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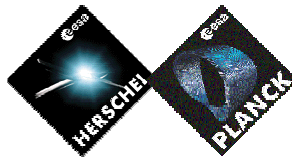
**Payload Management & OBCP**

**H-P-1-ASP-TN-1072**

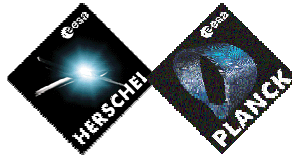
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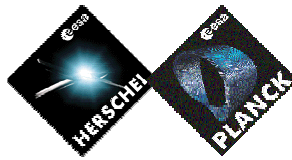


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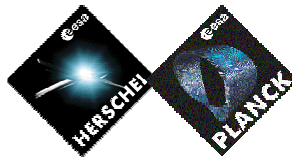
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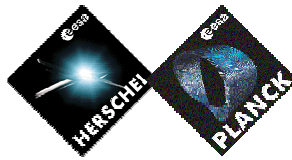


## TABLE OF CONTENTS

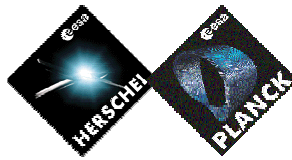
LIST OF FIGURES AND TABLES	7
1. INTRODUCTION	8
1.1 Purpose	8
1.2 Limitations	8
2. DOCUMENTATION AND TERMINOLOGY	8
2.1 Applicable documents	8
2.2 Reference documents	9
2.3 Glossary of terms and acronyms	9
3. PAYLOAD MANAGEMENT OVERVIEW	10
3.1 FDIR	10
3.1.1 Payload internal FDIR	10
3.1.2 S/C FDIR	10
3.1.2.1 S/C 1553B Bus FDIR	10
3.1.2.2 Science Data Monitoring	11
3.1.2.3 Class B Heater Loop FDIR	11
3.2 S/C Mode Transition	12
4. HERSCHEL	17
4.1 SPIRE	17
4.1.1 SPIRE FDIR	17
4.1.1.1 SPIRE internal FDIR	17
4.1.1.2 SPIRE S/C FDIR	18
4.1.1.2.1 SPIRE S/C 1553B Bus FDIR	18
4.1.1.2.2 SPIRE Science Data Monitoring	19
4.1.1.2.3 SPIRE Class B Heater Loop FDIR	19
4.1.2 SPIRE S/C Mode Transition	19
4.1.3 SPIRE OBCP	21
4.1.3.1 List of SPIRE OBCP	21
4.1.3.2 SPIRE OBCP Specification	23
4.1.3.2.1 DB_OBCP_H_SPIRE_DRCU_OFF	23
4.1.3.2.2 DB_OBCP_H_SPIRE_OFF	25
4.1.3.2.3 DB_OBCP_H_SPIRE_OFF_CTRL	28
4.1.3.2.4 DB_OBCP_H_SPIRE_STANDBY	31
4.1.3.2.5 DB_OBCP_H_SPIRE_OPE_STOP	32
4.1.3.2.6 DB_OBCP_H_SPIRE_OPE_RESUME	33



4.2	PACS	34
4.2.1	PACS FDIR	34
4.2.1.1	PACS internal FDIR	34
4.2.1.2	PACS S/C FDIR	35
4.2.1.2.1	PACS S/C 1553B Bus FDIR	35
4.2.1.2.2	PACS Science Data Monitoring	36
4.2.1.2.3	PACS Class B Heater Loop FDIR	36
4.2.2	PACS S/C Mode Transition	36
4.2.3	PACS OBCP	38
4.2.3.1	List of PACS OBCP	38
4.2.3.2	PACS OBCP Specification	40
4.2.3.2.1	DB_OBCP_H_PACS_SAFE	40
4.2.3.2.2	DB_OBCP_H_PACS_BOLC_OFF	42
4.2.3.2.3	DB_OBCP_H_PACS_POWER_CYCLE	44
4.2.3.2.4	DB_OBCP_H_PACS_IMMEDIATE_OFF	53
4.2.3.2.5	DB_OBCP_H_PACS_NORMAL_OFF	56
4.3	HIFI	63
4.3.1	HIFI FDIR	63
4.3.1.1	HIFI internal FDIR	63
4.3.1.2	HIFI S/C FDIR	63
4.3.1.2.1	HIFI S/C 1553B Bus FDIR	63
4.3.1.2.2	HIFI Science Data Monitoring	64
4.3.1.2.3	HIFI Class B Heater Loop FDIR	64
4.3.2	HIFI S/C Mode Transition	64
4.3.3	HIFI OBCP	65
4.3.3.1	List of HIFI OBCP	65
4.3.3.2	HIFI OBCP Specification	66
4.3.3.2.1	DB_OBCP_H_HIFI_RESET	66
4.3.3.2.2	DB_OBCP_H_HIFI_STANDBY	73
4.4	Common HERSCHEL OBCP	74
4.4.1	DB_H_PL_SC_MODE_OBCP	74
4.4.2	DB_H_PL_SC_SM_OBCP	75
5.	PLANCK	76
5.1	HFI	76
5.1.1	HFI FDIR	76
5.1.1.1	HFI internal FDIR	76
5.1.1.2	HFI S/C FDIR	78
5.1.1.2.1	HFI S/C 1553B Bus FDIR	78
5.1.1.2.2	HFI Science Data Monitoring	79
5.1.1.2.3	HFI Class B Heater Loop FDIR	79
5.1.2	HFI S/C Mode Transition	79
5.1.3	HFI OBCP	80
5.1.3.1	List of HFI OBCP	80
5.1.3.2	HFI OBCP Specification	81
5.1.3.2.1	DB_OBCP_P_HFI_REU_RESYNCH	81
5.1.3.2.2	DB_OBCP_P_HFI_REU_RESTART	84
5.1.3.2.3	DB_OBCP_P_HFI_4KCDE_RESTART	87
5.1.3.2.4	DB_OBCP_P_HFI_DCE_RESTART	90
5.1.3.2.5	DB_OBCP_P_HFI_OFF	93
5.1.3.2.6	DB_OBCP_P_HFI_DPU_RESTART	97

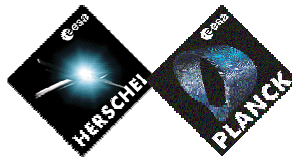


5.2	LFI	102
5.2.1	LFI FDIR	102
5.2.1.1	LFI internal FDIR	102
5.2.1.2	LFI S/C FDIR	102
5.2.1.2.1	LFI S/C 1553B Bus FDIR	102
5.2.1.2.2	LFI Science Data Monitoring	103
5.2.1.2.3	LFI Class B Heater Loop FDIR	103
5.2.2	LFI S/C Mode Transition	103
5.2.3	LFI OBCP	105
5.2.3.1	List of LFI OBCP	105
5.2.3.2	LFI OBCP Specification	106
5.2.3.2.1	DB_OBCP_P_LFI_RAA_OFF	106
5.2.3.2.2	DB_OBCP_P_LFI_CHECK_REBA_TM	108
5.3	SCE	113
5.3.1	SCE FDIR	113
5.3.1.1	SCE internal FDIR	113
5.3.1.2	SCE S/C FDIR	115
5.3.1.2.1	SCE S/C 1553B Bus FDIR	115
5.3.1.2.2	SCE Science Data Monitoring	116
5.3.1.2.3	SCE Class B Heater Loop FDIR	116
5.3.2	SCE S/C Mode Transition	116
5.3.3	SCE OBCP	117
5.3.3.1	List of SCE OBCP	117
5.3.3.2	SCE OBCP Specification	119
5.3.3.2.1	DB_OBCP_P_SCE_20A_POWER_OFF	119
5.3.3.2.2	DB_OBCP_P_SCE_20A_POWER_ON	122
5.3.3.2.3	DB_OBCP_P_SCE_OFF	123
5.4	Common PLANCK OBCP	126
5.4.1	DB_P_PL_SC_MODE_OBCP	126
5.4.2	DB_P_PL_SC_SM_OBCP	127
6.	OPEN POINTS	128
6.1	OBCP Telecommand Verification Report	128
6.2	OBCP TM/TC rate	128
6.3	OBCP simplification vs. P/L FDIR hierarchy	128



## LIST OF FIGURES AND TABLES

TABLE 2.1-1 : APPLICABLE DOCUMENTS	8
TABLE 2.2-1 : REFERENCE DOCUMENTS	9
FIGURE 3.1.2-1 : S/C MODE TRANSITION LOGIC	13
TABLE 3.1.2-1 : OBCP VS. S/C MODE TRANSITION	14
TABLE 3.1.2-2 : OBCP VS. S/C MODE TRANSITION - SIMPLIFIED	16
TABLE 4.1.1-1 : SPIRE INTERNAL FDIR EVENT REPORTS	17
TABLE 4.1.1-2 : EAT FOR SPIRE INTERNAL FDIR	18
TABLE 4.1.1-3 : SPIRE S/C 1553B BUS FDIR	19
TABLE 4.1.1-4 : EAT FOR SPIRE S/C 1553B BUS FDIR	19
TABLE 4.1.2-1 : SPIRE OBCP VS. S/C MODE TRANSITION	20
TABLE 4.1.3-1 : LIST OF SPIRE OBCP	22
TABLE 4.2.1-1 : PACS INTERNAL FDIR EVENT REPORTS	34
TABLE 4.2.1-2 : EAT FOR PACS INTERNAL FDIR	35
TABLE 4.2.1-3 : PACS S/C 1553B BUS FDIR	36
TABLE 4.2.1-4 : EAT FOR PACS S/C 1553B BUS FDIR	36
TABLE 4.2.2-1 : PACS OBCP VS. S/C MODE TRANSITION	37
TABLE 4.2.3-1 : LIST OF PACS OBCP	39
TABLE 4.3.1-1 : HIFI S/C 1553B BUS FDIR	63
TABLE 4.3.1-2 : EAT FOR HIFI S/C 1553B BUS FDIR	63
TABLE 4.3.2-1 : HIFI OBCP VS. S/C MODE TRANSITION	64
TABLE 4.3.3-1 : LIST OF HIFI OBCP	65
TABLE 5.1.1-1 : HFI INTERNAL FDIR EVENT REPORTS	76
TABLE 5.1.1-2 : EAT FOR HFI INTERNAL FDIR	78
TABLE 5.1.1-3 : HFI S/C 1553B BUS FDIR	78
TABLE 5.1.1-4 : EAT FOR HFI S/C 1553B BUS FDIR	79
TABLE 5.1.2-1 : HFI OBCP VS. S/C MODE TRANSITION	79
TABLE 5.1.3-1 : LIST OF HFI OBCP	80
FIGURE 5.1.3-1 : HFI « REU FPGA SYNCHRONISATION FAILURE » PROCEDURE	83
FIGURE 5.1.3-2 : HFI « LOSS OF DPU-REU COMMUNICATION » PROCEDURE	86
FIGURE 5.1.3-3 : HFI « LOSS OF DPU-4KCDE COMMUNICATION » PROCEDURE	89
FIGURE 5.1.3-4 : HFI « LOSS OF DPU-DCE COMMUNICATION » PROCEDURE	92
FIGURE 5.1.3-5 : HFI « LOSS OF S/C-DPU COMMUNICATION » PROCEDURE	101
TABLE 5.2.1-1 : LFI INTERNAL FDIR EVENT REPORTS	102
TABLE 5.2.1-2 : EAT FOR LFI INTERNAL FDIR	102
TABLE 5.2.1-3 : LFI S/C 1553B BUS FDIR	103
TABLE 5.2.1-4 : EAT FOR LFI S/C 1553B BUS FDIR	103
TABLE 5.2.2-1 : LFI OBCP VS. S/C MODE TRANSITION	104
TABLE 5.2.3-1 : LIST OF LFI OBCP	105
FIGURE 5.2.3-1 : LFI « LOSS OF DAE HK » PROCEDURE	107
FIGURE 5.2.3-2 : LFI « LOSS OF TM FROM LFI » PROCEDURE	112
TABLE 5.3.1-1 : SCE INTERNAL FDIR EVENT REPORTS	113
TABLE 5.3.1-2 : EAT FOR SCE INTERNAL FDIR	115
TABLE 5.3.1-3 : SCE S/C 1553B BUS FDIR	115
TABLE 5.3.1-4 : EAT FOR SCE S/C 1553B BUS FDIR	116
TABLE 5.3.2-1 : SCE OBCP VS. S/C MODE TRANSITION	116
TABLE 5.3.3-1 : LIST OF SCE OBCP	118



## 1. INTRODUCTION

### 1.1 Purpose

This documents aims at specifying the On-Board Control Procedures (OBCP) that are necessary to support the Herschel/Planck Payload Management functionality being implemented in the CDMS OBSW.

In addition, it identifies the Payload event reports that shall trigger the execution of some of these OBCP. Entries in the Event/Action Table (EAT) supported by the CDMS ASW are defined to create the link between event report and action (nominal or recovery) to be performed by the CDMS OBSW.

### 1.2 Limitations

OBCP that Ground may need for nominal operations of the Payloads are not covered by this document as they are not under AAS-F responsibility.

## 2. DOCUMENTATION AND TERMINOLOGY

### 2.1 Applicable documents

Following documents must be applied when using this document, with the extend specified in the text. The documents quoted in this section are referenced throughout the document by [ADi] as in the list below. If not specified, the latest available version is used.

