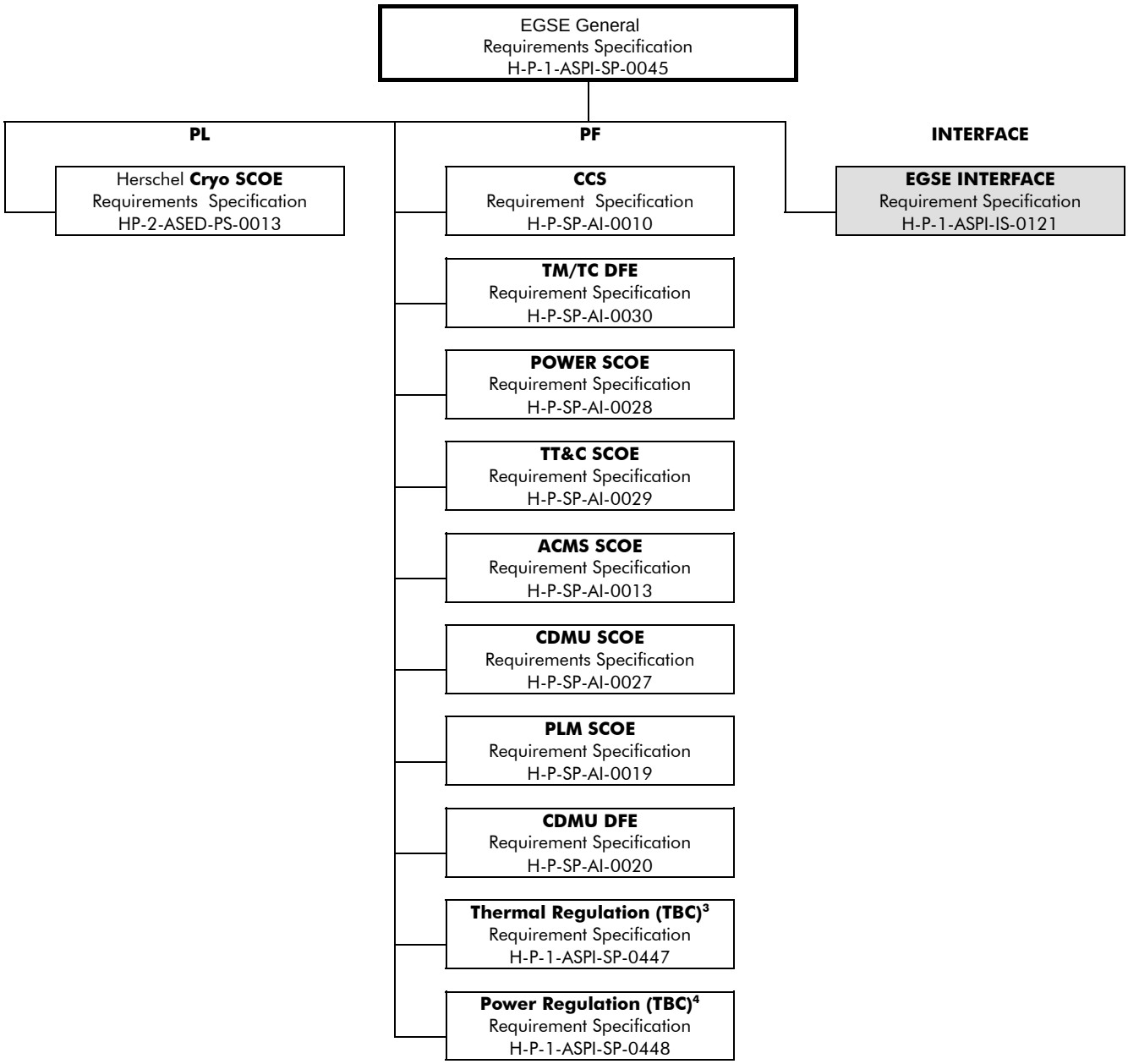


Figure 8 : PLANCK EGSE Launch Configuration

EGSE Specification Tree



[3] SCOE neither specify, procure and use by Alenia
[4] SCOE neither specify, procure and use by Alenia

3.2 SPECIFIC TERMS AND DEFINITION

There are a number of concepts that have been adopted within the EGSE that have an effect on the specification of the interfaces described in this document. These can be summarised as the following:

The CCS is solely responsible for sending telecommands and commanding the SCOE's.

In the following paragraph, DFE will design :
1. **TM/TC DFE** in EGSE SVM configuration, S/C configuration and Launch configuration (CCS will interface with S/C for TM and TC via TM/TC DFE)
2. **CDMU DFE** in EGSE PLM configuration (Herschel and Planck), (CCS Lite will interface with PLM for TM and TC via CDMU DFE)

The SCOE's shall be able to be controlled completely from the CCS without intervention on the SCOE

The CCS is responsible for archiving all Low rate Telemetry, Telecommand Data and all other CCS/SCOE traffic

4 EGSE INTERNAL INTERFACE REQUIREMENTS

4.1 PROTOCOL DEFINITION

4.1.1 General

Assuming that source packet are provided as the highest level data units for both TM and TC, typical EGSE and simulation systems would require a data routing mechanism that allows Packets to be transferred from one system to another.
The simplest solution can be found in routing the Source Packet from one location to another without any additional information or encapsulation. Analysis shows however that even in a simple environment, additional information would be required.

This solution allows PIPE protocol to adopt the following concepts:
- Allow for separate TM and TC data link
- Allow for dedicated command link (RC)
- Allow for Acknowledge RC
- Allow for Acknowledge TC
- Allow for SCOE/DFE/IS monitoring link (RM)
- Allow for Telemetry distribution link
- Allow for TC Echo link

The main purpose of PIPE protocol is to allow Packets exchange between EGSE items connected via LAN.

The protocol is structured in such a way that Packets are transferred without any changes. This is achieved by the attachment of an information header that contain additional information required for proper routing and processing of the Packets. This complete data structure is referred to as a PIPE message.

The header contains a number of fixed fields that can be used to identify and allow further processing of the Packet.

Following the header, a complete (unchanged) TM/TC Packet is embedded into the message. Theoretically the Packet can have a maximum length of 65529 Bytes as dictated by [S2] and [S3] with the limitation of residue PIPE header. However, for Herschel-Planck, the maximum length of a complete TC Packet (and RC Packet) is 248 bytes, and the maximum length of a complete TM Packet (and RM Packet) is 1024 bytes as mentioned in [S4] (H-P PS-ICD).

[IFRQT-0010] [Analysis]

The communication and control interface between EGSE item shall be based under 100 Mb/s ETHERNET network using TCP/IP with a class B IP network addressing.

- Communication between CCS and SCOE shall be done via SCOE/DFE LAN
- Communication between CCS and Instrument Station shall be done via IS LAN
- Communication between CCS and www station shall be done via standard LAN and is not covered by this specification
- Communication between TM/TC DFE and NDIU shall be done via [AD4]

[IFRQT-0020] [Analysis]

This control/command exchange is based on the PIPE protocol dedicated to real time communication.

[IFRQT-0030] [Analysis]

They are two types of exchanged data:

Control Flow:

- Telecommand Packets sending on-board (TC)
- EGSE Remote Command (RC) → *(Packets sent by CCS to SCOE for commanding this SCOE (configuration, set value, synch...))*

Monitoring Flow:

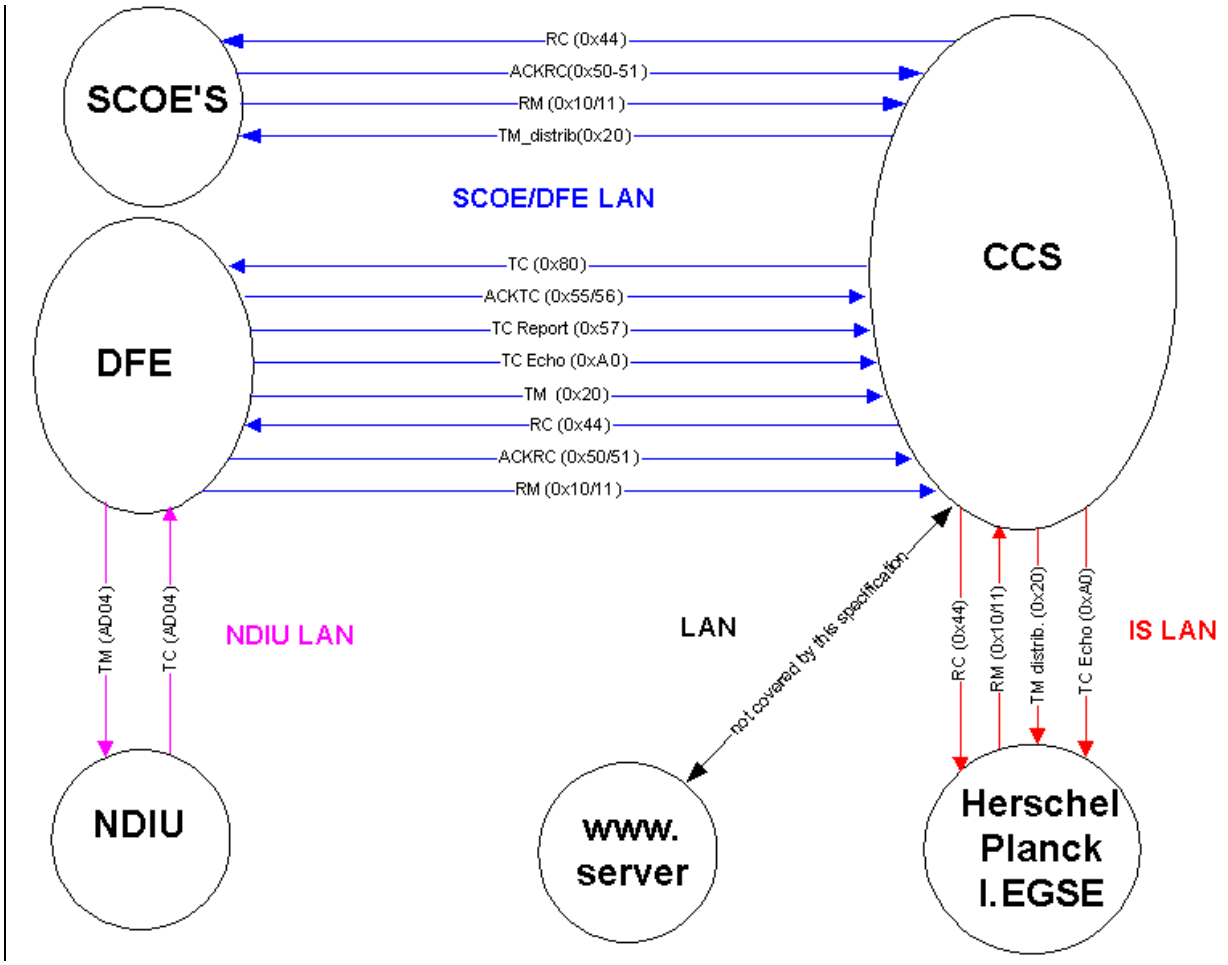
- On-board Telemetry Packets (TM)
- EGSE Remote Message Packets (RM) → *(Packet generated by each SCOE (one packet per SCOE identified by APID) sent to CCS containing its internal data like status, logging message, error report, data acquisition...):*
    - Periodic packets containing vital data acquired/measured by SCOE
    - Asynchronous packets containing special SCOE/DFE/IS event/error/warning
    - Keep Alive Packet
- Acknowledge RC packets
- Acknowledge TC packets
- TC Echo distribution

[IFRQT-0040] [Analysis]

It shall be foreseen to have a single TCP/IP socket for each connection between SCOE/DFE/IS and CCS

[IFRQT-0042] Deleted [Test]

[IFRQT-0043] Deleted [Test]


SCOE'S
DFE
CCS
RC (0x44)
ACKRC(0x50-51)
RM (0x10/11)
TM_distrib(0x20)
SCOE/DFE LAN
TC (0x80)
ACKTC (0x55/56)
TC Report (0x57)
TC Echo (0xA0)
TM (0x20)
RC (0x44)
ACKRC (0x50/51)
RM (0x10/11)
TM (AD04)
TC (AD04)
NDIU LAN
LAN
not covered by this specification
RC (0x44)
RM (0x10/11)
TM distrib. (0x20)
TC Echo (0x40)
IS LAN
NDIU
www. server
Herschel Planck I.EGSE

4.1.2 Communication Link

[IFRQT-0045] [Test]

The communication links between CCS and SCOE/DFE/IS shall be managed following a Client/Server philosophy where the CCS acts as a Client and the SCOE/DFE/IS is the Servers accepting connection and service requests.