Title	Reference	Issue	Date
[AD1] Packet Structure Interface Control Document	SCI-PT-ICD-7527	- <sup>1</sup>	-
[AD2] SPIRE Data ICD	SPIRE-RAL-PRJ-001078	2.0	15/11/2004
[AD3] PACS ICD	??		
[AD4] HIFI TC Packet ICD	SRON-U/HIFI/SP/2001-001	1.5	05/10/2005
[AD5] HIFI TM Packet ICD	SRON-U/HIFI/SP/2001-002	1.6	05/10/2005
[AD6] HIFI HK Packet ICD	SRON-U/HIFI/SP/2001-003	1.8	05/10/2005
[AD7] HFI OBSW TCTM List	LI-PHBC-300081-LAL	2.1	19/11/2004
[AD8] LFI ICD	??		
[AD9] SCE TC and TM Structures	TS-PSCBC-100010-LPSC	7.2	19/10/2005
[AD10] CDMU Software ICD for the BSW	P-HPL-NOT-00076-SE	- <sup>2</sup>	-
[AD11] CDMU ASW ICD	H-P-4-SSF-IC-0001	- <sup>3</sup>	-

Table 2.1-1 : Applicable documents

<sup>1</sup> PS-ICD Issue 5.0 was used when writing initial release of this document.

<sup>2</sup> CDMU BSW ICD Issue 11 was used when writing initial release of this document.

<sup>3</sup> CDMU ASW ICD Issue 3.2 was used when writing initial release of this document.





## 2.2 Reference documents

Following documents have been taken into account when writing this document or are mentioned in the text as complementary information.

The documents quoted in this section are referenced throughout the document by [RD*i*] as in the list below. If not specified, the latest available version is used.

Title	Reference	Issue	Date
[RD1] List of Acronyms	H-P-1-ASPI-LI-0077	-	
[RD2] System Operations & FDIR Requirements	H-P-1-ASPI-SP-0209	-	
[RD3] SPIRE FDIR	SPIRE-RAL-PRJ-001978	1.0	13/07/2004
[RD4] PACS FDIR	PACS-ME-GP-002	1.0	23/06/2005
[RD5] HIFI FDIR Specification	SRON-U/HIFI/SP/2004-002	1.1	20/01/2006
[RD6] HFI Instrument Main Electronics OBSW ICD A	IC-PHBC-200031-LAL	3.1	16/03/2005
[RD7] Planck LFI – FDIR description	PL-LFI-PST-AN-002	1.0	18/05/2005
[RD8] Planck Sorption Cooler Electronics FMECA	PA-PSCB-100006-ISN	1.15	01/03/2005
[RD9] CDMU ASW Requirements Specification	H-P-SP-AI-0031	-	
[RD10] Intended Operational Usage of Sub-Schedules	PT-CMOC-OPS-TN-6605-OPS-OGH	Draft <sup>4</sup>	31/03/2004
[RD11] Data Management Working Group Meeting #21	H-P-ASP-MN-5558	-	20/10/2004

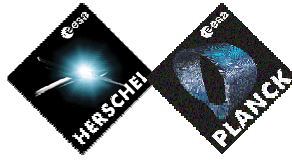
Table 2.2-1 : Reference documents

## 2.3 Glossary of terms and acronyms

If not defined below, terms and acronyms used are listed and defined in [RD1].

AFO	Autonomous Fail Operational
AFS	Autonomous Fail Safe
ASW	Application SoftWare
BSW	Basic SoftWare
CDMS	Command and Data Management Subsystem
CDMU	Central Data Management Unit
EAT	Event/Action Table
HPSDB	Herschel-Planck System Data-Base
ICD	Interface Control Document
OBCP	On-Board Control Procedure
OBSW	On-Board SoftWare
PCDU	Power Conditioning Distribution Unit
RT	Remote Terminal
RTU	Remote Terminal Unit
TBD	To Be Defined
SVM	SerVice Module

<sup>4</sup> No official release delivered to AAS-F. Intention to handle Sub-schedule as defined in this document shall be confirmed.



### 3. PAYLOAD MANAGEMENT OVERVIEW

#### 3.1 FDIR

##### 3.1.1 Payload internal FDIR

For some specific cases, Instruments need the support of the CDMS OBSW to start their recovery procedures via OBCP.

Instruments detect some internal failures and inform the CDMS OBSW by sending dedicated Event Reports. On receipt of these reports, the CDMS OBSW start an OBCP execution according to the related entries in the EAT definition.

Note that each entry related to Instrument internal FDIR will be configured as follows:

- Action Handling ID =  $01_b$  i.e. the action is Disabled in AFS<sup>5</sup> and Enabled in AFO
- Parameter Passing Status =  $1_b$  (Enabled) when Parameter A field of the event report has to be passed to the TC starting the action. In most cases, this field is set to  $0_b$  (Disabled) as action to be executed does not depend on the content of the related event report (event ID being sufficient).
- Action Status =  $1_b$  i.e. the action is Enabled by default

Note also that when one APID is allocated to each side of one instrument (nominal/redundant) for its telemetry including event reports, two entries in the EAT need to be defined.

##### 3.1.2 S/C FDIR

Some S/C FDIR detected by the SVM OBSW may impact the Instruments for which a new configuration is requested.

This new configuration is reached by executing an OBCP by the CDMS OBSW.

The FDIR related to CDMS/ACMS Level 3/4 is not treated in this section as covered by the S/C Mode Transition in section 3.2.

Consequently, the remaining S/C FDIR impacting the Instruments are:

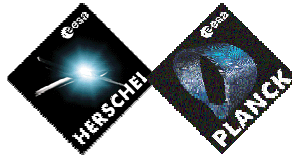
- S/C 1553B Bus FDIR
- Science Data Monitoring
- Class B Heater Loop FDIR

##### 3.1.2.1 S/C 1553B Bus FDIR

Start OBCP is executed as part of CDMU OBSW actions to perform the S/C 1553B Bus FDIR recovery as specified in [RD2]. The specification of the OBCP to start is given through the Event/Action Table (EAT)

---

<sup>5</sup> TBC: this has to be discussed with Instruments: the default FDIR status being AFS after a S/C mode transition, this would mean that the Payload Internal FDIR would be disabled. This sounds particularly of concern for Planck where Instrument request to do nothing during these transitions.



definition and as such is HPSDB and flight configurable. The triggering Event Reports and related OBCP to start are specific to each FDIR (DLL, TFL TC or TFL TM) and instrument.

Note that these events reports are generated by the CDMU BSW which supports the S/C 1553B Bus FDIR.

Note that each entry related to S/C 1553B Bus FDIR will be configured as follows:

- Action Handling ID =  $11_b$  i.e. the action is Enabled in AFS and AFO
- Parameter Passing Status =  $1_b$  (Enabled) when Parameter A field of the event report has to be passed to the TC starting the action. In most cases, this field is set to  $0_b$  (Disabled) as action to be executed does not depend on the content of the related event report (event ID being sufficient).
- Action Status =  $1_b$  i.e. the action is Enabled by default

### 3.1.2.2 Science Data Monitoring

In addition to the TFL TM FDIR on the S/C 1553B Bus (supported by the CDMU BSW), a functionality is in place in the CDMU ASW that allows to count the number of TM generated by each Instrument and monitor this number according to specified thresholds. This has been designed using the capability of the Monitoring Table (MOT) that supports the Service 12 specified in the [AD1].

If necessary, this would offer more flexibility than the TFL TM FDIR. Indeed, the TFL TM FDIR is "hard coded" and can not be modified in flight except by patching the OBSW. Its configuration is performed via inputs parameters coming from the HPSDB, namely SDB\_FDIR\_TFL\_TM\_PERIOD\_<Instrument>\_VALUE and SDB\_FDIR\_TFL\_TM\_MIN\_<Instrument>\_VALUE. At time being, the value of these parameters are set to:

- SDB\_FDIR\_TFL\_TM\_PERIOD\_<Instrument>\_VALUE = 90 seconds for each instrument
- SDB\_FDIR\_TFL\_TM\_MIN\_<Instrument>\_VALUE = 1 for each instrument

This means that the TFL TM FDIR triggers when the CDMU OBSW does not receive more than 1 TM from an Instrument during the last 90 seconds.

On the other hand, the Science Data Monitoring functionality implemented by the CDMU ASW allows to modify in-flight the minimum thresholds. Though the counting period of the TM packets is also "hard coded" and coming from the HPSDB, the MOT allows to act on the monitoring period and repetition number before triggering an event in case of values below the thresholds.

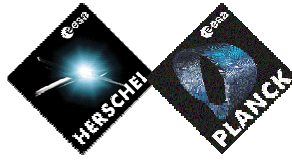
**TBC:** Need to use the Science Data Monitoring functionality instead of the TLF TM FDIR has to be assessed with Instruments. In case, events coming from related MOT entries would replace the ones associated with the TFL TM FDIR in the EAT entries triggering the relevant P/L OBCP. Slight adaptation of these OBCP would be needed.

### 3.1.2.3 Class B Heater Loop FDIR

As described in [RD9], the CDMU OBSW (ASW) monitors the temperature computed by each Class B control loop in order to detect any potential failure of the associated heaters.

In case such a failure is detected (i.e. temperature is over specific thresholds), an event report (TM(5,4,114,5)) is generated and a recovery procedure is started by the CDMS OBSW that consists in switching to the redundant heaters.

A place holder was foreseen at the beginning of this recovery procedure in order to start the execution of a Payload OBCP that would execute some actions needed by the Instruments.



However, as detailed in the Instruments specific sections of this document, only HIFI is thermally controlled with Class B control loops and in case of failure, HIFI do not request any action to be done other than generated an event to be informed of this failure case that may impact the accuracy of their measurements. This need is already covered by the generation of the TM(5,4,114,5).

Consequently, it is suggested to remove from [RD9] the execution of a specific payload OBCP as part of the recovery procedure of the class B heater loops. (TBC)

### 3.2 S/C Mode Transition

There are five S/C modes, namely:

- Launch Mode
- Sun Acquisition Mode (SAM)
- Earth Acquisition Mode (EAM)
- Nominal Mode (NOM)
- Survival Mode (SM)

S/C Mode transition can be commanded:

- By Ground via TC sent directly or via MTL or most unlikely via OBCP
- Autonomously by the CDMS OBSW:
  - o On separation detection
  - o For FDIR purpose, i.e. to recover from a level 3 or 4 alarm from the CDMS or ACMS.

All the possible S/C mode transitions are described in [RD2] and [RD9], and are recalled in the following figure.

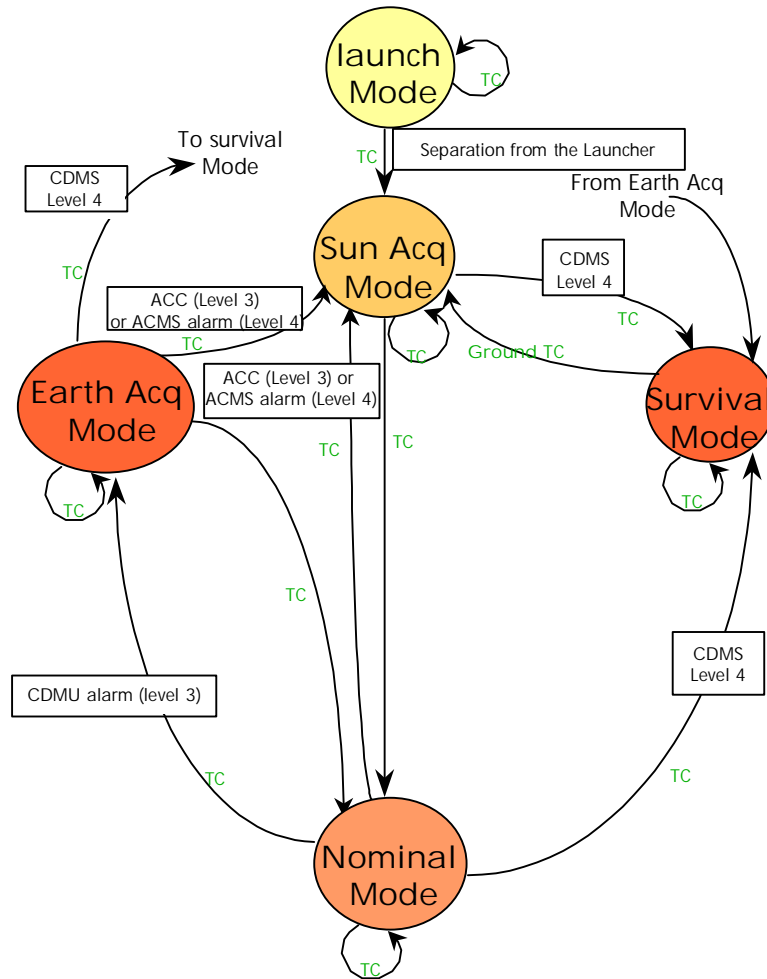
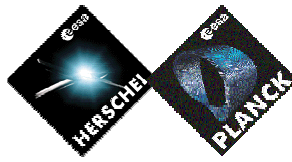
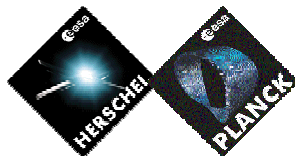


Figure 3.1.2-1 : S/C Mode Transition Logic

Whenever a transition to a non nominal mode is possible, an OBCP is executed as part of the sequence of actions to be performed by the CDMS OBSW in order to put the instruments in a "standby" mode according to the new reached S/C configuration.

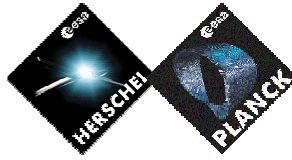
As only one OBCP is started by the CDMS OBSW during the mode transition sequence, a "mother" Payload OBCP is needed to call each OBCP related a specific instrument.



The following table identified the OBCP that are executed by the CMDS OBSW during the S/C Mode transitions as specified in [RD9].

To	Launch		S/C SAM		S/C NOM		S/C EAM		S/C SM	
From	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP
Launch	TC	None (Instruments are OFF at Launch)	TC	None (Instruments are OFF at Launch)	Illegal	N/A	Illegal	N/A	Illegal	N/A
	CDMS Level 3b		Separation detected							
S/C SAM	Illegal	N/A	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS	TC	None (Never autonomous)	Illegal	N/A	TC	DB_LEVEL_4_INSTRUMENTS
			TC	DB_LEVEL_3b_INSTRUMENTS						
			ACMS Level 3/4 (AIR)	??						
S/C NOM	Illegal	N/A	TC	DB_NOM_TO_SAM_INSTRUMENTS	TC	None (Never autonomous)	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS	TC	DB_LEVEL_4_INSTRUMENTS
			ACMS Level 3/4 (AIR)	DB_ACMS_LEVEL_4_INSTRUMENTS			TC	DB_LEVEL_3b_INSTRUMENTS		
S/C EAM	Illegal	N/A	TC	DB_EAM_TO_SAM_INSTRUMENTS	TC	None (Never autonomous)	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS	CDMS Level 4	DB_LEVEL_4_INSTRUMENTS
			ACMS Level 3/4 (AIR)	DB_ACMS_LEVEL_4_INSTRUMENTS			TC	DB_LEVEL_3b_INSTRUMENTS		
S/C SM	Illegal	N/A	TC	DB_SURV_TO_SAM_INSTRUMENTS	Illegal	N/A	Illegal	N/A	TC	DB_LEVEL_4_INSTRUMENTS

Table 3.1.2-1 : OBCP vs. S/C Mode transition



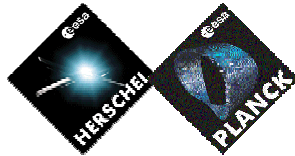
As far as the Instruments are concerned, only two general cases are relevant:

- Transition from any mode to SAM or EAM
  - o This transition can occur either
    - § Autonomously
      - after a CDMS Level 3a or 3b alarm for both SAM and EAM
      - after an ACMS level 3 or 4 (AIR) alarm for SAM
    - § By TC
- Transition from any mode to SM
  - o This transition can occur either
    - § Autonomously
      - After a CDMS Level 4 alarm
      - No action is requested from the Instruments as they are switched OFF by the CDMS RM after a Level 4 Alarm
    - § By TC
      - As the CDMS RM sequence is not executed in this case, it is under Ground responsibility to ensure that instruments are switched OFF before entering SM

However, as:

- Only one S/C mode transition can occur at a time,
  - Instruments request is identical for transition to EAM and SAM,
  - Instruments request is identical for each cause of the transition (TC, 3a/3b, AIR) to SAM or EAM,
- only two OBCPs for each S/C are needed (DB\_H/P\_PL\_SC\_MODE\_OBCP, DB\_H/P\_PL\_SC\_SM\_OBCP) and the following simplification applies.

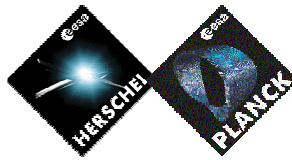
Note that DB\_H/P\_PL\_SC\_SM\_OBCP stays as a placeholder, as nothing is requested from instruments as when autonomously entering in SM, the instruments are switched OFF by the RM and the complete MTL is stopped. Again, if the SM mode is entered on TC, it is Ground responsibility to properly set the Instruments accordingly.



To	Launch		S/C SAM		S/C NOM		S/C EAM		S/C SM	
From	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP
Launch	TC	None (Instruments are OFF at Launch)	TC	None (Instruments are OFF at Launch)	Illegal	N/A	Illegal	N/A	Illegal	N/A
	CDMS Level 3b		Separation detected		Illegal		Illegal		Illegal	
S/C SAM	Illegal	N/A	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	Illegal	N/A	TC	DB_H/P_PL_SC_SM_OBCP
			TC	DB_H/P_PL_SC_MODE_OBCP						
			ACMS Level 3/4 (AIR)	??						
S/C NOM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP	TC	DB_H/P_PL_SC_SM_OBCP
			ACMS Level 3/4 (AIR)	DB_H/P_PL_SC_MODE_OBCP			TC	DB_H/P_PL_SC_MODE_OBCP		
S/C EAM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP	CDMS Level 4	DB_H/P_PL_SC_SM_OBCP
			ACMS Level 3/4 (AIR)	DB_H/P_PL_SC_MODE_OBCP			TC	DB_H/P_PL_SC_MODE_OBCP		
S/C SM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	Illegal	N/A	Illegal	N/A	TC	DB_H/P_PL_SC_SM_OBCP

Table 3.1.2-2 : OBCP vs. S/C Mode transition - Simplified





## 4. HERSCHEL

### 4.1 SPIRE

#### 4.1.1 SPIRE FDIR

##### 4.1.1.1 SPIRE internal FDIR

According to [RD3], SPIRE generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.

Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DRCU Power Anomaly	5,2	0xC000	Switch Off the DRCU	DB_OBCP_H_SPIRE_DRCU_OFF
DRCU Temperature Anomaly				
DPU Power Anomaly	5,2	0xC010	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF
Operations Anomaly	5,2	0xC100	Disable TC to SPIRE until further notice	DB_OBCP_H_SPIRE_OPE_STOP
Operations Resume	5,2	0xC110	Re-enable TC to SPIRE at the start of the next Subschedule	DB_OBCP_H_SPIRE_OPE_RESUME

Table 4.1.1-1 : SPIRE internal FDIR Event Reports

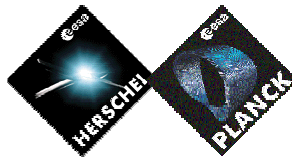
From the previous table, one can define the following EAT entries to support SPIRE Internal FDIR.

Note that SPIRE Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0500 for SPIRE Prime
- 0x0501 for SPIRE Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0500 (SPIRE Prime)	0xC000 (DRCU Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_DRCU_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC000 (DRCU	TC(18,3) [Start OBCP] Procedure ID =	01 <sub>b</sub> (Disabled in	0 (Disabled)	1 (Enabled)



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
	Anom)	DB_OBCP_H_SPIRE_DRCU_OFF N1=0	AFS & Enabled in AFO)		
0x0500 (SPIRE Prime)	0xC010 (DPU Power)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC010 (DPU Power)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0500 (SPIRE Prime)	0xC100 (Operations Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_STOP N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC100 (Operations Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_STOP N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0500 (SPIRE Prime)	0xC110 (Operations Resume)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_RESUME N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC110 (Operations Resume)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_RESUME N1=0	01 <sub>b</sub> (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)

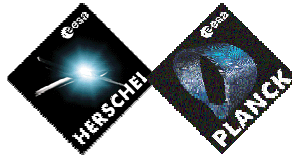
Table 4.1.1-2 : EAT for SPIRE Internal FDIR

#### 4.1.1.2 SPIRE S/C FDIR

##### 4.1.1.2.1 SPIRE S/C 1553B Bus FDIR

The following table summarises what SPIRE requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with SPIRE triggers. Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	152	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF
TFL TC FDIR	5,x	171	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF



FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
TFL TM FDIR	5,x	185	Switch Off SPIRE in a controlled manner	DB_OBCP_H_SPIRE_OFF_CTRL

Table 4.1.1-3 : SPIRE S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support SPIRE S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	152 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	171 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	185 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF_CTRL N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.1.1-4 : EAT for SPIRE S/C 1553B Bus FDIR

#### 4.1.1.2.2 SPIRE Science Data Monitoring

**TBW**

#### 4.1.1.2.3 SPIRE Class B Heater Loop FDIR

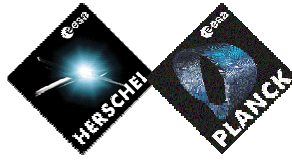
No Class B Thermal Control Loop is applicable to SPIRE.

#### 4.1.2 SPIRE S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, SPIRE will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP.

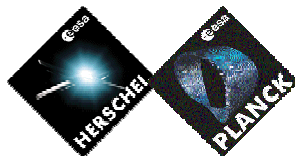
This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...



S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Put SPIRE in Standby Mode	DB_OBCP_H_SPIRE_STANDBY	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_H_PL_SC_SM_OBCP

Table 4.1.2-1 : SPIRE OBCP vs. S/C Mode transition

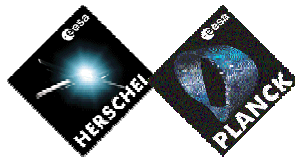


### 4.1.3 SPIRE OBCP

#### 4.1.3.1 List of SPIRE OBCP

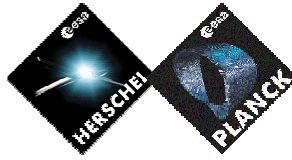
According to sections 4.1.1 and 4.1.2, the following OBCP are needed to support SPIRE activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_SPIRE_DRCU_OFF	X					0x0500 (SPIRE Prime)	5,2	0xC000	
	X					0x0501 (SPIRE Red.)	5,2	0xC000	
DB_OBCP_H_SPIRE_OFF	X					0x0500 (SPIRE Prime)	5,2	0xC010	
	X					0x0501 (SPIRE Red.)	5,2	0xC010	
		X				0x0010 (CDMS)	5,x	0x0098 152 (DLL)	
		X				0x0010 (CDMS)	5,x	0x00AB 171 (TFL TC)	
DB_OBCP_H_SPIRE_OFF_CTRL		X				0x0010 (CDMS)	5,x	0x00B9 185 (TFL TM)	
DB_OBCP_H_SPIRE_STANDBY					X				DB_H_PL_SC_MODE_OBCP
DB_OBCP_H_SPIRE_OPE_STOP	X					0x0500 (SPIRE Prime)	5,2	0xC100	
	X					0x0501 (SPIRE Red.)	5,2	0xC100	
DB_OBCP_H_SPIRE_OPE_RESUME	X					0x0500 (SPIRE Prime)	5,2	0xC110	



OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
	X					0x0501 (SPIRE Red.)	5,2	0xC110	

Table 4.1.3-1 : List of SPIRE OBCP

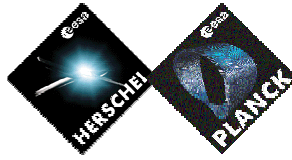


### 4.1.3.2 SPIRE OBCP Specification

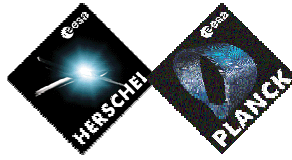
#### 4.1.3.2.1 DB\_OBCP\_H\_SPIRE\_DRCU\_OFF

OBCP DB_OBCP_H_SPIRE_DRCU_OFF		
ID	DB_OBCP_H_SPIRE_DRCU_OFF	TBD
Triggered by	Event 0xC000 from SPIRE Nom or Red	SPIRE Internal FDIR: - DRCU Power Anomaly - DRCU Temperature Anomaly
Type		TBD
Time-Out		30 seconds TBC
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. :  - 0xC000 from SPIRE Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC000 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC000 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None	
Command PSDU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.)  Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)
Issue TM(5,4) , EventID= TBD "SPIRE DRCU Switched OFF" Event Packet	Issue a TM(5,4) indicating "SPIRE DRCU Switched OFF"	Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_DRCU_OFF_EID> (TBD) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP <sup>6</sup> : - 0xC000 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC000 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC000 (SPIRE Red.)