[IFRQT-0050] [Test]

Each SCOE, DFE or Instrument Station (IS) shall automatically accept a "connection request" coming from the CCS in order to try to establish the connection after the On-line software start-up and in general every time the connection itself is dropped or failed.

[IFRQT-0070] [Test]

The connection between the CCS and a SCOE/DFE/IS shall be considered open as soon as TCP/IP connection has been successfully established.

[IFRQT-0080] [Test]

The CCS Shall expect to receive at least one *message* from each SCOE/DFE/IS every 60 seconds as soon as the connection is open.

It is not mutual i.e. no keep-alive message will be transmitted by CCS towards the SCOE's.

[IFRQT-0100] [Test]

In case of logical connection broken or any problem to open/close a connection, the CCS and the SCOE/DFE/IS concerned shall automatically raise an alarm to local operator I/F

[IFRQT-0102] [Test]

Following error type shall automatically drop the connection and raise an alarm to local operator I/F:

- PIPE Header Error - inconstistent Length
- PIPE Header Error – inconstistent Synchro Word
- Whole PIPE message writing and reading not possible in the time of 5 seconds
- No data received for more than 60 seconds
- SCOE connection error (port not free, unrecoverable communication error)

[IFRQT-0103] [Test]

Following error type shall automatically raise an alarm to local operator I/F:

- PIPE Header Error- Unknown Message ID
- PIPE Header Error - illegal VCID
- TM packet format error
- RM packet format error
- Unexpected RC (RC received before sending ACKRC)

[IFRQT-0104] [Test]

The CCS user shall be able to open and close the connection on explicit user command

[IFRQT-0110] [Test]

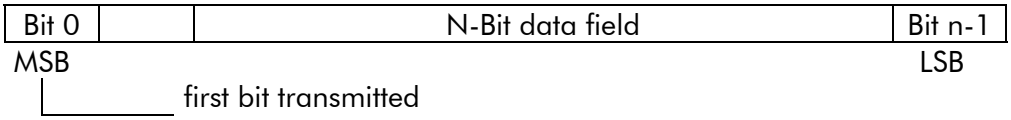
As soon as the connection between the CCS and a SCOE/DFE/IS is established, the SCOE/DFE/IS (whatever its mode is (Local or Remote)) shall send to the CCS RM Keep-Alive Packet (0x11) or at least one Remote Message packet (RM) every 60 seconds (0x10)

(See 4.6 MONITORING FLOW – Remote Message Packets)

4.1.3 Byte order

In this document the following convention is used to identify each bit in a forward-justified N-bit field.

The first bit in the field to be transmitted is defined to be 'Bit 0'; the following bit is called 'Bit 1' and so on, up to 'Bit n-1'. When the field is used to express a binary value (such as an integer), the Most Significant Bit (MSB) shall be the first transmitted bit of the field (i.e., 'Bit 0').



The byte order is 'big endianity'

4.1.4 Message Structure

[IFRQT-0120] [Analysis]

All the TCP-IP messages exchanged between the CCS, the TM/TC DFE and other SCOE start with the PIPE Header followed by the Body.
The PIPE header is added/removed by PIPE layer (it is not seen at application level)
All the Integer value are under IEEE format

PIPE Header	Body message
10 bytes	User defined (14 bytes< <1024)

Table 1 : PIPE message lay-out

4.1.5 PIPE Message HEADER

The PIPE Header consists of a fixed number of 10 bytes split up in several fields whose minimum length is one byte.

The detailed structure of the PIPE header is depicted in the figure below:

Field	Length (byte)	DESCRIPTION	TYPE
Message ID	1	Identification of the message	integer
VCID	1	Filled only for TM message. 0x00 otherwise.	integer
Remaining length	2	Length of the message excluding the first 4 bytes	integer
Request ID	4	TC/RC identification	integer
Synchronisation Word	2	Synchro of PIPE message	integer

Table 2 : PIPE message Header

Message ID
In order to support a number of different messages with different purpose, a PIPE message starts with a one byte message identifier. This ID can be used to make a distinction between different control, status and data messages.

VCID
The one-byte Virtual Channel ID field indicates on which VCID are downlinked the TM source packet. This field is filled by TM/TC DFE.

Remaining Message length
The message length is a two-byte length field indicating the remaining length of the message including the remaining header fields and data.
Remaining Message length = Body Message length + 6 bytes.
Unit is "number of bytes".

Request ID
The 4 bytes field identifies which TC (RC) will be sent. This value will be checked with that one return by the ACKTC (ACKRC) and TC Report messages. The Request ID field of TC Echo message will be fixed to 0. The Request ID wraps around from “full-scale” to zero

Synchronisation Word
The two-bytes field is used to assure the PIPE protocol management.
This field will be forced to 0x**FADE**

PIPE structure	Field Description	Size	Values	TYPE
Header	Message ID	1 byte	Variable	integer
	VCID	1 byte	Variable	integer
	Remaining length	2 bytes	Variable	integer
	Request ID	4 bytes	Variable	integer
	Synchronisation Word	2 bytes	Forced to 0x**FADE**	integer

Table 3 : Monitoring Flow (TM/RM) PIPE Header

PIPE structure	Field Description	Size	Values	TYPE
Header	Message ID	1 byte	Variable	integer
	VCID	1 byte	Forced to 0x**00**	integer
	Remaining length	2 bytes	Variable	integer
	Request ID	4 bytes	Variable	integer
	Synchronisation Word	2 bytes	Forced to 0x**FADE**	integer

Table 4 : Command Flow (TC/RC) PIPE Header

4.1.6 Body message

The Body Message is constituted of one Header Field and of one Data Field.
The Header Field have a total length of 6 bytes.
The Data Fields can have a minimum length of 14 bytes and a maximum length of 65536 bytes as dictated by the CCSDS & ESA packet standards [S2] and [S3].

The Message Body of a PIPE message consists of Herschel-Planck TM/TC source packets, with structures and limitations conformant to the H-P PS-ICD [S4].
For the purpose of message verification it is recommended to check the packet size against the maximum packet size applicable for TM and TC packets in H-P, respectively.

4.1.6.1 Monitoring Flow message (SCOE's/DFE/IS → CCS)

[IFRQT-0130] [Analysis]

For **on-board Telemetry Packet**, the complete body message shall be used to embed a Packet without any modifications to the contents or length of the Packet in question

[IFRQT-0140] [Analysis]

For **Remote Message (RM) Packets** provided by SCOE's, the complete body message shall be formatted as **TM** source packet and shall have the following structure :

SOURCE PACKET HEADER (48 bits)							**PACKET DATA FIELD** (VARIABLE)		
Packet Identification				Packet Sequence Control		Packet Length	Data Field Header	Source Data	Packet Error Ctrl
Version Number	Type	Data Fields Header Flag	Application Process ID	Segmentation Flags	Source Sequence count				
3	1	1	11	2	14				
16 bits				16 bits		16 bits	80 bits	N x 16 bits	16 bits

Spare	TM Source Packet PUS Version Number	Spare	Packet Type	Packet Sub-Type	Spare	Time
(1 bits)	(3 bits)	(4 bits)	(8 bits)	(8 bits)	(8 bits)	(48 bits)

field	length	VALUE	TYPE
Source Packet Header			
Version number	3 bits	forced to '**000**'	binary
Type	1 bit	forced to '**0**'	binary
Data field header flag	1 bit	forced to '**1**'	binary
Application process ID	11 bits	SCOE/DFE/IS APID (Refer to * depend on EGSE location (Alenia, Astrium, Alcatel) Table 15 page 78)	integer
Segmentation flags	2 bits	forced to '**11**'	binary
Source sequence count	14 bits	Packet count per APID	binary
Packet length	2 bytes	*length of packet data field - 1*	Integer
	6 bytes		

Table 5 : RM Source Packet Header

field	length	VALUE	TYPE
Spare	1 bits	forced to '**0**'	binary
PUS version number	3 bits	forced to '**000**'	binary
Spare	4 bits	forced to '**0000**'	binary
Packet type	1 byte	*depend on the service type*	integer
Packet sub-type	1 byte	*depend on the service sub type*	integer
Spare	1 byte	forced to 0x**00**	integer
Time	6 bytes	SCOE/DFE/IS time	CUC
	10 bytes		

Table 6 : RM Data Field Header

field	length	VALUE	TYPE
Source data	Nx1 byte	SCOE/DFE/IS *parameter list*	variable
Packet error control	2 bytes	Not Used	Integer

Table 7 : RM Remaining Packet Data Field

Application process ID
The APID field indicating uniquely identifies the source of the packet.
For ***Remote Message*** Packet, the APID identifies the SCOE/DFE/IS emitting the packet.

Packet length
The Packet Length field specifies the number of octets contained within the Packet Data Field, including the Data Field Header. The number is an unsigned integer "C" where
C = (Number of octets in Packet Data Field) - 1

Packet Type:
This indicates the Service to which this telemetry source packet relates.

Packet Subtype:

Together with the Packet Type, the Subtype uniquely identifies the nature of the Service constituted by this telemetry source packet.

Time:
This field represents the EGSE reference time of the packet, expressed in CUC. Details of the time field are given in appendix 6 of [S4]
- 48 bits of time field are split into 4 bytes for Coarse time (seconds) and 2 bytes for Fine time (subseconds).
- TAI Epoch is 1958-January-1st.

Source Data (Variable)
The source data constitutes the data element of the RM packet. It contains all internal parameter of each SCOE's.

Packet Error Control (PEC) (16 bits)
The Packet Error Control field shall transport an error detection code that can be used by the ground to verify the integrity of the complete telemetry source packet → **not used for RM**

4.1.6.2 Control Flow message (CCS → SCOE's/DFE/IS)

[IFRQT-0150] [Analysis]

For **Telecommand Packets**, the complete body message shall be used to embed a Packet without any modifications to the contents or length of the Packet in question

[IFRQT-0160] [Analysis]

For **Remote Command (RC) Packets** sent to SCOE's, the complete body message shall be formatted as **TC** packet and shall have the following structure :

SOURCE PACKET HEADER (48 bits)							**PACKET DATA FIELD** (VARIABLE)		
Packet Identification				Packet Sequence Control		Packet Length	Data Field Header	Application Data	Packet Error Ctrl
Version Number	Type	Data Fields Header Flag	Application Process ID	Sequence Flags	Sequence count				
3	1	1	11	2	14				
16 bits				16 bits		16 bits	32 bits	N x 16 bits	16 bits
				Seq flag	Seq Count				
				(3 bits)	(11 bits)				

CCSDS Secondary Header flag	TC Source Packet PUS Version Nbr	Acknowledge	Packet Type	Packet Sub-Type	Spare
(1 bit)	(3 bits)	(4 bits)	(8 bits)	(8 bits)	(8 bits)

field	length	VALUE	TYPE
Source Packet Header			
Version number	3 bits	forced to '**000**'	binary
Type	1 bit	forced to '**1**'	binary
Data field header flag	1 bit	forced to '**1**'	binary
Application process ID	11 bits	*SCOE/DFE/IS destination address (Refer to* * depend on EGSE location (Alenia, Astrium, Alcatel) Table 15 *page78)*	integer
Segmentation flags	2 bits	forced to '**11**'	binary
Sequence count			binary
Source part	3 bits	forced to '**000**'	binary
Sequence part	11 bits	Packet count per APID	binary
Packet length	2 bytes	*length of packet data field - 1*	Integer
	6 bytes		

Table 8 : RC Source Packet Header

field	length	VALUE	TYPE
CCSDS Sec Header flag	1 bits	forced to '**0**'	binary
PUS version number	3 bits	forced to '**000**'	binary
Acknowledge	4 bits	forced to '**0001**'	binary
Packet type	1 byte	forced to 0x**08**	integer
Packet sub-type	1 byte	forced to 0x**04**	integer
Spare	1 byte	forced to 0x**00**	integer
	4 bytes		

Table 9 : RC Data Field Header

field	length	VALUE	TYPE
Application data			
Function ID	1 byte	RC identifier (**Mandatory**)	Enum
Activity ID	1 byte	Activity of function (**Mandatory**)	Enum
SID	2 bytes	Structure of parameter field (**Mandatory**)	Enum
Parameter	variable	*Optional parameter list*	Any
Packet error control	2 bytes	forced to 0x**00** (not Used for RC only)	Integer

Table 10 : RC Remaining Packet Data Field

Application process ID
The Application Process ID defines the application or unit that the Telecommand **is addressed to.**
For ***Remote Command*** Packet, the APID identifies the SCOE/DFE/IS receiving the packet.