<sup>6</sup> TBC: This could be useful in case the current recovery did not succeed





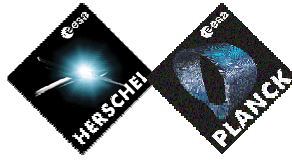


#### 4.1.3.2.2 DB\_OBCP\_H\_SPIRE\_OFF

OBCP DB_OBCP_H_SPIRE_OFF		
ID	DB_OBCP_H_SPIRE_OFF	TBD
Triggered by	Event 0xC010 from SPIRE Nom or Red.	SPIRE Internal FDIR - DPU Power Anomaly
	Event 0x0098 from CDMS	DLL FDIR
	Event 0x00AB from CDMS	TFL TC FDIR
Type		TBD
Time-Out		60 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	<p>Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. :</p> <ul style="list-style-type: none"> <li>- 0xC010 from SPIRE Nom &amp; Red. as they trigger the current OBCP</li> <li>- 0x0098/0x00AB from the CDMS as they trigger the current OBCP</li> <li>- 0xC110 from SPIRE Nom &amp; Red. as they would re-enable the SPIRE sub-schedules.</li> </ul>	<p>Send TC(19,5) "Disable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0006</li> <li>- APID / Event ID = 0x0500 / 0xC010 (SPIRE Nom.)</li> <li>- APID / Event ID = 0x0501 / 0xC010 (SPIRE Red.)</li> <li>- APID / Event ID = 0x0010 / 0x0098 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AB (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.)</li> <li>- APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)</li> </ul>
	<p>Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:</p> <ul style="list-style-type: none"> <li>- DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.</li> </ul>	<p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME</li> </ul>
Disable all the telecommands from the MTL for SPIRE		<p>Send TC(11,2) "Disable Release of Telecommands" with the following parameters:<sup>7</sup></p> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_CMD&gt; TBD (SPIRE command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_META&gt; TBD (SPIRE meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
	Declare the two SPIRE RT as OFF <sup>8</sup>	<p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RT_A_SPIRE_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

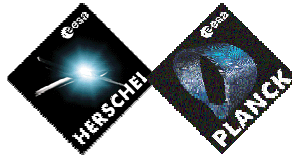
<sup>7</sup> According to [RD10]

<sup>8</sup> This will avoid to trigger any S/C 1553B bus FDIR related to SPIRE when it is OFF



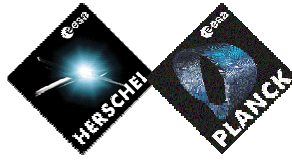
		<ul style="list-style-type: none"> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_SPIRE_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Command PDSU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)</li> </ul>
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Command PDSU to remove power from SPIRE DPU	OPEN LCL related to both nominal and redundant SPIRE HSDPU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x000B (LCL 11 = SPIRE HSDPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x000C (LCL 12 = SPIRE HSDPU Red.)</li> </ul>
	(TBC) <sup>9</sup> Mark SPIRE Unit as OFF in order to inform the Thermal Control Management function that SPIRE OFF thresholds have to be used.	(TBC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0308 (SPIRE)</li> </ul>
Issue TM(5,4) , EventID= (TBD) "SPIRE Switched OFF" Event Packet		Issue a TM(5,4) with the following parameters: <ul style="list-style-type: none"> <li>- Event ID = &lt;SPIRE_OFF_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>

<sup>9</sup> TBC: This should not be done as the SPIRE panel is thermally controlled with the CCU that are still ON.



	<p>Enable EAT entries that triggered the current OBCP<sup>10</sup>:</p> <ul style="list-style-type: none"> <li>- 0xC010 from SPIRE Nom &amp; Red.</li> <li>- 0x0098/0x00AB from the CDMS</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0004</li> <li>- APID / Event ID = 0x0500 / 0xC010 (SPIRE Nom.)</li> <li>- APID / Event ID = 0x0501 / 0xC010 (SPIRE Red.)</li> <li>- APID / Event ID = 0x0010 / 0x0098 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AB (CDMS TFL TC FDIR)</li> </ul>
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<sup>10</sup> TBC: This could be useful in case the current recovery did not succeed

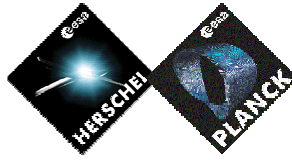


#### 4.1.3.2.3 DB\_OBCP\_H\_SPIRE\_OFF\_CTRL

OBCP DB_OBCP_H_SPIRE_OFF_CTRL		
ID	DB_OBCP_H_SPIRE_OFF_CTRL	TBD
Triggered by	Event 0x00B9 from CDMS	TFL TM FDIR <sup>11</sup>
Type		TBD
Time-Out		60 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : <ul style="list-style-type: none"> <li>- 0x00B9 from the CDMS as it triggers the current OBCP</li> <li>- 0xC110 from SPIRE Nom &amp; Red. as they would re-enable the SPIRE sub-schedules.</li> </ul>	Send TC(19,5) "Disable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0003</li> <li>- APID / Event ID = 0x0010 / 0x00B9 (CDMS TFL TM FDIR)</li> <li>- APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.)</li> <li>- APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)</li> </ul>
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: <ul style="list-style-type: none"> <li>- DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.</li> </ul>	Send TC(18,4) "Stopping a procedure", with the following parameters: <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME</li> </ul>
Disable all the telecommands from the MTL for SPIRE		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>12</sup> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_CMD&gt; (TBD) (SPIRE command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_META&gt; (TBD) (SPIRE meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
Stop current VMs (send 4 TCs to instrument)		Send TC(8,4, 2, 3) "HALT_VM " to SPIRE Send TC(8,4, 3, 3) "HALT_VM1 " to SPIRE Send TC(8,4, 4, 3) "HALT_VM2 " to SPIRE Send TC(8,4, 5, 3) "HALT_VM3 " to SPIRE
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Send TC to instrument to run VM to switch DRCU to SAFE mode		(TBC) Send TC(8,4,2,2) "RUN_VM" to SPIRE with the following parameters: <ul style="list-style-type: none"> <li>- TABLEID = (TBD)</li> </ul>

<sup>11</sup> TBC: Note that SPIRE RT is declared as Sick\_TM by the CDMU OBSW. This means that no TM transfer from SPIRE is performed during this recovery. Is this acceptable?

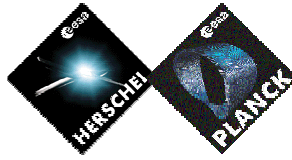
<sup>12</sup> According to [RD10]



		<ul style="list-style-type: none"> <li>- INDEX = TBC</li> <li>- N = TBC</li> <li>- DATA = TBC</li> </ul>
Wait 5 (TBC) seconds		Wait 5 (TBC) seconds
	Declare the two SPIRE RT as OFF <sup>13</sup>	<p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RT_A_SPIRE_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RT_B_SPIRE_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Command PDSU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)</li> </ul>
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Command PDSU to remove power from SPIRE DPU	OPEN LCL related to both nominal and redundant SPIRE HSDPU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x000B (LCL 11 = SPIRE HSDPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x000C (LCL 12 = SPIRE HSDPU Red.)</li> </ul>
	(TBC) <sup>14</sup> Mark SPIRE Unit as OFF in order to inform the Thermal Control Management	(TBC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:

<sup>13</sup> This will avoid to trigger any S/C 1553B bus FDIR related to SPIRE when it is OFF

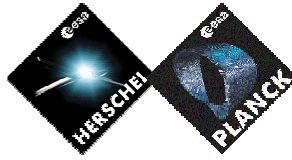
<sup>14</sup> TBC: This should not be done as the SPIRE panel is thermally controlled a with the CCU that are still ON.



	function that SPIRE OFF thresholds have to be used.	- Status Unit ID = 0x0308 (SPIRE)
Issue TM(5,4) , EventID= <b>TBD</b> "SPIRE Shutdown" Event Packet		Issue a TM(5,4) with the following parameters: <ul style="list-style-type: none"> <li>- Event ID = &lt;SPIRE_SHUTDOWN_EID&gt; (<b>TBD</b>)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
	Enable EAT entries that triggered the current OBCP <sup>15</sup> : <ul style="list-style-type: none"> <li>- 0x00B9 from the CDMS</li> </ul>	Send TC(19,4) "Enable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x00B9 (CDMS TFL TM FDIR)</li> </ul>

**TBC: Common parts between DB\_OBCP\_H\_SPIRE\_OFF\_CTRL and DB\_OBCP\_H\_SPIRE\_OFF could be implemented in a sub OBCP to ease the maintenance of them. In this case, one parameter would have to be passed to this sub OBCP to distinguish between SPIRE OFF request in a control manner or not**

<sup>15</sup> TBC: This could be useful in case the current recovery did not succeed



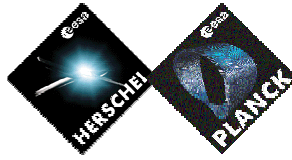
#### 4.1.3.2.4 DB\_OBCP\_H\_SPIRE\_STANDBY

OBCP DB_OBCP_H_SPIRE_STANDBY		
ID	DB_OBCP_H_SPIRE_STANDBY	TBD
Triggered by	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		TBD
Time-Out		30 seconds (TBD)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : <ul style="list-style-type: none"> <li>- 0xC110 from SPIRE Nom &amp; Red. as they would re-enable the SPIRE sub-schedules.</li> </ul>	Send TC(19,5) "Disable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.)</li> <li>- APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)</li> </ul>
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: <ul style="list-style-type: none"> <li>- DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.</li> </ul>	Send TC(18,4) "Stopping a procedure", with the following parameters: <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME</li> </ul>
	Disable all the telecommands from the MTL for SPIRE <sup>16</sup>	Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>17</sup> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_CMD&gt; (TBD) (SPIRE command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;SPIRE_SUBS_ID_META&gt; (TBD) (SPIRE meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
Send TC to SPIRE to put the instrument into Standby Mode		(TBD) Send TC(8,4, 0xC1,0x02) "SET_OBS_MODE" to SPIRE with the following parameters: <ul style="list-style-type: none"> <li>- MODE = (TBD) (STANDBY)</li> </ul>
	Enable EAT entries that triggered the current OBCP <sup>18</sup> : <ul style="list-style-type: none"> <li>- None</li> </ul>	

<sup>16</sup> TBD: Not specified by Instrument but it is assumed this is needed

<sup>17</sup> According to [RD10]

<sup>18</sup> TBD: This could be useful in case the current recovery did not succeed



#### 4.1.3.2.5 DB\_OBCP\_H\_SPIRE\_OPE\_STOP

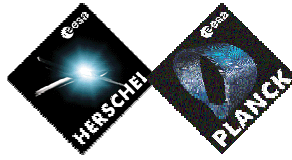
OBCP DB_OBCP_H_SPIRE_OPE_STOP		
ID	DB_OBCP_H_SPIRE_OPE_STOP	TBD
Triggered by	Event 0xC100 from SPIRE Nom. or Red.	SPIRE Internal FDIR - Operations Anomaly
Type		TBD
Time-Out		30 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. :  - 0xC100 from SPIRE Nom & Red. as they trigger the current OBCP.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC100 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC100 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None <sup>19</sup>	
Disable all the telecommands from the MTL for SPIRE		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>20</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_CMD> TBD (SPIRE command sub-schedule) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> TBD (SPIRE meta subschedule) - M = 0 ( All APID)
Issue TM(5,4) , EventID= TBD "SPIRE Operations Stopped" Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_OPE_STOP_EID> TBD - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP <sup>21</sup> : - 0xC100 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC100 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC100 (SPIRE Red.)

<sup>19</sup> It is assumed there is enough time to allow executing the stop procedure before a resume request is sent.

<sup>20</sup> According to [RD10]

<sup>21</sup> TBD: This could be useful in case the current recovery did not succeed





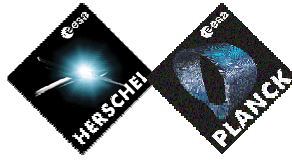
#### 4.1.3.2.6 DB\_OBCP\_H\_SPIRE\_OPE\_RESUME

OBCP DB_OBCP_H_SPIRE_OPE_RESUME		
ID	DB_OBCP_H_SPIRE_OPE_STOP	TBD
Triggered by	Event 0xC110 from SPIRE Nom. or Red.	SPIRE Internal FDIR - Operations Resume
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. :  - 0xC110 from SPIRE Nom & Red. as they trigger the current OBCP.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None <sup>22</sup>	
Re-enable telecommands from the MTL to the instrument at the start of the next subschedule		Send TC(11,1) "Enable Release of Telecommands" with the following parameters: <sup>23</sup> - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (TBD) (SPIRE meta subschedule) - M = 0 ( All APID)
Issue TM(5,4) , EventID= TBD "SPIRE Operations Resumed" Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_OPE_RESUME_EID> (TBD) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP <sup>24</sup> : - 0xC110 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)

<sup>22</sup> It is assumed there is enough time to allow executing the resume procedure before a stop request is sent.

<sup>23</sup> According to [RD10]

<sup>24</sup> TBC: This could be useful in case the current recovery did not succeed



## 4.2 PACS

### 4.2.1 PACS FDIR

#### 4.2.1.1 PACS internal FDIR

According to [RD4], PACS generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.

Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
GO SAFE	5,2	4	Put PACS in SAFE mode	DB_OBCP_H_PACS_SAFE
BOLC OFF	5,2	5	Switch OFF the BOLC	DB_OBCP_H_PACS_BOLC_OFF
POWER CYCLE	5,2	6	Power cycle PACS	DB_OBCP_H_PACS_POWER_CYCLE
IMMEDIATE OFF	5,2	13	Switch OFF PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
NORMAL OFF	5,2	25	Switch OFF PACS in a controlled way	DB_OBCP_H_PACS_NORMAL_OFF

Table 4.2.1-1 : PACS internal FDIR Event Reports

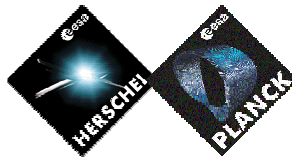
From the previous table, one can define the following EAT entries to support PACS Internal FDIR.