Sequence Count: (14 bits):
This field is provided to identify a particular Telecommand packet so that it can be traced within the end-to-end Telecommand system. The field is divided into two parts as follows:

Source part (3 most significant bits) identifies the generator or source of a certain command as follows:

111 = Ground, all sources (maintained by ground)

Sequence part (11 bits) shall be used to represent the actual Sequence Count. The Sequence Count is maintained by the Telecommand source for each Application Process ID. The sequence count shall be incremented by 1 whenever a command is generated with that Application Process ID. The counter wraps around from "full-scale" to zero.
When an acknowledgement of a TC-packet is required (see "Ack" field in the data field header below), it is mandatory that the full Sequence Control field is included in the telemetry acknowledge packet as the identifier of the Telecommand packet being acknowledged (see §4.7). No check is to be performed by the addressed application regarding the monotony of the sequence counter, **the application shall accept commands regardless of the sequence counte**r.

Packet length
The Packet Length field specifies the number of octets contained within the Packet Data Field, including the Data Field Header. The number is an unsigned integer "C" where
C = (Number of octets in Packet Data Field) - 1

Packet Type:
This indicates the Service to which this telecommand source packet relates.

Packet Subtype:
Together with the Packet Type, the Subtype uniquely identifies the nature of the Service constituted by this telecommand source packet.

Ack:
This field is used to indicate which acknowledgements, in the form of Telecommand verification packets, are required to notify acceptance and to verify execution of this Telecommand packet. This relates only to acknowledgement of successful acceptance and execution, since failure reports shall be generated by default.
The bit settings shall be as follows:

---1 (bit 3 of the Ack field set): **mandator**y, acknowledge acceptance of the packet by the Application Process

Application Data
The Telecommand application data constitute the data element of the Remote Command to be used by the CCS to command SCOE's.

Packet Error Control (PEC) (16 bits)
The purpose of the mandatory Packet Error Control field is to transport an error detection code that shall be used by the receiving Application Process to verify the integrity of the complete Telecommand Packet → **Not used for RC**

4.1.7 Message ID List

Message ID	TYPE	Description	(Type, SubType)	Source	Dest.	[IFRQT-]
0x**80**	TC	S/C TELECOMMAND Packets		CCS	DFE	0170
0x**44**	RC	SCOE Command Packets	(8,4)	CCS	SCOE/DFE/IS	0200
0x**20**	TM	On-Board Telemetry Packets acquisition		DFE	CCS	0500
0x**20**	TM	Telemetry Packets Distribution		CCS	SCOE/DFE/IS	0520
0x**10**	RM	SCOE Periodic Telemetry	(3,25)	SCOE/DFE/IS	CCS	0562
0x**10**	RM	SCOE Asynch. Telemetry	(5,1)	SCOE/DFE/IS	CCS	0563
0x**11**	RM	SCOE Idle Packet (Alive Packet)		SCOE/DFE/IS	CCS	0809-2
0x**50**	ACKRC	RC Acceptance report – Success	(1,1)	SCOE/DFE/IS	CCS	0803
0x**51**	ACKRC	RC Acceptance report – Failure	(1,2)	SCOE/DFE/IS	CCS	0804
0x**55**	ACKTC	TC Acceptance report – Success	(1,1)	DFE	CCS	0808-2
0x**56**	ACKTC	TC Acceptance report – Failure	(1,2)	DFE	CCS	0808-3
0x**A0**	TC Echo	TC Echo		DFE CCS	CCS IS station	0809
0x**57**	TC Report	TC Report – Success	(5,1)	DFE	CCS	0809-1
		TC Report – transmission failure	(5,4)			

Table 11 : Message ID

4.1.8 Message Control Flow description

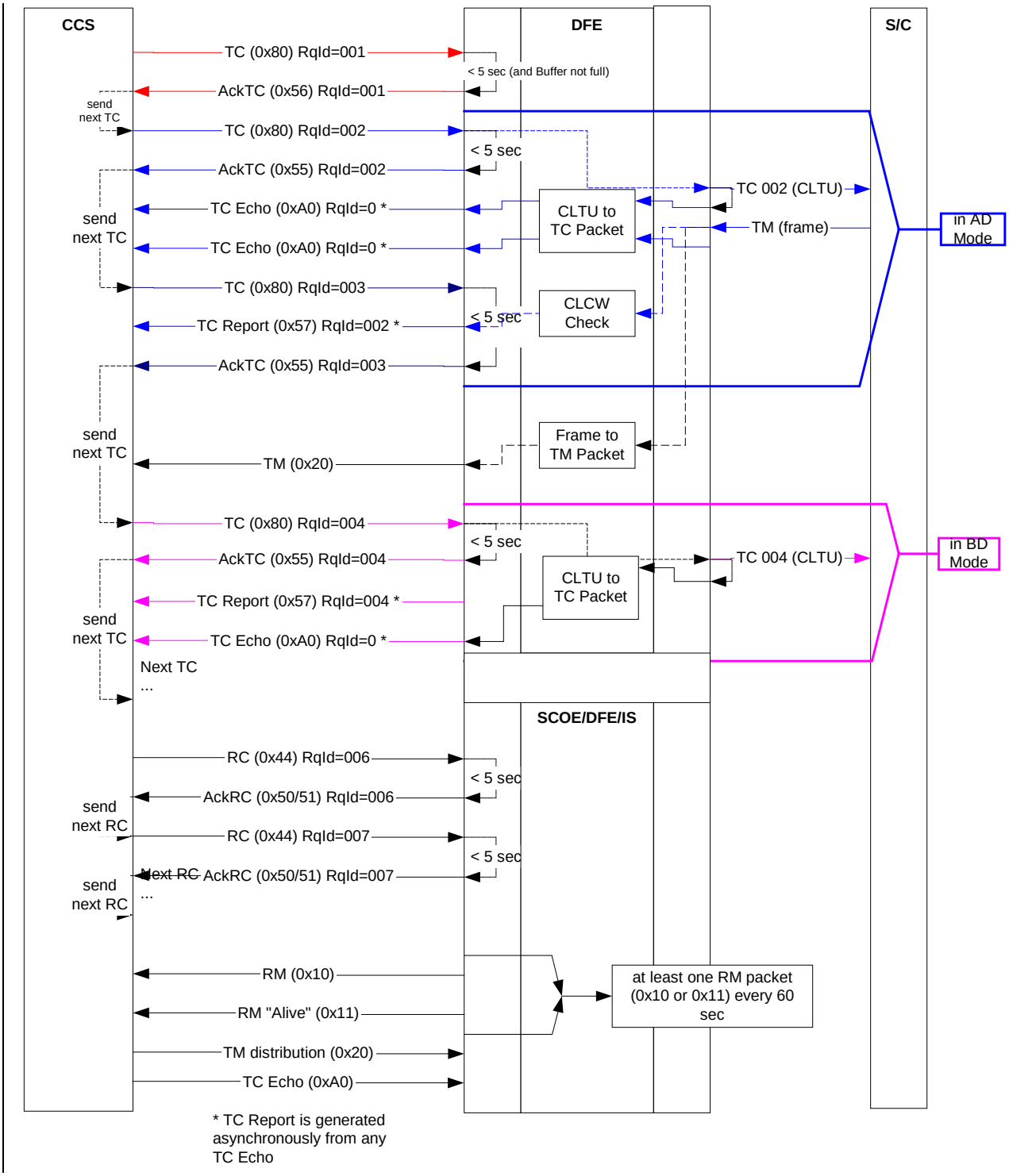


Figure 9 : Control Flow message description

[IFRQT-0161] [Test]

The exchange of TC Source Packet between a client (CCS) and a server (TM/TC DFE) shall respect the following interactions :

1. Client (CCS) issues a **TC Source Packet** message (0x80) to a Server (TM/TC DFE)
2. TM/TC DFE checks if this TC Source Packet could be accepted (dangerous list, TC encoder status, DFE status, …)
3. After these verifications, TM/TC DFE will sent a TC acknowledge message (**ACKTC**) to the CCS : "**Success**" (0x55) if TC Source Packet is being queued, "**Failure**" (0x56) otherwise.
4. DFE shall maintain a TC buffer. In case this buffer become full, DFE shall stop sending ACKTC message until buffer there is again available space in buffer.
5. Once ACKTC message received (Success or Failure), the CCS could issue an other TC Source Packet (step 1 to 3)
6. In the case of Positive ACKTC, TM/TC DFE will encode TC Source Packet into CLTU
7. TM/TC DFE will then decode the resulting CLTU bitstream into a TC Source Packet (nominally identical to the original TC Source Packet). This TC Source Packet will be sent to CCS in a dedicated message called **TC Echo message** (0xA0)
8. TM/TC DFE will generate a **TC Report** (0x57) message both in AD and BD mode (but only uses the CLCW information when in AD mode).
   The TC Report is a guaranteed one-to-one "final confirmation of transmission" for all TC Packets (irrespective of mode) and is generated always (also in case of ACKTC=Failure).

[IFRQT-0162] [Test]

CCS shall wait for RC acceptance/failure report (ACKRC) before sending the next RC command

[IFRQT-0163] [Test]

CCS shall wait for TC acceptance/failure report (ACKTC) before sending the next Telecommand

[IFRQT-0164] [Test]

Request ID mechanism :

1. Field filled by CCS when generating a TC (resp RC) message
2. TM/TC DFE has to fill in the field with the same Request ID when sending back ACKTC and TC Report message (resp ACKRC message)

[IFRQT-0165] [Test]

Timeout response :

The acknowledgement shall be sent by the receiver as soon as possible without any artificial delay.

CCS shall expect ACKTC (or ACKRC) messages in less than 5 seconds after sending TC (or RC) command.

[IFRQT-0166] [Test]

TC Report (0x57) shall be generated asynchronously from any TC Echo (0xA0).

4.2 CONTROL FLOW – TELECOMMAND Packets

[IFRQT-0170] [Test]

CCS shall send **Telecommand Packets** to DFE using the following format

Source	CCS
Destination	DFE
Rate	4 kb/s
LAN	SCOE/DFE LAN

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 4 page 30 with : Message ID = Refer to Table 11 page 37 Request ID = Variable (initiated by CCS)			
Body	**TC Packet**	**variable**	**variable**	variable

[IFRQT-0180] Deleted [Analysis]

[IFRQT-0190] Deleted [Analysis]

4.3 CONTROL FLOW – CCS REMOTE Commanding Packets

Source	CCS
Destination	SCOE/DFE/IS
Rate	N/A
LAN	SCOE/DFE LAN

[IFRQT-0200] [Analysis]

CCS shall send **Remote Command (RC) Packets** to SCOE's/DFE using the following format

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 4 page 30 with : Message ID = Refer to Table 11 page 37			
Body	Source Packet Header	Refer to Table 8 page 35		
	Data field header	Refer to Table 9 page 35 with : Packet Type = 0x**08** Packet sub-type = 0x**04**		
	Application data	*Length*	*Parameter list*	*Type*
	Function ID	1 byte	RC identifier (**Mandatory**)	Enum
	Activity ID	1 byte	Activity of function (**Mandatory**)	Enum
	SID	2 bytes	Structure of parameter field (**Mandatory**)	Enum
	Parameter 1	variable	Optional	Any
	Parameter …	variable	Optional	Any
	Parameter n	variable	Optional	Any
	Packet error control	2 bytes	Not Used	integer

[IFRQT-0201] Deleted [Analysis]

[IFRQT-0210] Deleted [Analysis]

[IFRQT-0220] [Analysis]

Each Remote Command shall be identified by one unique mnemonic defined in HPSDB (as for TC.)