Note that PACS Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0480 for PACS Prime
- 0x0481 for PACS Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0480 (PACS Prime)	4 (GO SAFE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_SAFE N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	4 (GO SAFE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_SAFE N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	5 (BOLC OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_BOLC_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	5 (BOLC OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_BOLC_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)



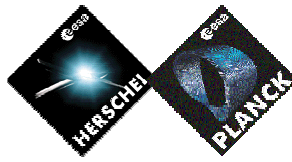
APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0480 (PACS Prime)	6 (POWER CYCLE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_POWER_CYCLE N1=0x0001 OBCP-PID= 0xXXXX = <PACS_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <PACS_PL_SIDE_NOM> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	6 (POWER CYCLE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_POWER_CYCLE N1=0x0001 OBCP-PID= 0xXXXX = <PACS_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <PACS_PL_SIDE_RED> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	13 (IMMEDIATE OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	13 (IMMEDIATE OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	25 (NORMAL OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_NORMAL_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	25 (NORMAL OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_NORMAL_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 4.2.1-2 : EAT for PACS Internal FDIR

#### 4.2.1.2 PACS S/C FDIR

##### 4.2.1.2.1 PACS S/C 1553B Bus FDIR

The following table summarises what PACS requests to be done by the CDMS OBSW in case a S/C 1553B Bus FDIR related to the communication with PACS triggers.



Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	153	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
TFL TC FDIR	5,x	172	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
TFL TM FDIR	5,x	186	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF

Table 4.2.1-3 : PACS S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support PACS S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	153 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	172 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	186 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.2.1-4 : EAT for PACS S/C 1553B Bus FDIR

#### 4.2.1.2.2 PACS Science Data Monitoring

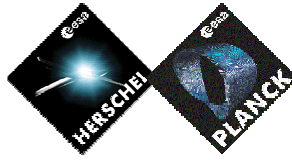
**TBW**

#### 4.2.1.2.3 PACS Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to PACS.

### 4.2.2 PACS S/C Mode Transition

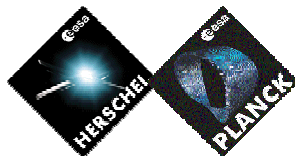
As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, PACS will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP.



This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Put PACS in SAFE Mode	DB_OBCP_H_PACS_SAFE	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_H_PL_SC_SM_OBCP

Table 4.2.2-1 : PACS OBCP vs. S/C Mode transition

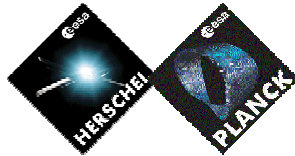


## 4.2.3 PACS OBCP

### 4.2.3.1 List of PACS OBCP

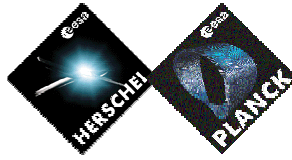
According to sections 4.2.1 and 4.2.2, the following OBCP are needed to support PACS activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_PACS_SAFE	X					0x0480 (PACS Prime)	5,2	0x00044	
	X					0x0481 (PACS Red.)	5,2	0x00044	
					X				DB_H_PL_SC_MODE_OBCP
DB_OBCP_H_PACS_BOLC_OFF	X					0x0480 (PACS Prime)	5,2	0x00055	
	X					0x0481 (PACS Red.)	5,2	0x00055	
DB_OBCP_H_PACS_POWER_CYCLE	X					0x0480 (PACS Prime)	5,2	0x00066	
	X					0x0481 (PACS Red.)	5,2	0x00066	
DB_OBCP_H_PACS_IMMEDIATE_OFF	X					0x0480 (PACS Prime)	5,2	0x000D13	
	X					0x0481 (PACS Red.)	5,2	0x000D13	
		X				0x0010 (CDMS)	5,x	0x0099153 (DLL)	
		X				0x0010 (CDMS)	5,x	0x00AC172 (TFL TC)	



OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
		X				0x0010 (CDMS)	5,x	0x00BA 186 (TFL TM)	
DB_OBCP_H_PACS_NORMAL_OFF	X					0x0480 (PACS Prime)	5,2	0x0019 25	
	X					0x0481 (PACS Red.)	5,2	0x0019 25	

Table 4.2.3-1 : List of PACS OBCP



#### 4.2.3.2 PACS OBCP Specification

##### 4.2.3.2.1 DB\_OBCP\_H\_PACS\_SAFE

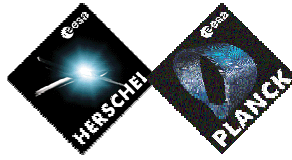
OBCP DB_OBCP_H_PACS_SAFE		
ID	DB_OBCP_H_PACS_SAFE	TBD
Triggered by	Event 0x0004 from PACS Nom. or Red.	Internal FDIR - GO SAFE
	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		TBD
Time-Out		60 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0004 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0004 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0004 (PACS Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None <sup>25</sup>	
Disable all commanding of PACS from the MTL  Stop all commanding from ground <sup>26</sup>		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>27</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> TBD (PACS command sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_META> TBD (PACS meta subschedule) - M = 0 ( All APID)  TBD Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100 <sub>b</sub> (Ground, low priority) - EOD = 0 <sub>b</sub> (Routing Disabled)
Send the TC to PACS which triggers the transition into PACS SAFE mode.		Send TC(18, 3) "Start Procedure" to SPIRE, with the following parameters: - Procedure-ID = 24 (Enter SAFE mode) - N1 = 0 (No parameter)
	Wait 10 TBD seconds (execution time of	Wait 10 TBD seconds

<sup>25</sup> TBD: it is assumed that even if a power cycling is in progress it is preferable to let it complete

<sup>26</sup> TBD: is this really necessary and in case should it be applied to all instruments?

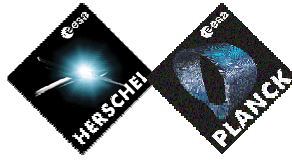
<sup>27</sup> According to [RD10]





	PACS SAFE mode TC)	
	<p>Enable EAT entries that triggered the current OBCP<sup>28</sup>:</p> <ul style="list-style-type: none"> <li>- 0x0004 from PACS (both Nom. and Red.)</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0480 / 0x0004 (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x0004 (PACS Red.)</li> </ul>

<sup>28</sup> TBC: This could be useful in case the current recovery did not succeed



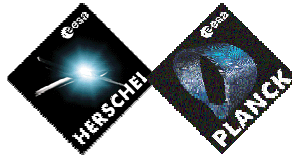
#### 4.2.3.2.2 DB\_OBCP\_H\_PACS\_BOLC\_OFF

OBCP DB_OBCP_H_PACS_BOLC_OFF		
ID	DB_OBCP_H_PACS_BOLC_OFF	TBD
Triggered by	Event 0x0005 from PACS Nom. or Red.	Internal FDIR - BOLC OFF
Type		TBD
Time-Out		60 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0005 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0005 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0005 (PACS Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None <sup>29</sup>	
Disable all commanding of PACS from the MTL  Stop all commanding from ground <sup>30</sup>		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>31</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (TBD) (PACS command sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_META> (TBD) (PACS meta subschedule) - M = 0 ( All APID)  (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100 <sub>b</sub> (Ground, low priority) - EOD = 0 <sub>b</sub> (Routing Disabled)
Send the TC to PACS which triggers the transition into PACS SAFE mode.		Send TC(18, 3) "Start Procedure" to SPIRE, with the following parameters: - Procedure-ID = 24 (Enter SAFE mode) - N1 = 0 (No parameter)
	Wait 10 (TBC) seconds (execution time of PACS SAFE mode TC)	Wait 10 (TBC) seconds
Switch OFF the 28V power for	OPEN LCL related to both nominal and	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following

<sup>29</sup> TBC: it is assumed that even if a power cycling is in progress it is preferable to let it complete

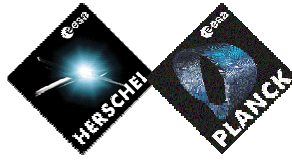
<sup>30</sup> TBC: is this really necessary and in case should it be applied to all instruments?

<sup>31</sup> According to [RD10]



the BOLC	redundant PACS BOLC	<p>parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)</li> </ul>
	Mark PACS BOLC Unit as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	<p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0309 (PACS BOLC)</li> </ul>
	<p>Enable EAT entries that triggered the current OBCP<sup>32</sup>:</p> <ul style="list-style-type: none"> <li>- 0x0005 from PACS (both Nom. and Red.)</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0480 / 0x0005 (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x0005 (PACS Red.)</li> </ul>

<sup>32</sup> TBC: This could be useful in case the current recovery did not succeed



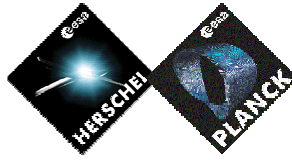
#### 4.2.3.2.3 DB\_OBCP\_H\_PACS\_POWER\_CYCLE

OBCP DB_OBCP_H_PACS_POWER_CYCLE		
ID	DB_OBCP_H_PACS_POWER_CYCLE	TBD
Triggered by	Event 0x0006 from PACS Nom. or Red.	Internal FDIR - POWER CYCLE
Type		TBD
Time-Out		900 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0006 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - None	
Disable all commanding of PACS from the MTL  Stop all commanding from ground <sup>33</sup>		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>34</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (TBD) (PACS command sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_META> (TBD) (PACS meta subschedule) - M = 0 ( All APID)  (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100 <sub>b</sub> (Ground, low priority) - EOD = 0 <sub>b</sub> (Routing Disabled)
Execute procedure "PACS Switch-OFF in a safe way"		/* See DB_OBCP_H_PACS_NORMAL_OFF */ <sup>35</sup>
Wait 20 seconds		Wait 20 seconds

<sup>33</sup> TBC: is this really necessary and in case should it be applied to all instruments?

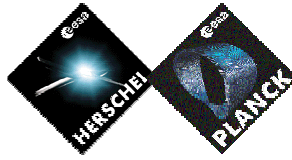
<sup>34</sup> According to [RD10]

<sup>35</sup> TBC: A sub OBCP could be defined and called by both DB\_OBCP\_H\_PACS\_NORMAL\_OFF & DB\_OBCP\_H\_PACS\_POWER\_CYCLE

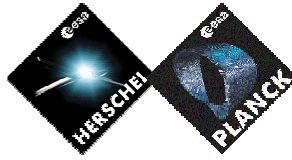


Execute procedure "PACS Switch-ON":		
	Declare the two PACS RT as ON <sup>36</sup>	<p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_A_VALUE&gt;</li> <li>- F0 / M0 = 1<sub>b</sub> / 1<sub>b</sub> (RTA ON)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_B_VALUE&gt;</li> <li>- F0 / M0 = 1<sub>b</sub> / 1<sub>b</sub> (RTA ON)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
		<pre> If (PL_Side == NOM) then {   LCL_SPU = 35;   LCL_BOLC = 27;   LCL_DEC_MEC = 29;   LCL_DPU = 41; } Else /* Redundant side */ {   LCL_SPU = 36;   LCL_BOLC = 28;   LCL_DEC_MEC = 30;   LCL_DPU = 42; } </pre>
Switch ON power supply for DPU	CLOSE LCL related to PACS DPU in use	<p>Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_DPU ;</li> </ul>
Wait 12 seconds		Wait 12 seconds
Wait 5 seconds (TEI jitter)		Wait 5 seconds
Force Boot DPU		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x70 (112 = <b>IBC</b>)</li> </ul>

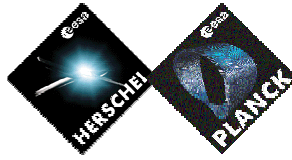
<sup>36</sup> In order to be able to send TC to PACS as it was declare as OFF by the Switch OFF procedure.