[IFRQT-0230] [Analysis]

Application data shall be composed of :
- '*Function ID*' field will contain the RC identifier (which identify uniquely the RC)
- '*Activity ID*' field could be used freely by SCOE contractor (if needed, else to be set to zero).
- '*SID*' field will indicate the presence of RC parameter(s). (zero =no parameters are sent)
- parameters fields (optional)

[IFRQT-0240] [Analysis]

HPSDB will link the RC mnemonic with all the data in order to built the RC packet message and to identify the target IP address/port and name:

RC Mnemo → RC_ID → SCOE IF Name → APID
IP name → IP address
SCOE Port

Parameter → Transfer function
PIPE message length
RC Packet length
Packet type
Packet sub type

[IFRQT-0245] [Information]

The list of commands and parameters contained in **Application Data** field is non exhaustive; It shall be filled by the Sub-Contractor of each SCOE.

[IFRQT-0246] [Information]

All SCOE/DFE shall have a common set of mandatory Remote Commands :

RC mnemonic	Operational description
	Execute Self-test
	Switch the SCOE to ON line
	Switch the SCOE to OFF line
	Switch the SCOE to LOCAL Mode
	Switch the SCOE to REMOTE Mode
	Enable of archive
	Disable of archive

Table 12 : Common Remote Commands

[IFRQT-0247] [Information]

Each SCOE Sub-contractor is free to define and to add all the commands needed for SCOE application in the tables defined hereafter

4.3.1 COMMUNICATION VIA SCOE/DFE LAN

4.3.1.1 CCS Commands

[IFRQT-0250] N/A [Analysis]

4.3.1.2 CCS → CDMU SCOE Commands

[IFRQT-0260] To Be Completed [Test]

CDMU SCOE shall accept from CCS at least the following command

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD17]

4.3.1.3 CCS → ACMS SCOE Commands

[IFRQT-0270] To Be Completed [Test]

ACMS SCOE shall accept from CCS at least command to :

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD18]

4.3.1.4 CCS → TT&C SCOE Commands

[IFRQT-0280] To Be Completed [Test]

TT&C SCOE shall accept from CCS at least the following command

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD20]

4.3.1.5 CCS → TM/TC DFE Commands

[IFRQT-0290] [Test]

TM/TC DFE SCOE shall accept from CCS at least the following command

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD16]

4.3.1.6 CCS → Umbilical I/F Module Commands

[IFRQT-0300] Deleted [Test]

4.3.1.7 CCS → BATSIM SCOE Commands

[IFRQT-0310] To Be Completed [Test]

Battery Simulator SCOE shall accept from CCS at least command to :

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD19]

4.3.1.8 CCS → SAS SCOE Commands

[IFRQT-0320] Deleted [Test]

4.3.1.9 CCS → BCE SCOE Commands

[IFRQT-0330] N/A (no interface with CCS) [Test]

4.3.1.10 CCS → LPS/SAS Commands

[IFRQT-0340] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD19]

4.3.1.11 CCS → SIS SCOE Commands

[IFRQT-0350] [Test]

Deleted

4.3.1.12 CCS → PLM SCOE Commands

[IFRQT-0360] To Be Completed [Test]

RC mnemonic	Operational description
See Table 18	Common RC (refer to Table 12 page 42)
	Refer to [RD14]

4.3.1.13 CCS → Herschel Cryo SCOE/CRYO COTE Commands

[IFRQT-0370] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD21]

4.3.1.14 CCS → Planck PLM SCOE Commands

[IFRQT-0380] Deleted [Test]

4.3.1.15 CCS → Planck Sorption SCOE Commands

[IFRQT-0390] Deleted [Test]

4.3.1.16 CCS → CDMU DFE Commands

[IFRQT-0400] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Common RC (refer to Table 12 page 42)
		Refer to [RD15]

4.3.1.17 CCS → 1553 Bus Probe Commands

[IFRQT-0405] N/A [Test]

4.3.1.18 CCS → Quick Load Commands

[IFRQT-0410] [Test]

N/A

4.3.2 COMMUNICATION VIA Instrument Station LAN

4.3.2.1 CCS → Instrument Stimuli SCOE Commands

[IFRQT-0420] Deleted [Test]

4.3.2.2 CCS → HFI EGSE Commands

[IFRQT-0430] Deleted [Test]

4.3.2.3 CCS → LFI EGSE Commands

[IFRQT-0440] Deleted [Test]

4.3.2.4 CCS → HCSS SCOE Commands

[IFRQT-0450] Deleted [Test]

4.3.2.5 CCS → HIFI EGSE Commands

[IFRQT-0460] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Refer to [RD22]

4.3.2.6 CCS → PACS EGSE Commands

[IFRQT-0470] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Refer to [RD22]

4.3.2.7 CCS → SPIRE EGSE Commands

[IFRQT-0480] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 18		Refer to [RD22]

4.3.3 COMMUNICATION VIA www LAN

4.3.3.1 CCS → www.Server Commands

[IFRQT-0490] Deleted [Test]

4.4 MONITORING FLOW - On-Board Telemetry Packets acquisition

Source	DFE
Destination	CCS
Rate	As soon as a valid packet is available
LAN	SCOE/DFE LAN

[IFRQT-0500] [Analysis]

DFE shall send all TM source packet received to CCS using the following format

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = VCID number of the corresponding frame Request ID = Forced to 0x**0000 0000**			
Body	**TM Source Packet**	**variable**	**variable**	

[IFRQT-0510] [Analysis]

DFE shall transmit TM Packet as soon as a valid TM packet is available.

4.5 MONITORING FLOW - Telemetry Packets Distribution

Source	CCS
Destination	SCOE/DFE/IS
Rate	As soon as a valid packet is available
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0520] [Analysis]

The CCS shall be able to distribute all incoming Packets to the proper destination on the basis of their SPID (APID+Type+Subtype+SID)
The TM distribution is based on a table define inside the HPSDB.

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = VCID number of the corresponding frame Request ID = Forced to 0x**0000 0000**			
Body	**TM Source Packet**	**variable**	**variable**	

4.6 MONITORING FLOW – Remote Message Packets

[IFRQT-0525] [Analysis]

Two kinds of Remote Message shall be foreseen :

1. Periodic RM packets containing vital data measured/acquired by each SCOE/DFE/IS
2. Asynchronous RM packets containing special events /errors/warning notification

[IFRQT-0540] Deleted [Analysis]

[IFRQT-0550] [Analysis]

Source data shall contain all the necessary information concerning the SCOE/DFE/IS (status, current, voltage, temperature, alarm, etc...)

The content of these fields is describe for each SCOE/DFE/IS in the following paragraphs.

The list of parameters contained in **Source Data** field is non exhaustive; It shall be filled by the Sub-Contractor of each SCOE/DFE/IS.

[IFRQT-0560] [Analysis]

Each RM Packet source shall be identified by its APID defined in HPSDB (as for TM packets.)

Refer to * depend **on EGSE location (Alenia, Astrium, Alcatel)**

Table 15 page 78.

RM Packet structure shall be identify by the combination of APID, Packet type, Packet subtype and SID (structure Identifier).

4.6.1 PERIODIC RM Message

Source	SCOE/DFE/IS
Destination	CCS
Rate	1 packet/second for POWER SCOE and PLM SCOE 1 packet/10 seconds for all other SCOE/DFE/IS
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0562] (Was -0530) [Analysis]

Each SCOE/DFE/IS shall send **Remote Message (RM) Packets** to the CCS using the following format.

The period of these RM Message shall be available in each SCOE/DFE/IS configuration file and shall be modifiable.

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00**			
Body	Source Packet Header	Refer to Table 5 page 32		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**03** Packet sub-type = 0x**19**		
	Source data	*Length*	*Parameter list*	*Type*
	SID	2 bytes	Structure of parameter field (**Mandatory**)	**Enumerated 2 octets**
	Parameter 1	variable	Mandatory	Any
	Parameter …	variable	Optional	Any
	Parameter n	variable	Optional	Any
	Packet error control	2 bytes	Not Used	integer

SID: free used by sub-co

The SID, together with the Application Process ID and the nature of the packet (packet type / subtype) implicitly identifies the structure of the parameter field.

The combination of APID/Type/Sub-type/SID fields solely identify the parameters of the packet.

Parameters:

This field consists of a sequence of values of housekeeping or diagnostic parameters that are sampled nominally once per packet generation interval.

[IFRQT-0562-1] [Information]

All SCOE/DFE/IS shall have a common set of mandatory Periodic Remote Monitoring parameters

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
See Table 21	**SCOE mode**	0 Local mode 1 Remote mode	1	Integer
	Software activity :	0 idle 1 loading 2 running 3 simulation 4 Self Test	1	Integer
	SCOE Configuration :		1	Integer
	SCOE On-line/Off-line status*	0 Off-line 1 On-line	1	Integer
	Self-test status 0 **Unknown** (during software start-up) 1 **Passed** (if all tests went OK) 2 **Failed** (if some tests failed) 3 **Override** (if the operator indicate that the failed tests are not severe and test sequence execution shall be allowed)		1	Integer
	SCOE set	0 set #1 (AVM) 1 set #2 (Herschel) 2 set #3 (Planck)	1	Integer

* in Off-line mode, Satellite power lines are completely isolated from the SCOE (all relay OFF, …)

Table 13 : Common Periodic Remote Monitoring Parameters

[IFRQT-0562-2] [Information]

Each SCOE Sub-contractor is free to define and to add all the parameters needed for SCOE application in the tables defined hereafter

[IFRQT-0562-3] [Information]

If needed, SCOE/DFE/IS could send several different RM Packet (3,25) by using SID mandatory field.
It is up to Sub-contractor to define the meaning of each different RM Packet.

It is possible to make each packet with a logical split; e.g. one packet for acquisition sensors, one for heater status, one for current/voltage, etc
Note : some RM packet (3,25) could be not periodic, but this shall be rare.

4.6.2 ASYNCHRONOUS RM Message (Event Report)

Source	SCOE/DFE/IS
Destination	CCS
Rate	Asynchronous
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0563] [Analysis]

When a special event happen (error, warning, …), each SCOE/DFE shall send an Event Report to the CCS using the following format.

At least packet sub-type (5,1) is mandatory.

If needed packet sub-type (5,2) for Exception Report and (5,4) for Alarm Report could be used by the SCOE's sub-contractor

PIPE structure	Field Description			
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00**			
Body	Source Packet Header	Refer to Table 5 page 32		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**05** Packet sub-type = 0x**01 or** 0x**02 or** 0x**04**		
	Source data	**length**	***Parameter list***	**value**
	Event ID	2 bytes	Event Identifier	Any
	SID	*2 bytes*	*Structure Identifier*	*Forced to **0***
	Parameters A	*8 bytes*	*Complementary Information*	*Forced to **0***
	Event Seq Counter	*2 bytes*	*Event Sequence Counter*	*Forced to **0***
	Parameters B	Variable n x 2 bytes	**Optional**	Any
	Packet error control	Integer 2 bytes	Not Used	

Event ID free used by sub-co:
The Event Identifier allows to distinguish a certain Event unambiguously from any other, which may be generated by a certain Application Process or unit. It may be used by the on-board Event/Action Service, or by ground control, to initiate a foreseen activity, if that Event occurs.

SID :
Not used. Forced to 0.

Parameters A :
Not used. Forced to 0.

Event Sequence Counter :
Not used. Forced to 0.

Parameters B (optional) :
The Parameters B -field may provide further complementary information related to the particular event.
In all cases the parameter field shall have a length corresponding to one or several 16-bit words.

[IFRQT-0563-1] [Information]

All SCOE/DFE/IS shall have a common set of mandatory Asynchronous Remote Monitoring parameter :

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
See Table 21	**Event ID**		2	Integer
	Local disk capacity	0 Not OK (full) 1 OK (not full)	2	Integer

Table 14 : Common Asynchronous Remote Monitoring Parameters

[IFRQT-0563-2] [Information]

SCOE will use Event Packet to send Log Messages to CCS. In this case, ASCII string parameters will be 'fixed length' type.