		<ul style="list-style-type: none"> <li>- Activity-ID = 0x03 (3 = TBC)</li> <li>- SID = 0x0000</li> </ul>
Wait 1 second		Wait 1 second
Switch ON power supply for DMC	CLOSE LCL related to PACS DEC-MEC in use	<p>Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_DEC_MEC;</li> </ul>
Wait 15 seconds		Wait 15 seconds
Wait 5 seconds (TEI jitter)		Wait 5 seconds
DPU reset of 1355		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x64 (100 = TBC)</li> <li>- Activity-ID = 0x0B (11 = TBC)</li> <li>- SID = 0x0000</li> </ul>
Establish DPU à DMC connection (DPU as master)		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0013 (19 = TBC)</li> <li>- N1 = 0x0002 (2 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0000</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0001</li> </ul>
Wait 4 seconds		Wait 4 seconds
Copy DMC SW from EEPROM to RAM		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- DMC_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- DMC_EEPROM_START_ADDR = 0x0000_0000</li> <li>- DMC_RAM_MEMORY_ID = 0x0000_0001</li> <li>- DMC_RAM_START_ADDR = 0x0000_6EE0</li> <li>- DMC_DATA_LENGTH_HLSW = 0x0000_4000</li> </ul> <p>Wait 2 seconds</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- DMC_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- DMC_EEPROM_START_ADDR = 0x0000_8000</li> <li>- DMC_RAM_MEMORY_ID = 0x0000_0001</li> <li>- DMC_RAM_START_ADDR = 0x0000_8000</li> <li>- DMC_DATA_LENGTH_HLSW = 0x0000_8000</li> </ul>
Wait 2 seconds		Wait 2 seconds
Start DMC HLSW		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0015 (21 = TBC)</li> <li>- N1 = 0x0003 (3 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0000</li> </ul>

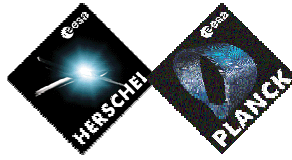


		<ul style="list-style-type: none"> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0001</li> <li>- OBCP-PID /Value = 0x0003 / 0x0000_8032</li> </ul>
Wait 10.5 seconds		Wait 10.5 seconds
Establish DPUà DMC (DPU as slave)		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0013 (19 = <b>TBC</b>)</li> <li>- N1 = 0x0002 (2 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0000</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0002</li> </ul>
Wait 3 seconds		Wait 3 seconds
Switch ON power supply for BOLC	CLOSE LCL related to PACS BOLC in use	<p>Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_BOLC;</li> </ul>
Wait 10 seconds		Wait 10 seconds
Wait 5 seconds (TEI jitter)		Wait 5 seconds
DMC_RESET_SMCS_CHIP_2		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = <b>TBC</b>)</li> <li>- Activity-ID = 0x59 (89 = <b>TBC</b>)</li> <li>- SID = 0x0000</li> </ul>
Wait 4 seconds		Wait 4 seconds
Execute BOLC initialisation including frequency setting		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x0A00_0035</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x0700_00FF</li> </ul> <p>Wait 0.5 second</p> <p>Wait 5 seconds</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x0B02_0020</li> </ul>

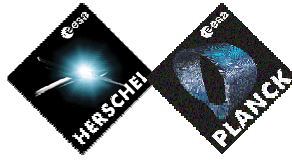


		Wait 0.5 second
Switch on power supply for SPU	CLOSE LCL related to PACS SPU in use	Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_SPU;
Wait 15 seconds		Wait 15 seconds
Wait 5 seconds (TEI jitter)		Wait 5 seconds
DPU reset of 1355		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x64 (100 = TBC) - Activity-ID = 0x0B (11 = TBC) - SID = 0x0000
Wait 4 seconds		Wait 4 seconds
Establish DPU à DMC (DPU as slave)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0000 - OBCP-PID /Value = 0x0002 / 0x0000_0002
Wait 10 seconds		Wait 10 seconds
Establish DPU à blue SPU links (DPU as master)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0001 - OBCP-PID /Value = 0x0002 / 0x0000_0001
Wait 4 seconds		Wait 4 seconds
Establish DPU à red SPU links (DPU as master)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0002 - OBCP-PID /Value = 0x0002 / 0x0000_0001
Wait 4 seconds		Wait 4 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM first chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x66 (102 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUL_EEPROM_MEMORY_ID = 0x0000_0003 - SPUL_EEPROM_START_ADDR = 0x0000_0100 - SPUL_RAM_MEMORY_ID = 0x0000_0001 - SPUL_RAM_START_ADDR = 0x0000_0100 - SPUL_DATA_LENGTH_HLSW = 0x0000_01E0

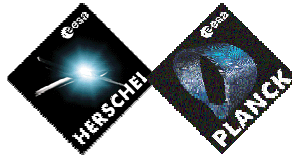




Wait 2 seconds		Wait 2 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM second chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x66 (102 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- SPUL_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- SPUL_EEPROM_START_ADDR = 0x0000_0300</li> <li>- SPUL_RAM_MEMORY_ID = 0x0000_0001</li> <li>- SPUL_RAM_START_ADDR = 0x0000_0300</li> <li>- SPUL_DATA_LENGTH_HLSW = 0x0000_0700</li> </ul>
Wait 2 seconds		Wait 2 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM third chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x66 (102 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- SPUL_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- SPUL_EEPROM_START_ADDR = 0x0000_0A00</li> <li>- SPUL_RAM_MEMORY_ID = 0x0000_0001</li> <li>- SPUL_RAM_START_ADDR = 0x0000_0A00</li> <li>- SPUL_DATA_LENGTH_HLSW = 0x0000_A600</li> </ul>
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM first chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x65 (101 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- SPUS_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- SPUS_EEPROM_START_ADDR = 0x0000_0100</li> <li>- SPUS_RAM_MEMORY_ID = 0x0000_0001</li> <li>- SPUS_RAM_START_ADDR = 0x0000_0100</li> <li>- SPUS_DATA_LENGTH_HLSW = 0x0000_01E0</li> </ul>
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM second chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x65 (101 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- SPUS_EEPROM_MEMORY_ID = 0x0000_0003</li> <li>- SPUS_EEPROM_START_ADDR = 0x0000_0300</li> <li>- SPUS_RAM_MEMORY_ID = 0x0000_0001</li> <li>- SPUS_RAM_START_ADDR = 0x0000_0300</li> <li>- SPUS_DATA_LENGTH_HLSW = 0x0000_0700</li> </ul>
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM third chunk		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x65 (101 = TBC)</li> <li>- Activity-ID = 0x65 (101 = TBC)</li> <li>- SID = 0x0005</li> <li>- SPUS_EEPROM_MEMORY_ID = 0x0000_0003</li> </ul>

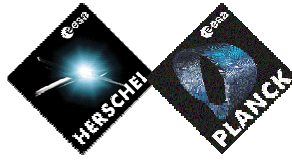


		<ul style="list-style-type: none"> <li>- SPUS_EEPROM_START_ADDR = 0x0000_0A00</li> <li>- SPUS_RAM_MEMORY_ID = 0x0000_0001</li> <li>- SPUS_RAM_START_ADDR = 0x0000_0A00</li> <li>- SPUS_DATA_LENGTH_HLSW = 0x0000_A600</li> </ul>
Wait 4 seconds		Wait 4 seconds
Start SPUS HLSW		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0015 (21 = <b>TBC</b>)</li> <li>- N1 = 0x0003 (3 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0001</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0001</li> <li>- OBCP-PID /Value = 0x0003 / 0x0000_0A02</li> </ul>
Wait 3 seconds		Wait 3 seconds
Establish DPU à blue SPU links (DPU as slave)		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0013 (19 = <b>TBC</b>)</li> <li>- N1 = 0x0002 (2 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0001</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0002</li> </ul>
Wait 4 seconds		Wait 4 seconds
Start SPUL HLSW		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0015 (21 = <b>TBC</b>)</li> <li>- N1 = 0x0003 (3 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0002</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0001</li> <li>- OBCP-PID /Value = 0x0003 / 0x0000_0A02</li> </ul>
Wait 3 seconds		Wait 3 seconds
Establish DPU à red SPU links (DPU as slave)		<p>Send TC(18,3) "Start Procedure" to PACS with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure ID = 0x0013 (19 = <b>TBC</b>)</li> <li>- N1 = 0x0002 (2 parameters)</li> <li>- OBCP-PID /Value = 0x0001 / 0x0000_0002</li> <li>- OBCP-PID /Value = 0x0002 / 0x0000_0002</li> </ul>
Wait 5 seconds		Wait 5 seconds
Establish connection SPUL-DMC, DMC as master		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x66 (102 = <b>TBC</b>)</li> <li>- Activity-ID = 0x10 (16 = <b>TBC</b>)</li> <li>- SID = 0x0001</li> <li>- SPUL_MASTER_OR_SLAVE = 0x0000_0022</li> </ul>
Wait 1 second		Wait 1 second
Establish connection SPUS-DMC, DMC as master		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x65 (101 = <b>TBC</b>)</li> </ul>

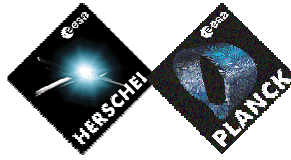


		<ul style="list-style-type: none"> <li>- Activity-ID = 0x10 (16 = TBC)</li> <li>- SID = 0x0001</li> <li>- SPUS_MASTER_OR_SLAVE = 0x0000_0022</li> </ul>
Wait 2 seconds		Wait 2 seconds
Establish connection DMC-SPURS DMC Master		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = TBC)</li> <li>- Activity-ID = 0x57 (87 = TBC)</li> <li>- SID = 0x0001</li> <li>- DMC_MASTER_OR_SLAVE = 0x0000_0001</li> </ul>
Wait 1 second		Wait 1 second
Establish connection DMC-SPURL DMC Master		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = TBC)</li> <li>- Activity-ID = 0x56 (86 = TBC)</li> <li>- SID = 0x0001</li> <li>- DMC_MASTER_OR_SLAVE = 0x0000_0001</li> </ul>
Wait 2 seconds		Wait 2 seconds
DMC_SWON_TEMP_SENSORS		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = TBC)</li> <li>- Activity-ID = 0x5F (95 = TBC)</li> <li>- SID = 0x0000</li> </ul>
Wait 0.5 second		Wait 0.5 second
putlog "FPU T-sensors are activated"		<p>Issue a TM(5,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;PACS_FPU_TSENSORS_ON_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000<sup>37</sup></li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
	<p>Mark PACS Units as ON in order to inform the Thermal Control Management function that ON thresholds have to be used.</p>	<p>Send TC(8,4,116,26) "Mark Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0309 (PACS BOLC)</li> </ul> <p>Send TC(8,4,116,26) "Mark Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030A (PACS DEC-MEC)</li> </ul> <p>Send TC(8,4,116,26) "Mark Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030B (PACS DPU/SPU)</li> </ul>
End of procedure "PACS Switch-ON"		

<sup>37</sup> TBC: There could be 2 different values depending on PI\_Side



	Enable EAT entries that triggered the current OBCP: <ul style="list-style-type: none"><li>- 0x0006 from PACS Nom &amp; Red.</li></ul>	Send TC(19,4) "Enable Actions" with the following parameters: <ul style="list-style-type: none"><li>- N = 0x0002 (5 entries)</li><li>- APID / Event ID = 0x0480 / 0x0006 (PACS Nom.)</li><li>- APID / Event ID = 0x0481 / 0x0006 (PACS Red.)</li></ul>
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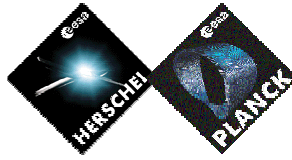


#### 4.2.3.2.4 DB\_OBCP\_H\_PACS\_IMMEDIATE\_OFF

OBCP DB_OBCP_H_PACS_IMMEDIATE_OFF		
ID	DB_OBCP_H_PACS_IMMEDIATE_OFF	TBD
Triggered by	Event 0x000D from PACS Nom. or Red.	Internal FDIR - NORMAL OFF
	Event 0x0099 from CDMS	DLL FDIR
	Event 0x00AC from CDMS	TFL TC FDIR
	Event 0x00BA from CDMS	TFL TM FDIR
Type		TBD
Time-Out		180 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	<p>Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. :</p> <ul style="list-style-type: none"> <li>- 0x000D from PACS Nom &amp; Red. as they trigger the current OBCP</li> <li>- 0x0099, 0x00AC, 0x00BA from CDMS as they trigger the current OBCP</li> <li>- 0x0006 from PACS Nom &amp; Red. As they would be switched ON PACS.</li> </ul>	<p>Send TC(19,5) "Disable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0007 (7 entries)</li> <li>- APID / Event ID = 0x0480 / 0x000D (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x000D (PACS Red.)</li> <li>- APID / Event ID = 0x0010 / 0x0099 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AC (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00BA (CDMS TFL TM FDIR)</li> <li>- APID / Event ID = 0x0480 / 0x0006 (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x0006 (PACS Red.)</li> <li>-</li> </ul>
	<p>Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:</p> <ul style="list-style-type: none"> <li>- DB_OBCP_H_PACS_POWER_CYCLE as it would be switched ON PACS</li> </ul>	<p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_H_PACS_POWER_CYCLE</li> </ul>
<p>Disable all commanding of PACS from the MTL</p> <p>Stop all commanding from ground<sup>38</sup></p>		<p>Send TC(11,2) "Disable Release of Telecommands" with the following parameters:<sup>39</sup></p> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;PACS_SUBS_ID_CMD&gt; (TBD) (PACS command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;PACS_SUBS_ID_META&gt; (TBD) (PACS meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul> <p>(TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters:</p> <ul style="list-style-type: none"> <li>- TC_APID = 0x0480 (PACS)</li> <li>- TC_SRC = 100<sub>b</sub> (Ground, low priority)</li> <li>- EOD = 0<sub>b</sub> (Routing Disabled)</li> </ul>
	Declare the two PACS RT as OFF <sup>40</sup>	

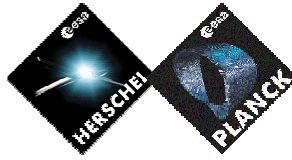
<sup>38</sup> TBC: is this really necessary and in case should it be applied to all instruments?