4.6.3 COMMUNICATION VIA SCOE/DFE LAN

4.6.3.1 RM CDMU SCOE Definition

[IFRQT-0565] To Be Completed [Test]

Periodic RM (3,25) - SID = 1

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD17]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD17]		

4.6.3.2 RM ACMS SCOE Definition

[IFRQT-0570] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD18]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD18]		

4.6.3.2.1 Quick Load

Deleted

4.6.3.2.2 Optical Stimuli

Deleted

4.6.3.2.3 Stimuli Feedback

Deleted

4.6.3.3 RM TT&C SCOE Definition

[IFRQT-0580] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD20]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD20]		

4.6.3.4 RM TM/TC DFE Definition

[IFRQT-0590] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD16]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD20]		

4.6.3.5 RM Umbilical I/F Definition

[IFRQT-0600] Deleted [Test]

4.6.3.6 RM BATSIM SCOE Definition

[IFRQT-0610] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD19]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD19]		

4.6.3.7 RM SAS SCOE Definition

[IFRQT-0620] Deleted [Test]

4.6.3.8 RM BCE SCOE Definition

[IFRQT-0630] N/A (no interface with CCS) [Test]

4.6.3.9 RM LAUNCH POWER SUPPLY Definition

[IFRQT-0640] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD19]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD19]		

4.6.3.10 RM SIS SCOE Definition

[IFRQT-0650] Deleted [Test]

4.6.3.11 RM PLM SCOE Definition

[IFRQT-0660] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD14]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)	2	Integer
See Table 21	Refer to [RD14]		

4.6.3.12 RM Herschel Cryo SCOE/CRYO COTE Definition

[IFRQT-0670] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD21]		

Periodic RM (3,25) - SID = 2→ TBC

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 21	Refer to [RD21]		

Periodic RM (3,25) - SID =3→ TBC

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 21	Refer to [RD21]		

Periodic RM (3,25) - SID =4→ TBC

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 21	Refer to [RD21]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD21]		

4.6.3.13 RM Planck PLM SCOE Definition

[IFRQT-0680] Deleted [Test]

4.6.3.14 RM Planck Sorption SCOE Definition

[IFRQT-0690] Deleted [Test]

4.6.3.15 RM CDMU DFE Definition

[IFRQT-0700] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD15]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD15]		

4.6.3.16 RM 1553 Bus Probe Definition

[IFRQT-0710] [Test]

Definition integrated in CDMU DFE and CDMU SCOE RM definition

4.6.3.17 RM Quick Load I/F Definition

[IFRQT-0720] N/A [Test]

4.6.3.18 RM 1553 Bus Monitor Definition

[IFRQT-0700] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD15]		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 55)		
See Table 21	Refer to [RD15]		

4.6.4 COMMUNICATION VIA IS LAN

4.6.4.1 RM Instrument Stimuli SCOE Definition

[IFRQT-0730] Deleted [Test]

4.6.4.2 RM HFI EGSE Definition

[IFRQT-0740] Deleted [Test]

4.6.4.3 RM LFI EGSE Definition

[IFRQT-0750] Deleted [Test]

4.6.4.4 RM HCSS SCOE Definition

[IFRQT-0760] Deleted [Test]

4.6.4.5 RM HIFI EGSE Definition

[IFRQT-0770] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28) TBC	4	Integer
See Table 21	Refer to [RD22]		

4.6.4.6 RM PACS EGSE Definition

[IFRQT-0780] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD22]		

4.6.4.7 RM SPIRE EGSE Definition

[IFRQT-0790] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 28)		
See Table 21	Refer to [RD22]		

4.6.5 COMMUNICATION VIA www LAN

4.6.5.1 RM www.Server Definition

[IFRQT-0800] Deleted [Test]

4.7 MONITORING FLOW – Acknowledge Message Packets (ACKRC)

Source	SCOE/DFE
Destination	CCS
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0801] [Analysis]

Each SCOE/DFE shall send back to CCS an Acknowledgement message each time the SCOE/DFE received a Remote Command

[IFRQT-0802] [Analysis]

Once the complete PIPE Message is accepted, SCOE application software shall check the coherency of the RC Packet embedded inside PIPE Body .

[IFRQT-0802-1] [Analysis]

The validation for acceptance of RC packets depends on RC packet content and on SCOE/DFE configuration

[IFRQT-0802-2] [Analysis]

The verification of RC packets contents shall follow the hierarchy define hereafter :

1. Check Packet Length value coherency
2. Verify consistency of APID

[IFRQT-0802-3] [Analysis]

The verification of SCOE/DFE configuration shall follow the hierarchy define hereafter :

1. Check SCOE/DFE state (**On-line**/Off-line)
2. Check SCOE/DFE mode (**Remote**/local)

[IFRQT-0802-4] [Analysis]

If all the previous verification are positive, the acceptance message is return as Successful.

If at least one of the previous verification is negative, the acceptance message is return as Failure

4.7.1 Remote Command Acceptance report – Success (1,1)

[IFRQT-0803] [Analysis]

For all RC received by a SCOE/DFE, a Command Acceptance Report shall be generated immediately with the following format in case of acceptance :

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Same as the original RC initiated by CCS Remaining length = 0x**001C**			
Body	Source Packet Header	Refer to Table 5 page 32 with : Packet length = 0x**0F**		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**01** Packet sub-type = 0x**01**		
	Source data	*Length*	*Parameter list*	*Type*
	RC Packet Identifier	2 bytes	Original RC Packet Identifier	integer
	RC Packet Sequence Control	2 bytes	Original RC Sequence Control	integer
	Packet error control	2 bytes	Not Used	integer

where :

RC Packet Identifier (2 bytes) :
This is a copy of the corresponding field from the packet header of the RC to which this verification packet relates i.e. the APID (and the most significant 5 bits of this field).

RC Packet Sequence Control (2 bytes) :
This is a copy of the corresponding fields from the packet header of the RC to which this verification packet relates.

4.7.2 Remote Command Acceptance report – Failure (1,2)

[IFRQT-0804] [Analysis]

For all RC received by a SCOE/DFE, a Command Acceptance Report shall be generated immediately with the following format in case of rejection :

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Same as the original RC initiated by CCS Remaining length = Minimum 0x**001E**			
Body	Source Packet Header	Refer to Table 5 page 32 with : Packet length = minimum 0x**11**		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**01** Packet sub-type = 0x**02**		
	Source data			
	RC Packet Identifier	2 bytes	Original RC Packet ID	integer
	RC Packet Sequence Control	2 bytes	Original RC Sequence Control	integer
	Failure code *	2 bytes	Reason for failure of acceptance	integer
	Optional → *Parameters*	*nx2 bytes*	*Specific upon Failure code*	*Any*
	Packet error control	2 bytes	Not Used	integer

where :

RC Packet Identifier (2 bytes) :
This is a copy of the corresponding field from the packet header of the RC to which this verification packet relates i.e. the APID (and the most significant 5 bits of this field).

RC Packet Sequence Control (2 bytes) :
This is a copy of the corresponding fields from the packet header of the RC to which this verification packet relates.

*

Failure code	Signification
0	RC not authorised – local mode
1	RC not authorised– Off-line
2	TC input buffer full
3	Illegal APID
4	Illegal Data Field Header
5	Illegal packet length
6	Timeout reception
7	Port disconnection while message reading
8	RC unknown

4.7.3 Remote Command Execution Report - Started (1, 3)

[IFRQT-0805] [Analysis]

Deleted

4.7.4 Remote Command Execution report – Progress (1,5)

[IFRQT-0806] [Analysis]

Deleted

4.7.5 Remote Command Execution Report - Completed (1, 7)

[IFRQT-0807] [Analysis]

Deleted

4.7.6 Remote Command Execution report – Failure (1,8)

[IFRQT-0808] [Analysis]

Deleted

4.8 MONITORING FLOW – Acknowledge Message for TC (ACKTC)

Source	DFE
Destination	CCS
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0808-1] [Analysis]

DFE shall send back to CCS an Acknowledgement message each time the DFE received a TC

[IFRQT-0808-1.1] [Analysis]

Once the complete PIPE Message is accepted, DFE application software shall check the coherency of the TC Packet embedded inside PIPE Body .

[IFRQT-0808-1.2] [Analysis]

The validation for acceptance of TC packets depends on TC packet content and on DFE configuration

[IFRQT-0808-1.3] [Analysis]

The verification of TC packets contents shall follow the hierarchy define hereafter :

1. Check Packet Length value coherency
2. Verify CRC field value

[IFRQT-0808-1.4] [Analysis]

The verification of DFE configuration shall follow the hierarchy define hereafter :

1. Check DFE state (**On-line**/Off-line)
2. Check DFE mode (**Remote**/local)
3. Verify TC against dangerous list
4. Verify buffer state (**Not full**/Full)
5. Verify if NDIU is not used

[IFRQT-0808-1.5] [Analysis]

If all the previous verification are positive, the acceptance message is return as Successful.

If at least one of the previous verification is negative, the acceptance message is return as Failure

4.8.1 Telecommand Acceptance report – Success (1,1)

[IFRQT-0808-2] [Analysis]

For all TC received by a DFE, a Command Acceptance Report shall be generated immediately with the following format in case of acceptance (TC packet being queued):

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS Remaining length = 0x**001C**			
Body	Source Packet Header	Refer to Table 5 page 32 with : Packet length = 0x**0F**		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**01** Packet sub-type = 0x**01**		
	Source data			
	TC Packet Identifier	2 bytes	Original TC Packet ID	integer
	TC Packet Sequence Control	2 bytes	Original TC Sequence Control	integer
	Packet error control	2 bytes	Not Used	integer

4.8.2 Telecommand Acceptance report – Failure (1,2)

[IFRQT-0808-3] [Analysis]

For all TC received by DFE, a Command Acceptance Report shall be generated immediately with the following format in case of rejection :

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS Remaining length = 0x**001E** if no Optional parameter			
Body	Source Packet Header	Refer to Table 5 page 32 with : Packet length = 0x**11** if no Optional parameter		
	Data field header	Refer to Table 6 page 32with : Packet Type = 0x**01** Packet sub-type = 0x**02**		
	Source data			
	TC Packet Identifier	2 bytes	Original TC Packet ID	integer
	TC Packet Sequence Control	2 bytes	Original TC Sequence Control	integer
	Failure code *	2 bytes	Reason for failure of acceptance	integer
	Optional → *Parameters*	*nx2 bytes*	*Specific upon Failure code*	*Any*
	Packet error control	2 bytes	Not Used	integer

*

Failure code	Signification
0	TC not authorised – local mode
1	TC not authorised – NDIU in charge
2	TC not authorised – Off-line
3	TC not authorised – TC contained in the dangerous list
4	TC input buffer full
5	Illegal or inconsistent packet length
6	Timeout reception
7	Port disconnection while message reading
8	Incorrect checksum
9	TC Encoder not ready

4.9 MONITORING FLOW – TC Echo

Source ↓ Destination	DFE ↓ CCS	CCS ↓ IS station
Rate	Non periodic	Non periodic
LAN	SCOE/DFE LAN	IS LAN

[IFRQT-0809] [Analysis]

Upon reception of a Telecommand request issued by the CCS itself and when the TC request remotely come from the NDIU. DFE shall deliver the TC Echo packet with the following format :

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Forced to 0x**00**			
Body	**TC Packet**	**variable**	**variable**	

Note: the same TC Echo will be sent from 0 to n times depending on TC execution.

4.10 MONITORING FLOW – TC Report

Source	DFE
Destination	CCS
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0809-1] [Analysis]

Upon reception of a Telecommand request issued by the CCS itself and when the TC request remotely come from the NDIU, TM/TC DFE shall deliver the TC Report packet according to its current mode :

1. If TM/TC DFE in AD mode : TC Report shall be sent after CLCW check. (this means On-board TC acceptance)
2. If TM/TC DFE in BD mode, TC Report shall be sent after TC Acceptance Report (ACKTC) →this means DFE acceptance

Note: TC Report is generated asynchronously from any TC Echo

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS			
Body	Source Packet Header		Refer to Table 5 page 32'	
	Data field header		Refer to Table 6 page 32 with : Packet Type / sub-type = [5,1] for success Packet Type / sub-type = [5,4] for transmission failure	
	Source data	**length**	***Parameter list***	**value**
	Event ID	2 bytes	DFE supplier specific event code	
	SID	*2 bytes*	*Structure Identifier*	*Forced to **0***
	Parameters A	*8 bytes*	*Complementary Information*	*Forced to **0***
	Event Seq Counter	*2 bytes*	*Event Sequence Counter*	*Forced to **0***
	Request ID	4 bytes	Same as the original TC	
	Result code	1 bytes	Rejected/Failed/Succeeded	
	Priority	1 bytes	Normal/High	
	Protocol	1 bytes	AD/BD service mode used for this TC	
	VCID	1 Bytes	Virtual Channel used	
	MAPID	1 Bytes	MAP ID used	
	Retransmits	1 bytes	0..255 (for AD mode)	
	Time stamp	8 bytes	CUC time code for final confirmation	
	TC-ID	6 bytes	Copy of original TC packet header	
	Packet error control	2 bytes	Not Used	integer

4.11 MONITORING FLOW – RM Alive Packet

Source	SCOE/DFE/IS
Destination	CCS
Rate	1 packet every 60 seconds for all SCOE/DFE/IS
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0809-2] [Analysis]

Each SCOE/DFE/IS shall send to the CCS at least one SCOE HK status packet or an RM "Alive Packet" every 60 seconds with the following format:

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 30 with : Message ID = Refer to Table 11 page 37 VCID = 0x**00** Request ID = 0x**0000 0000** Remaining length = 0x**0018**			
Body	Source Packet Header	Refer to Table 5 page 32 with : Packet length = 0x**0B**		
	Data field header	Refer to Table 6 page 32 with : Packet Type = 0x**00** Packet sub-type = 0x**00**		
	Source data	None		
	Packet error control	2 bytes	Not Used	integer

The RM Alive Packet shall not be archived by CCS. It is just used in order to check if a SCOE (server) is still capable of correctly operating the PIPE Protocol.
The information contained as part of the data field within this message is not used for any further processing.

4.12 INTERFACES REQUIREMENTS

4.12.1 GENERIC INTERFACE NAME

EGSE	Item	APID		Host Name	Port number	*Main EGSE LAN* 192.168.200.xxx	*SCOE/DFE LAN* 192.168.201.xxx	*IS LAN* 192.168.202.xxx	*NDIU LAN*	*AIT Facility LAN*
		Dec	Hex							
CCSy	Master Test Processor	2016	7E0	HPy-S		Refer to RD23	Refer to RD23	Refer to RD23		
y=1 for CCS #1	Data Server			HPy-D		Refer to RD23				
y=2 for CCS #2	Work Station 1			HPWSy1		Refer to RD23				
y=3 for CCS #3	…			…		Refer to RD23				
y=4 for CCS Lite1	Work Station 8			HPWSy8		Refer to RD23				
y=5 for CCS Lite 2	B&W Printer			HPBWy1		Refer to RD23				
	B&W Printer			HPBWy2		Refer to RD23				
	Color Printer			HPCLy1		Refer to RD23				
	www server			HPNWPCy		Refer to RD23				*
CDMU SCOE	Work Station	2017	7E1	hpcdmuscoe	RD17		*			
ACMS SCOE	Work Station	2018	7E2	hpasmcscoe	RD18		*			
TT&C SCOE	Work Station	2019	7E3	hpttcscoe	RD20		*			
TM/TC DFE	Work Station	2020	7E4	hptmtcdfe	RD16		*		*	
BATSIM	Work Station	2023	7E7	hpbatsim	RD19		*			
LPS/SAS	Work Station	2024	7E8	hplpssas	RD19		*			
PLM SCOE	Work Station	2025	7E9	hpplmscoe	3342		*			
H CRYO SCOE / CRYO COTE	Work Station	2026	7EA	hcryoscoe	RD21		*			
							*			
CDMU DFE	Work Station	2028	7EC	hpcdmudfe	7001		*			
1553 Bus monitor	Work Station	2029	7ED	hp1553bm	7002		*			
NDIU	NDIU			hpndiu					*	
HFI EGSE	HFI EGSE	2040	7F8	hps2khfi	23456			212		
LFI EGSE	LFI EGSE	2041	7F9	hps2klfi	7001			211		
HIFI EGSE	HIFI EGSE	2042	7FA	hhifiegse	7001			101		
PACS EGSE	PACS EGSE	2043	7FB	hpacsegse	RD22			102		
SPIRE EGSE	SPIRE EGSE	2044	7FC	hspireegse	RD22			103		

* depend on EGSE location (Alenia, Astrium, Alcatel)

Table 15 : Generic Interface Name

4.12.2 DATABASE

[IFRQT-0810] [Analysis]

The sub-contractor responsible of each SCOE/DFE shall be in charge to provide all the information needed to define inside HPSDB all parameters constituting RM packets and RC Packets.

[IFRQT-0820] [Analysis]

The files that will be used to populate the HPSDB with SCOE/DFE parameters shall have the following format and shall be compatible with HPSDB [AD2]

(They will be used to update HPSDB)

Table 16 : RC definition

RC Mnemo YC 0xx pos	Param. Mnemo YP xxy pos	PTC (dec)	PFC (dec)	Pos byte	Short Description (15 max)	Long Description (64 max)	Default value
YC xxx xxx							
	RCD	*2*	*8*	*0*	*RC Ident*	*RC Id identify the command to be executed on SCOE (identify by APID)*	
	ACT	*2*	*8*	*1*	*Activity Id*	*Mandatory but not used in AIT. Forced to 0.*	0
	STR	*2*	*16*	*2*	*Structure Id*	*Structure Ident Field*	
YC xxx xxx							
	RCD	*2*	*8*	*0*	*RC Ident*	*See above*	
	ACT	*2*	*8*	*1*	*Activity Id*	*See above*	0
	STR	*2*	*16*	*2*	*Structure Id*	*See above*	

Table 17 : RM Packet definition

Position in Packet		Parameter									
Offset in Packet	Position in Byte	YM xxx pos[5]	Mnemonic	PTC	PFC	Description	Calib Curve			Values	
OffsetByte	StartBit	ItemName	Sdesc	Ptc	Pfc	Ldesc	Sdesc	ItemName	Ldesc	Min	Max
16	0	016	**Generic HK Parameters** - SID	2	16	The SID value for SCOE HK Packet					
18	0	018									

[5] [5] YM xxx 964 : xxx = Offset in Packet

4.12.3 DATE/TIME

[IFRQT-0830] [Analysis]

The date/time synchronisation between all EGSE's item shall be done by using standard service providing by NTP (Network Time Protocol)

[IFRQT-0840] [Test]

CCS defined as server and is requested to provide the time to which the SCOE/DFE/IS synchronises.

4.12.4 Quick loading function

[IFRQT-0850] Deleted [Analysis]

TBW

4.12.5 Interface TM/TC DFE↔ NDIU

[IFRQT-0860] [Analysis]

Two interfaces shall be provided compatible with the ESA provided Network Data Interconnect Unit (NDIU) for TM (frame) and TC (CLTU) interface between the satellites and the Mission Operation Centre (MOC).
Refer to [AD4]

4.12.6 Interface Instrument Stimuli SCOE ↔ Herschel Satellite

[IFRQT-0870] Deleted [Analysis]

4.12.7 Interface Instrument Stimuli SCOE ↔ Planck Satellite

[IFRQT-0880] Deleted [Analysis]

4.12.8 Performance

[IFRQT-0882] [Analysis]

The interface for the Telemetry packets delivery from the TM/TC DFE to the CCS shall support the maximum data rate of 150 Kbps plus overhead for message header/trailer.

[IFRQT-0884] [Analysis]

The interface for the Telecommand packets delivery from the CCS to the TM/TC DFE shall support the maximum data rate of 4Kbps plus overhead for message header/trailer.

[IFRQT-0886] [Analysis]

The interface for the Telemetry packets delivery from the CCS to the Instrument Stations shall support the maximum data rate of up to 150 Kbps for each connected Instrument Station plus overhead for message header/trailer.

4.12.9 File transfer

[IFRQT-0887] [Analysis]

All SCOE/DFE having a controller shall support NFS (Network File System) and/or FTP (File Transfer Protocol) to allow direct access from the CCS into the hard disk of the controller for file transfer purposes.

4.12.10 Naming Convention Rules for EGSE items

The aim of this paragraph is to fix the naming rules of all commands (RC) and parameters necessary to fulfil the communication between EGSE items
For more information, refer to [AD06].

[IFRQT-0888-1] [Analysis]
The allocation for EGSE Subsystem Identifier shall be "**Y**" (refer to AD[06] req. NMCVT-7500-C)

[IFRQT-0888-2] [Analysis]
The allocation for EGSE Subsystem Identifier shall be "**25**" (for RM packet (Y is 25th alphabetic letter))

[IFRQT-0888-3] [Analysis]
The allocation for EGSE item shall be as follows (Refer to AD[06] req. NMCVT-7520-C) :

EGSE Item	Position allocation
ACMS SCOE	[920-939]
CCS	[940-941]
PLM SCOE	[942-943]
CDMU DFE	[944-945]
TM/TC DFE	[946-947]
CDMU SCOE	[948-949]
TT&C SCOE	[950-951]
LPS	[952-953]
SAS	[954-955]
BATSIM	[956-957]
CRYO SCOE	[958-959]
CRYO COTE	[960-961]
HIFI	[962-963]
PACS	[964-965]
SPIRE	[966-967]
HFI	[968-969]
LFI	[970-971]

[IFRQT-0888-4] [Analysis]
The authorised character string should be one of the following:
[0-9] (decimal digits),
[A-H] (characters from "A" to "H", but only upper case),
[J-N] (characters from "J" to "N", but only upper case),
[P] (character "P", but only upper case),
[R-Z] (characters from "R" to "Z", but only upper case),
[_] (underscore).

This applies only for identifiers.

[IFRQT-0888-5] [Analysis]

RC Definition shall be as follows (Refer to AD[06] req. NMCVT-4540-C and NMCVT-4580-C):
e.g.

EGSE Item	RC mnemo						Short description	Long description	RC_ID	
	Sub-System	ID Subtype	Function (3 char)			Position allocation				
	Y	C				See [IFRQT-0888-3].				
…										

Note : Greyed columns are fixed

Table 18 : RC mnemonic definition

[IFRQT-0888-6] [Analysis]

The three characters of 'RC mnemo function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RC mnemo with respect to Table 18.
However, the combination of the three characters shall be, as far as possible, easily understandable.

[IFRQT-0888-7] [Analysis]

If needed RC Parameter shall be as follows (Refer to AD[06] req. NMCVT-5110-C and NMCVT-5150-C) :

e.g.

EGSE Item	RC Parameter Name						Textual Description
	Sub-System	ID Subtype	Function (3 char)			Position allocation	
	Y	P				See [IFRQT-0888-3].	
…							

Note : Greyed columns are fixed

Table 19 : RC parameters definition

[IFRQT-0888-8] [Analysis]

The three characters of 'RC param name function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RC parameter name with respect to Table 19.
However, the combination of the three characters shall be, as far as possible, easily understandable.

[IFRQT-0888-9] [Analysis]

RM Packet Definition shall be as follows (Refer to AD[06] req. NMCVT-4392-C):
e.g.

EGSE Item	RM mnemo			Textual Description	Pkt Type	Pkt SubType	Pkt SID
	Sub-System Number	Element RM pkt (4 dec)	Position allocation				
	25		See [IFRQT-0888-3].				

Note : Greyed columns are fixed

Table 20 : RM Packet definition

[IFRQT-0888-10] [Analysis]

The four characters of 'element RM pkt' field shall be of 'decimal digit string' type [0-9]
SCOE Subcontractor is free to define its own RM packet name with respect to Table 20.

[IFRQT-0888-11] NA for Cryo SCOE [Analysis]

First three characters shall be the same as the 'position allocation' field.

[IFRQT-0888-12] NA for Cryo SCOE [Analysis]

Fourth character shall uniquely identify the RM Packet Name.

Note : If there is more than 10 different SID for the same APID/Type/Subtype, Subcontractor could freely choose the affectation of the four digits of "Element RM packet"

[IFRQT-0888-14] [Analysis]

If needed RM Parameter shall be as follows (Refer to AD[06] req. NMCVT-5110-C and NMCVT-5150-C) :

e.g.

EGSE Item	Parameter Name						Textual Description	PTC	PFC
	Sub-System	ID Subtype	Function (3 char)			Position allocation			
	Y	M				See [IFRQT-0888-3].			

Note : Greyed columns are fixed

Table 21 : RM Parameter definition

[IFRQT-0888-15] [Analysis]

The three characters of 'RC param name function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RM parameter name with respect to Table 21.
However, the combination of the three characters shall be, as far as possible, easily understandable.

4.12.11 OBSM Files

[IFRQT-0889] [Analysis]

OBSM Files Format is define in [RD13] document (SCOS-2000 OBSM External Interfaces Control Document)

5 EGSE EXTERNAL INTERFACE REQUIREMENTS

This chapter defines all electrical Harness Interfaces between EGSE and SVM / PLM / S/C, and between all EGSE's item in all the different configurations.