<sup>39</sup> According to [RD10]



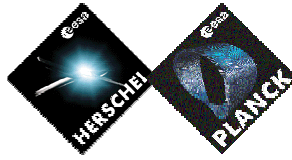
		<p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
<p>Switch OFF the 28V power for the FPSPU</p>	<p>OPEN LCL related to both nominal and redundant PACS SPU</p>	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0023 (LCL 35 = PACS SPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0024 (LCL 36 = PACS SPU Red.)</li> </ul>
<p>Switch OFF the 28V power for the FPBOLC</p>	<p>OPEN LCL related to both nominal and redundant PACS BOLC</p>	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)</li> </ul>
<p>Switch OFF the 28V power for the FPDMC</p>	<p>OPEN LCL related to both nominal and redundant PACS DEC-MEC</p>	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001D (LCL 29 = PACS DEC-MEC 1)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001E (LCL 30 = PACS DEC-MEC 2)</li> </ul>

<sup>40</sup> This will avoid to trigger any S/C 1553B bus FDIR related to PACS when it is OFF



<p>Switch OFF the 28V power for the FPDPU</p>	<p>OPEN LCL related to both nominal and redundant PACS DPU</p>	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0029 (LCL 41 = PACS DPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x002A (LCL 42 = PACS DPU Red.)</li> </ul>
	<p>Mark PACS Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.</p>	<p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0309 (PACS BOLC)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030A (PACS DEC-MEC)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030B (PACS DPU/SPU)</li> </ul>
	<p>Enable EAT entries that triggered the current OBCP<sup>41</sup>:</p> <ul style="list-style-type: none"> <li>- 0x000D from PACS Nom &amp; Red.</li> <li>- 0x0099, 0x00AC, 0x00BA from CDMS</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0005 (5 entries)</li> <li>- APID / Event ID = 0x0480 / 0x000D (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x000D (PACS Red.)</li> <li>- APID / Event ID = 0x0010 / 0x0099 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AC (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00BA (CDMS TFL TM FDIR)</li> </ul>

<sup>41</sup> TBC: This could be useful in case the current recovery did not succeed



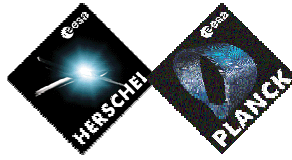
#### 4.2.3.2.5 DB\_OBCP\_H\_PACS\_NORMAL\_OFF

OBCP DB_OBCP_H_PACS_NORMAL_OFF		
ID	DB_OBCP_H_PACS_NORMAL_OFF	TBD
Triggered by	Event 0x0019 from PACS Nom. or Red.	Internal FDIR - NORMAL OFF
Type		TBD
Time-Out		300 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0019 from PACS Nom & Red. as they trigger the current OBCP - 0x0006 from PACS Nom & Red. As they would be switched ON PACS.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0004 (4 entries) - APID / Event ID = 0x0480 / 0x0019 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0019 (PACS Red.) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.) -
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution:  - DB_OBCP_H_PACS_POWER_CYCLE as it would be switched ON PACS	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_PACS_POWER_CYCLE
Disable all commanding of PACS from the MTL  Stop all commanding from ground <sup>42</sup>		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>43</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (TBD) (PACS command sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_META> (TBD) (PACS meta subschedule) - M = 0 (All APID)  (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100 <sub>b</sub> (Ground, low priority) - EOD = 0 <sub>b</sub> (Routing Disabled)
Execute procedure "PACS Switch-OFF in a safe way":		
- Set all groups bol bias 02 (VL) to 0.000 volt		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001

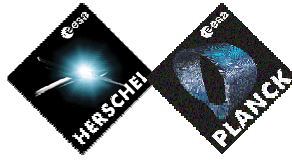
<sup>42</sup> TBC: is this really necessary and in case should it be applied to all instruments?

<sup>43</sup> According to [RD10]

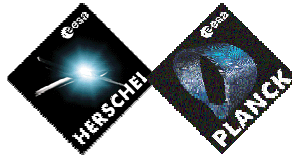




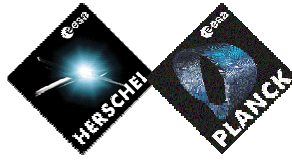
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 05 (VCH) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 01 (VH) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 03 (VRL) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 04 (VINJ) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 06 (VDL) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 08 (VGL) to 0.000 volt</li> <li>- Wait 0.5 second</li> </ul>		<ul style="list-style-type: none"> <li>- COMMAND = 0x00020000</li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00050000</li> </ul> </li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00010000</li> </ul> </li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00030000</li> </ul> </li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00040000</li> </ul> </li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00060000</li> </ul> </li> <li>Wait 0.5 second</li> <li>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00080000</li> </ul> </li> <li>Wait 0.5 second</li> </ul>
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<ul style="list-style-type: none"> <li>- Set all groups bol bias 07 (VSS) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00070000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 16 (VDD) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00100000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 15 (VGG) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000F0000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 09 (CKRLH) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00090000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 10 (CKRLI) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000A0000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 11 (VDECX-H) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000B0000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>
<ul style="list-style-type: none"> <li>- Set all groups bol bias 12 (VDECX-L) to 0.000 volt</li> </ul>		<p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000C0000</li> </ul>
<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> </ul>		<p>Wait 0.5 second</p>

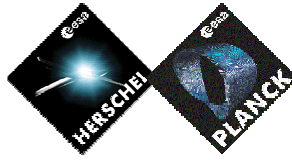


<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 13 (VSMS-H) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 14 (VSMS-L) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 18 (VDL-BU) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 20 (VH-BLIND) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 19 (VGL-BU) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 17 (VSS-BU) to 0.000 volt</li> <li>- Wait 0.5 second</li> <li>- Wait 1.0 second</li> <li>- Set all groups bol bias 21 (VDD-PROT-CL) OFF</li> </ul>		<p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000D0000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x000E0000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00120000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00140000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00130000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00110000</li> </ul> <p>Wait 0.5 second</p> <p>Wait 1.0 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> </ul>
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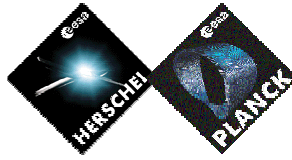


<ul style="list-style-type: none"> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 22 (VDD-PROT-BU) OFF</li> <li>- Wait 0.5 second</li> <li>- Set all groups bol bias 23 (GND-BU) OFF</li> <li>- Wait 0.5 second</li> <li>- Putlog « BOL biases are set to 0 »</li> <li>- Set temperature probes OFF</li> <li>- Wait 0.5 second</li> <li>- Set all groups to OFF</li> <li>- Wait 3.0 seconds</li> </ul>		<ul style="list-style-type: none"> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00150000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00160000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x00170000</li> </ul> <p>Wait 0.5 second</p> <p>Issue a TM(5, 1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;PACS_BOL_BIAS_RESET_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x07000000</li> </ul> <p>Wait 0.5 second</p> <p>Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x67 (103 = DEC sub-system)</li> <li>- Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC)</li> <li>- SID = 0x0001</li> <li>- COMMAND = 0x0A000000</li> </ul> <p>Wait 3.0 seconds</p>
	<p>Declare the two PACS RT as OFF<sup>44</sup></p>	<p>Send TC(8, 4, 10, 1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

<sup>44</sup> This will avoid to trigger any S/C 1553B bus FDIR related to PACS when it is OFF

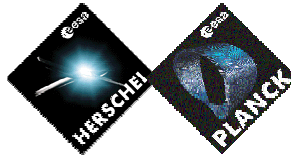


		<ul style="list-style-type: none"> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_PACS_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Switch OFF the 28V power for the FPSPU	OPEN LCL related to both nominal and redundant PACS SPU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0023 (LCL 35 = PACS SPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0024 (LCL 36 = PACS SPU Red.)</li> </ul>
Switch OFF the 28V power for the FPBOLC	OPEN LCL related to both nominal and redundant PACS BOLC	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)</li> </ul>
Switch OFF the 28V power for the FPDMC	OPEN LCL related to both nominal and redundant PACS DEC-MEC	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001D (LCL 29 = PACS DEC-MEC 1)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x001E (LCL 30 = PACS DEC-MEC 2)</li> </ul>
Switch OFF the 28V power for the FPDPU	OPEN LCL related to both nominal and redundant PACS DPU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0029 (LCL 41 = PACS DPU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x002A (LCL 42 = PACS DPU Red.)</li> </ul>
	Mark PACS Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	<p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0309 (PACS BOLC)</li> </ul>



		<p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030A (PACS DEC-MEC)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030B (PACS DPU/SPU)</li> </ul>
Putlog « PACS is OFF »		<p>Issue a TM(5,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;PACS_OFF_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
End of procedure "PACS Switch-OFF in a safe way"		
	<p>Enable EAT entries that triggered the current OBCP<sup>45</sup>:</p> <ul style="list-style-type: none"> <li>- 0x0019 from PACS Nom &amp; Red.</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002 (2 entries)</li> <li>- APID / Event ID = 0x0480 / 0x0019 (PACS Nom.)</li> <li>- APID / Event ID = 0x0481 / 0x0019 (PACS Red.)</li> </ul>

<sup>45</sup> TBC: This could be useful in case the current recovery did not succeed



### 4.3 HIFI

#### 4.3.1 HIFI FDIR

##### 4.3.1.1 HIFI internal FDIR

According to [RD5], HIFI requests no support from the CDMS OBSW to complete a recovery activity related to any internal failure.

##### 4.3.1.2 HIFI S/C FDIR

###### 4.3.1.2.1 HIFI S/C 1553B Bus FDIR

The following table summarises what HIFI requests to be done by the CDMS OBSW in case a S/C 1553B Bus FDIR related to the communication with HIFI triggers.

Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

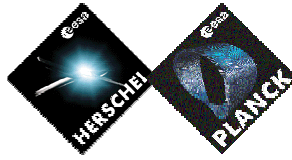
FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	151	Reset HIFI	DB_OBCP_H_HIFI_RESET
TFL TC FDIR	5,x	170	Reset HIFI	DB_OBCP_H_HIFI_RESET
TFL TM FDIR	5,x	184	Reset HIFI	DB_OBCP_H_HIFI_RESET

Table 4.3.1-1 : HIFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support PACS S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	151 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	170 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	184 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.3.1-2 : EAT for HIFI S/C 1553B Bus FDIR



#### 4.3.1.2.2 HIFI Science Data Monitoring

**TBW**

#### 4.3.1.2.3 HIFI Class B Heater Loop FDIR

HIFI is thermally controlled with Class B control loops.

However, in case of failure, HIFI do not request any action to be done other than generated an event to be informed of this failure case that may impact the accuracy of their measurements. This need is already covered by the generation of the TM(5,4,114,5).

Consequently, no additional OBCP is needed (see 3.1.2.3).

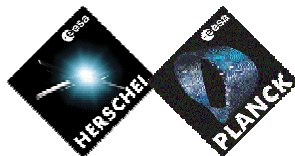
#### 4.3.2 HIFI S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, HIFI will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP. This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Put HIFI in STANDBY Mode	DB_OBCP_H_HIFI_STANDBY	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_H_PL_SC_SM_OBCP

Table 4.3.2-1 : HIFI OBCP vs. S/C Mode transition





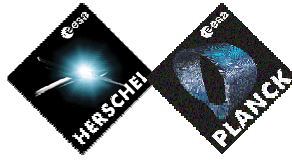
### 4.3.3 HIFI OBCP

#### 4.3.3.1 List of HIFI OBCP

According to sections 4.3.1 and 4.3.2, the following OBCP are needed to support HIFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_HIFI_RESET		X				0x0010 (CDMS)	5,x	0x0097 151 (DLL)	
		X				0x0010 (CDMS)	5,x	0x00AA 170 (TFL TC)	
		X				0x0010 (CDMS)	5,x	0x00B8 184 (TFL TM)	
DB_OBCP_H_HIFI_STANDBY					X				DB_H_PL_SC_MODE_OBCP

Table 4.3.3-1 : List of HIFI OBCP



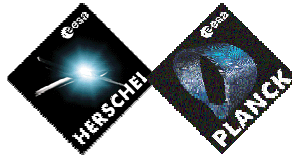
### 4.3.3.2 HIFI OBCP Specification

#### 4.3.3.2.1 DB\_OBCP\_H\_HIFI\_RESET

OBCP DB_OBCP_H_HIFI_RESET		
ID	DB_OBCP_H_HIFI_RESET	TBD
Triggered by	Event 0x0097 from CDMS	DLL FDIR
	Event 0x00AA from CDMS	TFL TC FDIR
	Event 0x00B8 from CDMS	TFL TM FDIR
Type		TBD
Time-Out		300 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HIFI related events that could contradict or interfere with current OBCP execution, i.e. : <ul style="list-style-type: none"> <li>- 0x0097, 0x00AA, 0x00B8 from CDMS as they trigger the current OBCP</li> </ul>	Send TC(19,5) "Disable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0003 (3 entries)</li> <li>- APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)</li> </ul>
	Stop execution of all running HIFI OBCP that could contradict or interfere with current OBCP execution: <ul style="list-style-type: none"> <li>- None<sup>46</sup></li> </ul>	
Disable timeline		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>47</sup> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_CMD&gt; TBD (HIFI command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_META&gt; TBD (HIFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
	Declare HIFI RT (Nom. and Red.) as Well_TM, Well_TC and Valid in order to be able to send TC and receive TM, and to check later on if anomaly is still present	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HIFI_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TC)</li> <li>- F3 / M3 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TM)</li> <li>- F4 / M4 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Valid)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

<sup>46</sup> TBD: it is assumed that a request to go to standby mode would not interfere with the reset procedure.