[IFRQT-0890] [Analysis]

Table below resumes all the H/P EGSE interfaces :

EGSE		Internal Interface (communication protocol)					External Interface (Hardware)				
		NDIU Lite	CCS				EGSE			S/C	
		NDIU LAN	www LAN	SCOE/DFE LAN		IS LAN	TM/TC DFE	NDIU	LPS/SAS	Herschel	Planck
				CCS → SCOE (RC)	SCOE → CCS (RM)						
Planck IS	HFI IS EGSE					4.5-4.9-4.11					
	LFI IS EGSE					4.5-4.9-4.11					
Herschel IS	HCSS IS EGSE					4.5-4.9-4.11 4.6.4.4 (RM) 4.3.2.4 (RC)					
	HIFI IS EGSE					4.5-4.9-4.11 4.6.4.5 (RM) 4.3.2.5 (RC)					
	PACS IS EGSE					4.5-4.9-4.11 4.6.4.6 (RM) 4.3.2.6 (RC)					
	SPIRE IS EGSE					4.5-4.9-4.11 4.6.4.7 (RM) 4.3.2.7 (RC)					
TT&C	TM/TC DFE	AD 4		4.3.1.5 (RC) 4.2 (TC)	4.6.3.4 (RM) 4.4 (TM)			5.2.1		5.1.15	5.1.15
	TT&C SCOE RF			4.3.1.4	4.6.3.3		5.2.1			5.1.3	5.1.3
ACMS SCOE	ACMS SCOE Optical Stim			4.3.1.3 4.3.1.3.2	4.6.3.2 4.6.3.2.2					5.1.2 5.1.2.1	5.1.2 5.1.2.1
	Stim Feedbk			4.3.1.3.3	4.6.3.2.3					5.1.2.2	5.1.2.2
Power SCOE	Battery Sim			4.3.1.7	4.6.3.6					5.1.6	5.1.6
	BCE SCOE									5.1.8	5.1.8
	LPS/SAS			4.3.1.10	4.6.3.9					5.1.9	5.1.9
PLM	PLM SCOE			4.3.1.11	4.6.3.12					5.1.10	5.1.10

EGSE		Internal Interface (communication protocol)					External Interface (Hardware)				
		NDIU Lite	CCS				EGSE			S/C	
		NDIU LAN	www LAN	SCOE/DFE LAN		IS LAN	TM/TC DFE	NDIU	LPS/SAS	Herschel	Planck
				CCS → SCOE (RC)	SCOE → CCS (RM)						
Herschel	H-Cryo SCOE			4.3.1.13	4.6.3.12					5.1.11	
	H-Cryo COTE			4.3.1.1	4.6.3.1				5.2.2		
MIL 1553B	CDMU SCOE			4.3.1.2	4.6.3.1					5.1.1	5.1.1
	CDMU DFE			4.3.1.16	4.6.3.15					5.1.12	5.1.12
	1553 Bus prob			4.3.1.17	4.6.3.16					5.1.13	5.1.13
OBSW Load/Dump Tool										5.1.14	5.1.14

Table 22 : H/P EGSE Interfaces

5.1 EGSE to S/C INTERFACES

5.1.1 CDMU SCOE

5.1.1.1 Quick SW Loading I/F

[IFRQT-0900] Deleted [Analysis]

5.1.1.2 MIL-STD-1553B I/F

[IFRQT-0910] [Analysis]

Refer to [AD7] §6.8.3

5.1.1.3 Time pulse

[IFRQT-0915] [Analysis]

Refer to [AD7] §6.8.1.4

5.1.2 ACMS SCOE

5.1.2.1 Optical Stimuli Commands

[IFRQT-0920] [Analysis]

Refer to [RD4]

5.1.2.2 Stimuli Feedback Commands

[IFRQT-0930] [Analysis]

Refer to [RD4]

5.1.3 TT&C SCOE RF

[IFRQT-0940] [Analysis]

TT&C SCOE shall interface with SVM with the following electrical characteristics :

- TT&C SCOE shall interface to the spacecraft only by RF Cables
- The RF outputs VSWR shall be less than 1.2:1 in 50 ohms
- All the I/F versus Spacecraft shall be galvanically insulated from TT&C SCOE ground(s)
- The RF connector shall be SMA(m)

5.1.4 Launch POWER SCOE

[IFRQT-0950] [Analysis]

Launch Power SCOE shall interface with the SVM for :

5.1.4.1 Power System I/F

Refer to [AD7] §6.7

5.1.4.2 PCDU I/F

Parameter	**Herschel/Planck Limit**(at SVM interface)
S/C Powering	- 6 current sections from 0 to 3A each.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100κΩ line protection resistors in series with the positive lines.
Charge Array disable link	- 2 straps to short-circuit the current sections

5.1.4.3 Telecommand I/F

[IFRQT-0960] Deleted [Analysis]

[IFRQT-0970] Deleted [Analysis]

5.1.4.4 Telemetry I/F

[IFRQT-0980] Deleted [Analysis]

[IFRQT-0990] Deleted [Analysis]

5.1.5 BATSIM SCOE

[IFRQT-1000] [Analysis]

BATSIM SCOE shall interface with the SVM with the following electrical characteristics :

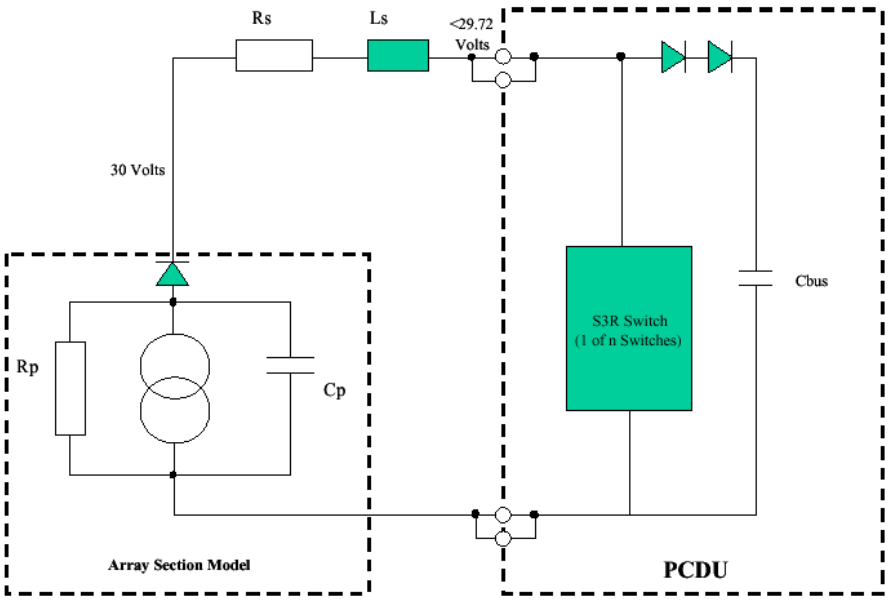
Parameter	Herschel/Planck Limit
Minimum EOD voltage Veodmin	15 (V)
Nominal EOD voltage Veod	18 (V)
Nominal EOC voltage Veoc	25.2 (V)
Maximum EOC voltage Veocmax	27.7 (V) (tbc)
Maximum harness voltage drop outside the PCDU, based on GDIR 1% requirement applied at EOD	0.15
Maximum harness voltage drop, based on discharge criteria and a charge rate of 6 Amps	0.06 (V)
The maximum allowable transient current drawn by the PCDU, under any conditions, shall not exceed	120(A) (1 ms max) 35 (A) (1 minute max)

5.1.6 SAS part of LPS

[IFRQT-1010] [Analysis]

SAS part of LPS shall interface with the SVM with the following electrical characteristics :

Positive array connection	- 0 to 60 Volts (section open circuit voltage) - 0 to 3 A D.C. Max. BOL, 2A Max. EOL. (for analysis purpose a nominal section current in sunlight can be assumed to be 2 to 3A). - Redundant connector pins to guard against open circuit failure.
Negative array connection	- 0 volts (reference ground is the power bus capacitor). - Redundant connector pins to guard against open circuit failure.
Section Capacitance Cp (μF) max	0,5μF
Section Inductance Ls (mH) max	7,5 mH
Effective Series Resistance Rs	2,5 Ω



Equivalent Circuit (tbc):

5.1.7 BCE SCOE

[IFRQT-1020] [Analysis]

BCE SCOE shall interface with the SVM with the following electrical characteristics :

Parameter	Herschel/Planck Limit
Minimum EOD voltage Veodmin	15 (V)
Nominal EOD voltage Veod	18 (V)
Nominal EOC voltage Veoc	25.2 (V)
Maximum EOC voltage Veocmax	27.7 (V)
Maximum harness voltage drop outside the PCDU, based on GDIR 1% requirement applied at EOD	0.15
Maximum harness voltage drop, based on discharge criteria and a charge rate of 6 Amps	0.06 (V)
The maximum allowable transient current drawn by the PCDU, under any conditions, shall not exceed	120(A) (1 ms max) 35 (A) (1 minute max)

5.1.8 COTE (Launch configuration)

[IFRQT-1030] [Analysis]

COTE SCOE shall interface with the SVM with the following electrical characteristics :

5.1.8.1 Power System I/F

Refer to [AD7] §6.7

5.1.8.2 PCDU I/F

Parameter	Herschel/Planck Limit(at SVM interface)
S/C Powering	- 6 current sections from 0 to 3A each.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100κΩ line protection resistors in series with the positive lines.
Charge Array disable link	- 2 straps to short-circuit the current sections

5.1.8.3 Telecommand I/F

[IFRQT-1040] Deleted [Analysis]

[IFRQT-1050] Deleted [Analysis]

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5.1.8.4 Telemetry I/F

[IFRQT-1060] Deleted [Analysis]

[IFRQT-1070] Deleted [Analysis]

5.1.9 HERSCHEL Stimuli Instrument SCOE

[IFRQT-1080] Deleted [Analysis]

5.1.10 PLM SCOE

[IFRQT-1090] [Analysis]

PLM SCOE shall simulate the PCDU functionality. It shall power the Satellite with a voltage Bus between 26 and 29 V.

5.1.11 Herschel Cryo SCOE

[IFRQT-1100] [Analysis]

Herschel CRYO SCOE shall interface the H-PLM for :

- Heaters powering
- Launch valve command
- Thermal sensor acquisition

5.1.12 CDMU DFE

5.1.12.1 Internal Commands I/F

[IFRQT-1130] [Analysis]

Refer to [AD7] §6.8.1

5.1.12.2 Internal Telemetry I/F

[IFRQT-1140] [Analysis]

Refer to [AD7] §6.8.2

5.1.13 CDMU SCOE - 1553 Bus Probe

[IFRQT-1150] [Analysis]

Refer to [AD7] §6.8.2

5.1.14 OBSW Load/Dump tool

[IFRQT-1155] [Analysis]

OBSW Load/Dump Tool shall interface with SVM for quick loading of the EEPROM of both CDMU Processor Modules with the electrical characteristics according to [RD3]

5.1.15 TM/TC DFE

5.1.15.1 Telecommand I/F

[IFRQT-1156] [Analysis]

2 TC interfaces shall be provided with the electrical characteristics according to [AD7] §6.8.1.4

[IFRQT-1157] [Analysis]

Each TC Interface shall comprise the following signals :

- TC Clock : Telecommand Clock signal input
- TC Data : Telecommand Data signal input
- TC Active : Telecommand Quality signal input

5.1.15.2 Telemetry I/F

[IFRQT-1158] [Analysis]

2 TM interfaces shall be provided with the electrical characteristics according to [AD7] §6.8.1.4

[IFRQT-1159] [Analysis]

Each TM Interface shall comprise the following signals :

- TM Clock : Telemetry Clock signal output
- TM Data : Telemetry Data signal output

5.2 EGSE to EGSE INTERFACES

5.2.1 TM/TC Interface

[IFRQT-1160] Deleted [Analysis]

[IFRQT-1170] [Analysis]

TM/TC DFE shall interface with TT&C SCOE RF with the electrical characteristics according to [AD7] § 6.8.1.4

[IFRQT-1180] [Analysis]

TM/TC DFE shall interface with NDIU with the electrical characteristics according to [AD7] § 6.8.1.4

[IFRQT-1182] [Analysis]

TM/TC DFE shall interface with TM/TC Amplifier with the electrical characteristics according to TBC

5.2.2 Launch Power Supply Interface

[IFRQT-1185] [Analysis]

LPS shall interface with CRYO COTE with the electrical characteristics according to [RD12] § 4.4.2.2

- 650 W heater powering : 4 lines
- 10 W heater powering : 2 lines
- Level sensor powering : 2 lines
- Level sensor signal : 2 lines
- Latch Valve command : 3 lines
- Thermal sensors : 2 lines

5.2.3 SAFETY LOOP

[IFRQT-1190] [Analysis]

Safety Loop signal shall link together LPS/ SAS and BATSIM SCOE with the electrical characteristics according to [AD5]

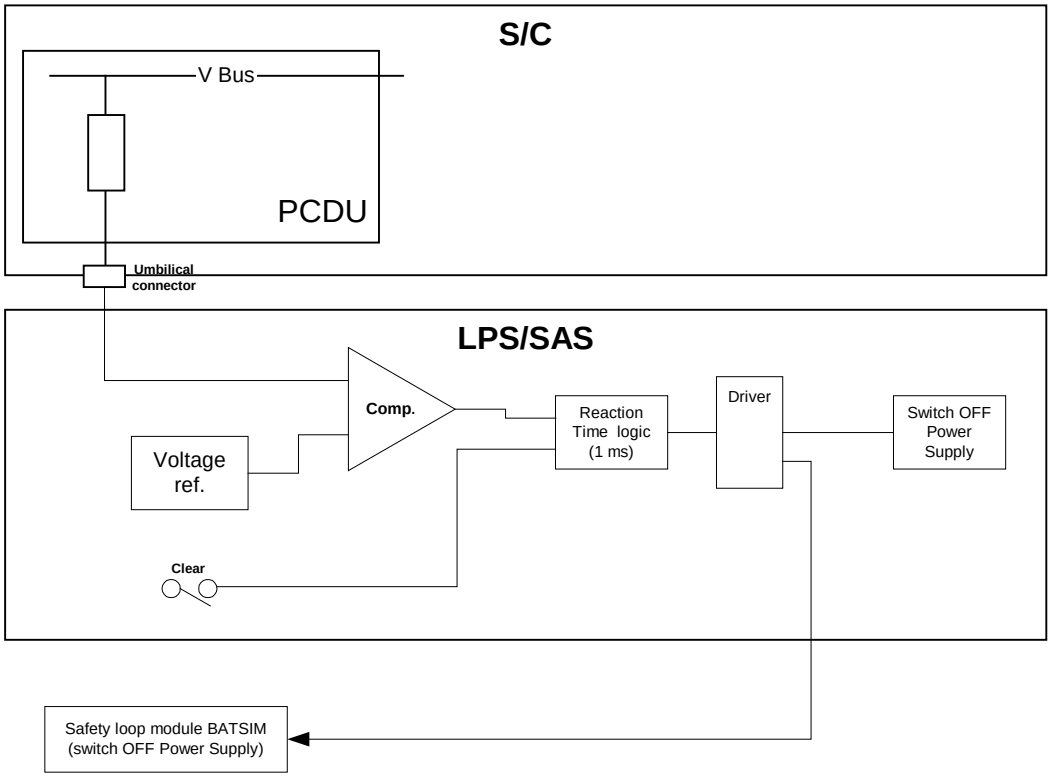

Figure 10 : SAFETY LOOP overview

6 VERIFICATION MATRIX

6.1 GENERAL REQUIREMENTS

The acceptance tests of the EGSE shall be distributed in 3 acceptance test levels:

- Level 1 acceptance test at equipment level.
- Level 2 acceptance test of system EGSE level.
- Level 3 acceptance test of H/P EGSE.

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0010]		Analysis	X	X
[IFRQT-0020]		Analysis	X	X
[IFRQT-0030]		Analysis	X	X
[IFRQT-0040]		Analysis	X	X
[IFRQT-0042]	Deleted			
[IFRQT-0043]	Deleted			
[IFRQT-0045]		Test	X	X
[IFRQT-0050]		Test	X	X
[IFRQT-0070]		Test	X	X
[IFRQT-0080]		Test	X	X
[IFRQT-0100]		Test	X	X
[IFRQT-0102]		Test	X	X
[IFRQT-0103]		Test	X	X
[IFRQT-0104]		Test	X	X
[IFRQT-0105]		Test	X	X
[IFRQT-0110]		Test	X	X
[IFRQT-0120]		Analysis	X	X
[IFRQT-0130]		Analysis	X	X
[IFRQT-0140]		Analysis	X	X
[IFRQT-0150]		Analysis	X	X
[IFRQT-0160]		Analysis	X	X
[IFRQT-0161]		Test	X	X
[IFRQT-0162]		Test	X	X
[IFRQT-0163]		Test	X	X
[IFRQT-0164]		Test	X	X
[IFRQT-0165]		Test	X	X
[IFRQT-0166]		Test	X	X
[IFRQT-0170]		Test	X	X
[IFRQT-0180]	Deleted			

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0190]	Deleted			
[IFRQT-0200]		Analysis	X	X
[IFRQT-0201]	Deleted			
[IFRQT-0210]	Deleted			
[IFRQT-0220]		Analysis	X	X
[IFRQT-0230]		Analysis	X	X
[IFRQT-0240]		Analysis	X	X
[IFRQT-0245]		Information	X	X
[IFRQT-0246]		Information	X	X
[IFRQT-0247]		Information	X	X
[IFRQT-0250]	N/A			
[IFRQT-0260]		Test	X	X
[IFRQT-0270]		Test	X	X
[IFRQT-0280]		Test	X	X
[IFRQT-0290]		Test	X	X
[IFRQT-0300]	Deleted			
[IFRQT-0310]		Test	X	X
[IFRQT-0320]	Deleted			
[IFRQT-0330]	N/A (no interface with CCS)			
[IFRQT-0340]		Test	X	X
[IFRQT-0350]	Deleted	Test		
[IFRQT-0360]		Test	X	X
[IFRQT-0370]		Test	X	X
[IFRQT-0380]	Deleted			
[IFRQT-0390]	Deleted			
[IFRQT-0400]		Test	X	X
[IFRQT-0405]	N/A			
[IFRQT-0410]		Test	X	X
[IFRQT-0420]	Deleted			
[IFRQT-0430]	Deleted	Test		
[IFRQT-0440]	Deleted	Test		
[IFRQT-0450]	Deleted			
[IFRQT-0460]		Test	X	X
[IFRQT-0470]		Test	X	X
[IFRQT-0480]		Test	X	X
[IFRQT-0490]	Deleted			
[IFRQT-0500]		Analysis	X	X
[IFRQT-0510]		Analysis	X	X
[IFRQT-0520]		Analysis	X	X
[IFRQT-0525]		Analysis	X	X
[IFRQT-0540]	Deleted			
[IFRQT-0550]		Analysis	X	X
[IFRQT-0560]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0562]	(Was -0530)	Analysis	X	X
[IFRQT-0562-1]		Information	X	X
[IFRQT-0562-2]		Information	X	X
[IFRQT-0562-3]		Information	X	X
[IFRQT-0563]	(Was -0535)	Analysis	X	X
[IFRQT-0563-1]		Information	X	X
[IFRQT-0563-2]		Information	X	X
[IFRQT-0565]		Test	X	X
[IFRQT-0570]		Test	X	X
[IFRQT-0580]		Test	X	X
[IFRQT-0590]		Test	X	X
[IFRQT-0600]	Deleted			
[IFRQT-0610]		Test	X	X
[IFRQT-0620]	Deleted			
[IFRQT-0630]	N/A			
[IFRQT-0640]		Test	X	X
[IFRQT-0650]		Test	X	X
[IFRQT-0660]		Test	X	X
[IFRQT-0670]		Test	X	X
[IFRQT-0680]	Deleted			
[IFRQT-0690]	Deleted			
[IFRQT-0700]		Test	X	X
[IFRQT-0710]		Test	X	X
[IFRQT-0720]	N/A			
[IFRQT-0700]		Test	X	X
[IFRQT-0730]	Deleted			
[IFRQT-0740]		Test	X	X
[IFRQT-0750]		Test	X	X
[IFRQT-0760]	Deleted			
[IFRQT-0770]		Test	X	X
[IFRQT-0780]		Test	X	X
[IFRQT-0790]		Test	X	X
[IFRQT-0800]	Deleted			
[IFRQT-0801]		Analysis	X	X
[IFRQT-0802]		Analysis	X	X
[IFRQT-0802-1]		Analysis	X	X
[IFRQT-0802-2]		Analysis	X	X
[IFRQT-0802-3]		Analysis	X	X
[IFRQT-0802-4]		Analysis	X	X
[IFRQT-0803]		Analysis	X	X
[IFRQT-0804]		Analysis	X	X
[IFRQT-0805]		Analysis	X	X
[IFRQT-0806]		Analysis	X	X
[IFRQT-0807]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0808]		Analysis	X	X
[IFRQT-0808-1]		Analysis	X	X
[IFRQT-0808-1.1]		Analysis	X	X
[IFRQT-0808-1.2]		Analysis	X	X
[IFRQT-0808-1.3]		Analysis	X	X
[IFRQT-0808-1.4]		Analysis	X	X
[IFRQT-0808-1.5]		Analysis	X	X
[IFRQT-0808-2]		Analysis	X	X
[IFRQT-0808-3]		Analysis	X	X
[IFRQT-0809]		Analysis	X	X
[IFRQT-0809-1]		Analysis	X	X
[IFRQT-0809-2]		Analysis	X	X
[IFRQT-0810]		Analysis	X	X
[IFRQT-0820]		Analysis	X	X
[IFRQT-0830]		Analysis	X	X
[IFRQT-0840]		Test	X	X
[IFRQT-0850]		Analysis	X	X
[IFRQT-0860]		Analysis	X	X
[IFRQT-0870]		Analysis	X	X
[IFRQT-0880]	Deleted			
[IFRQT-0882]		Analysis	X	X
[IFRQT-0884]		Analysis	X	X
[IFRQT-0886]		Analysis	X	X
[IFRQT-0887]		Analysis	X	X
[IFRQT-0888-1]		Analysis	X	X
[IFRQT-0888-2]		Analysis	X	X
[IFRQT-0888-3]		Analysis	X	X
[IFRQT-0888-4]		Analysis	X	X
[IFRQT-0888-5]		Analysis	X	X
[IFRQT-0888-6]		Analysis	X	X
[IFRQT-0888-7]		Analysis	X	X
[IFRQT-0888-8]		Analysis	X	X
[IFRQT-0888-9]		Analysis	X	X
[IFRQT-0888-10]		Analysis	X	X
[IFRQT-0888-11]		Analysis	X	X
[IFRQT-0888-12]		Analysis	X	X
[IFRQT-0888-14]		Analysis	X	X
[IFRQT-0888-15]		Analysis	X	X
[IFRQT-0889]		Analysis	X	X
[IFRQT-0890]		Analysis	X	X
[IFRQT-0900]		Analysis	X	X
[IFRQT-0910]		Analysis	X	X
[IFRQT-0915]		Analysis	X	X
[IFRQT-0920]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0930]		Analysis	X	X
[IFRQT-0940]		Analysis	X	X
[IFRQT-0950]		Analysis	X	X
[IFRQT-0960]	Deleted			
[IFRQT-0970]	Deleted			
[IFRQT-0980]	Deleted			
[IFRQT-0990]	Deleted			
[IFRQT-1000]		Analysis	X	X
[IFRQT-1010]		Analysis	X	X
[IFRQT-1020]		Analysis	X	X
[IFRQT-1030]		Analysis	X	X
[IFRQT-1040]	Deleted			
[IFRQT-1050]	Deleted			
[IFRQT-1060]	Deleted			
[IFRQT-1070]	Deleted			
[IFRQT-1080]		Analysis	X	X
[IFRQT-1090]		Analysis	X	X
[IFRQT-1100]		Analysis	X	X
[IFRQT-1130]		Analysis	X	X
[IFRQT-1140]		Analysis	X	X
[IFRQT-1150]		Analysis	X	X
[IFRQT-1155]		Analysis	X	X
[IFRQT-1156]		Analysis	X	X
[IFRQT-1157]		Analysis	X	X
[IFRQT-1158]		Analysis	X	X
[IFRQT-1159]		Analysis	X	X
[IFRQT-1160]	Deleted			
[IFRQT-1170]		Analysis	X	X
[IFRQT-1180]		Analysis	X	X
[IFRQT-1182]		Analysis	X	X
[IFRQT-1185]		Analysis	X	X
[IFRQT-1190]		Analysis	X	X

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