<sup>47</sup> According to [RD10]

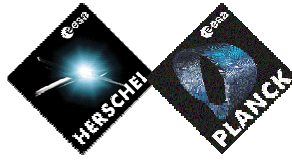


		<ul style="list-style-type: none"> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HIFI_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TC)</li> <li>- F3 / M3 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TM)</li> <li>- F4 / M4 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Valid)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Send the HIFI_goto_safe telecommand (which will or will not arrive)		<p>Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0xXX (TBD) = HIFI_Reset)</li> <li>- Activity-ID = 0xXX (TBD)</li> <li>- SID = 0xXXXX (TBD)<sup>48</sup></li> </ul>
Send the HIFI_reset telecommand (which will or will not arrive)		<p>Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function-ID = 0x11 (17 = HIFI_Goto_safe)</li> <li>- Activity-ID = 0x00</li> <li>- SID = 0x0000 (TBC)<sup>49</sup></li> </ul>
Issue an appropriate event		<p>Issue a TM(5,4) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;HIFI_SOFT_RESET_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
Check if the anomaly is still there		<p>Wait (TBD) seconds</p> <p>If HIFI RT is declared Sick_TC or Sick_TM or Invalid<sup>50</sup> then anomaly is still there.</p>
In case of no anomaly : enable timeline at the next observation		<p>If there is no anomaly (i.e. HIFI RT Well_TC &amp; Well_TM &amp; Valid) then</p> <pre>{ /* Enable EAT entries that triggered the current OBCP */ Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0003 (3 entries) - APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)  /* Re-enable telecommands from the MTL to the instrument at the start of the next subschedule */ Send TC(11,1) "Enable Release of Telecommands" with the</pre>

<sup>48</sup> TBD: [AD4] does not specify any SID though it is mandatory according to [AD1]

<sup>49</sup> TBD: [AD4] does not specify any FID/AID/SID associated with HIFI\_reset TC

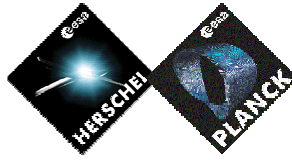
<sup>50</sup> The information can be extracted from DID\_BSW\_SDB\_RTA\_CFG\_HIFI\_A and DID\_BSW\_SDB\_RTA\_CFG\_HIFI\_B



		<p>following parameters:</p> <ul style="list-style-type: none"> <li>- N = 1 (One sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_META&gt; (TBD) (HIFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul> <p>}</p>
In case of anomaly proceed as follows:		<p>Else /* 1 */</p> <p>{</p>
Issue an appropriate event		<p>Issue a TM(5,4) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;HIFI_HARD_RESET_EID&gt; (TBD)</li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
Power off ICU	OPEN LCL related to both nominal and redundant HIFI ICU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0040 (LCL 64 = HIFI ICU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0044 (LCL 68 = HIFI ICU Red.)</li> </ul>
Wait 1 second		Wait 1 second
Power on ICU	CLOSE LCL related to HIFI ICU in-use	<p>If HIFI_ICU_In_Use<sup>51</sup> = NOM then HIFI_ICU_LCL = 64;</p> <p>Else HIFI_ICU_LCL = 68;</p> <p>Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xFFFF where XXXX = HIFI_ICU_LCL</li> </ul>
	Declare HIFI RT (Nom. and Red.) as Well_TM, Well_TC and Valid in order to be able to send TC and receive TM, and to check later on if anomaly is still present	<p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HIFI_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TC)</li> <li>- F3 / M3 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TM)</li> <li>- F4 / M4 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Valid)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

<sup>51</sup> HIFI\_ICU\_In\_Use can be determined either:

- by inspecting the Parameter\_A field of the event report that triggered the OBCP (in case parameter passing has to be activated)
- by reading which LCL is CLOSED before switching OFF the ICU
- by passing the information in the EAT



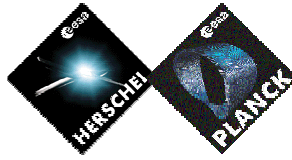
		<ul style="list-style-type: none"> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HIFI_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TC)</li> <li>- F3 / M3 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TM)</li> <li>- F4 / M4 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Valid)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Assume that it boots automatically or issue force-boot command <sup>52</sup>		<b>TBC</b>
Check if the anomaly is still there		<p>Wait <b>TBD</b> seconds<sup>53</sup></p> <p>If HIFI RT is declared Sick_TC or Sick_TM or Invalid<sup>54</sup> then anomaly is still there.</p>
In case of no anomaly : enable timeline at the next observation		<p>If there is no anomaly (i.e. HIFI RT Well_TC &amp; Well_TM &amp; Valid) then</p> <pre>{     /* Enable EAT entries that triggered the current OBCP */     Send TC(19,4) "Enable Actions" with the following     parameters:     - N = 0x0003 (3 entries)     - APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR)     - APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR)     - APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)      /* Re-enable telecommands from the MTL to the     instrument at the start of the next subschedule */     Send TC(11,1) "Enable Release of Telecommands" with     the following parameters:     - N = 1 (One sub-schedules)     - SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_META&gt; (<b>TBD</b>)     (HIFI meta subschedule)     - M = 0 ( All APID) }</pre>
In case of anomaly proceed as follows:		Else /* 2 */ {
	Declare the two HIFI RT as OFF <sup>55</sup>	<p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HIFI_A_VALUE&gt;</li> </ul>

<sup>52</sup> TBC: HIFI shall clarify if force-boot command has to be sent.

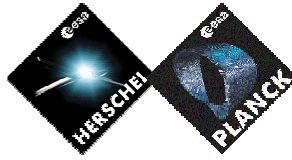
<sup>53</sup> TBC: In case no force boot command is sent, one dummy command as to be sent to HIFI to check that communication is OK

<sup>54</sup> The information can be extracted from DID\_BSW\_SDB\_RTA\_CFG\_HIFI\_A and DID\_BSW\_SDB\_RTA\_CFG\_HIFI\_B

<sup>55</sup> This will avoid to trigger any S/C 1553B bus FDIR related to HIFI when it is OFF



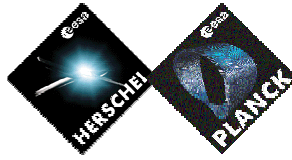
		<ul style="list-style-type: none"> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RT_A_HIFI_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
Issue an appropriate event		<p>Issue a TM(5,4) with the following parameters:</p> <ul style="list-style-type: none"> <li>- Event ID = &lt;HIFI_OFF_EID&gt; <b>(TBD)</b></li> <li>- SID = 0x0000</li> <li>- Parameters A = 0x0000_0000_0000_0000</li> <li>- Event Sequence Counter = Generated autonomously by the CDMU OBSW</li> <li>- Parameters B = None</li> </ul>
Switch off WBS-H, WBS-V	OPEN LCL related to HIFI WEH & WEV	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x002B (LCL 43 = HIFI WEH)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x002C (LCL 44 = HIFI WEV)</li> </ul>
Switch off HRS-H, HRS-V	OPEN LCL related to HIFI HRH & HRV	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x003F (LCL 63 = HIFI HRH)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0043 (LCL 67 = HIFI HRV)</li> </ul>
Switch off LCU	OPEN LCL related to both nominal and redundant HIFI LCU	<p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0035 (LCL 53 = HIFI LCU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0036 (LCL 54 = HIFI LCU Red.)</li> </ul>
Switch off ICU	OPEN LCL related to both nominal and	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with



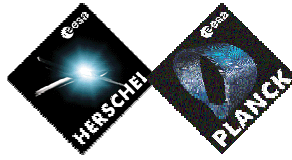
	<p>redundant HIFI ICU</p>	<p>the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0040 (LCL 64 = HIFI ICU Nom.)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0044 (LCL 68 = HIFI ICU Red.)</li> </ul>
	<p>Mark HIFI Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.<sup>56</sup></p>	<p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030C (HIFI WOV)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030D (HIFI HRV)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030E (HIFI WEV)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x030F (HIFI WOH)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0310 (HIFI WEH)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0311 (HIFI HRH)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0312 (HIFI LCU)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0313 (HIFI IFV)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0314 (HIFI LSU)</li> </ul> <p>Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- Status Unit ID = 0x0315 (HIFI FCU)</li> </ul>
	<p>Enable EAT entries that triggered the current OBCP<sup>57</sup>:</p> <ul style="list-style-type: none"> <li>- 0x000D from PACS Nom &amp; Red.</li> <li>- 0x0099, 0x00AC, 0x00BA from CDMS</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0003 (3 entries)</li> <li>- APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)</li> </ul>
		<p>} /* End Else 2 */</p>
		<p>} /* End Else 1 */</p>

<sup>56</sup> TBC: some of these units might be passive or still powered and in this case shall not be marked as OFF. This has to be clarified.

<sup>57</sup> TBC: This could be useful in case the current recovery did not succeed.







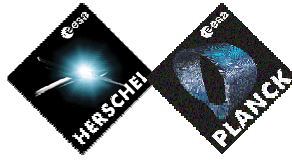
#### 4.3.3.2.2 DB\_OBCP\_H\_HIFI\_STANDBY

OBCP DB_OBCP_H_HIFI_STANDBY		
ID	DB_OBCP_H_HIFI_STANDBY	TBD
Triggered by	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HIFI related events that could contradict or interfere with current OBCP execution, i.e. :  - None	
	Stop execution of all running HIFI OBCP that could contradict or interfere with current OBCP execution:  - None <sup>58</sup>	
	(TBC) Disable all commanding of HIFI from the MTL	Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>59</sup> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_CMD&gt; (TBD) (HIFI command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;HIFI_SUBS_ID_META&gt; (TBD) (HIFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
Send the TC to HIFI which triggers the transition into HIFI STANDBY mode.		Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters: <ul style="list-style-type: none"> <li>- Function-ID = 0x0C (12 = Configure sub-system)</li> <li>- Activity-ID = 0x1A (26 = HIFI_HL_STANDBY)</li> <li>- SID = 0x0000</li> <li>- Building Block-ID = 0XXXXXXXX (TBD)</li> <li>- LS-CMD = 0xF00FOFF (HL_STANDBY)</li> </ul>
	Enable EAT entries that triggered the current OBCP <sup>60</sup> : - None	

<sup>58</sup> TBC: it is assumed that a request to reset should execute even if HIFI is requested to go to standby.

<sup>59</sup> According to [RD10]

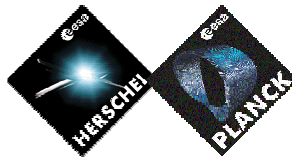
<sup>60</sup> TBC: This could be useful in case the current recovery did not succeed.



#### 4.4 Common HERSCHEL OBCP

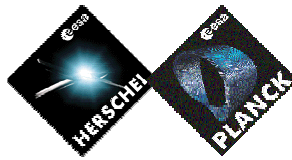
##### 4.4.1 DB\_H\_PL\_SC\_MODE\_OBCP

OBCP DB_H_PL_SC_MODE_OBCP		
ID	DB_H_PL_SC_MODE_OBCP	TBD
Triggered by	S/C mode transition to EAM or SAM	
Type		TBD
Time-Out		30 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
SPIRE : Put SPIRE in STANDBY Mode	Start OBCP DB_OBCP_H_SPIRE_STANDBY	Send TC(18,3) "Start Procedure" with the following parameters: - Procedure ID = 0XXXXX where XXXX = DB_OBCP_H_SPIRE_STANDBY - N1 = 0 (No parameter)
PACS: Put PACS in SAFE Mode	Start OBCP DB_OBCP_H_PACS_SAFE	Send TC(18,3) "Start Procedure" with the following parameters: - Procedure ID = 0XXXXX where XXXX = DB_OBCP_H_PACS_SAFE - N1 = 0 (No parameter)
HIFI: Put HIFI in STANDBY Mode	Start OBCP DB_OBCP_H_HIFI_STANDBY	Send TC(18,3) "Start Procedure" with the following parameters: - Procedure ID = 0XXXXX where XXXX = DB_OBCP_H_HIFI_STANDBY - N1 = 0 (No parameter)



#### 4.4.2 DB\_H\_PL\_SC\_SM\_OBCP

OBCP DB_H_PL_SC_SM_OBCP		
ID	DB_H_PL_SC_SM_OBCP	TBD
Triggered by	S/C mode transition to SM	
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
SPIRE : Do nothing		
PACS: Do nothing		
HIFI: Do nothing		



## 5. PLANCK

### 5.1 HFI

#### 5.1.1 HFI FDIR

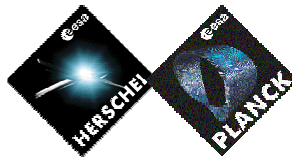
##### 5.1.1.1 HFI internal FDIR

According to [RD6], HFI generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity. Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
FDIR5-0 (REU FPGA synchronisation failure)	5,2	128 (EVENT_REU_FPGA_ERROR_ON)	Isolate two of the 12 analogue belts which produces a de-synchronisation (i.e. bad data transmission) with the REU processor belt	DB_OBCP_P_HFI_REU_RESYNCH
FDIR5-2 (Loss of DPU-REU communication)	5,2	130 (EVENT_NEED_REU_RESTART_ON)	Restart the REU	DB_OBCP_P_HFI_REU_RESTART
FDIR5-3 (Loss of DPU-4KCDE communication)	5,2	132 (EVENT_NEED_4KCDE_RESTART_ON)	Restart the 4KCDE	DB_OBCP_P_HFI_4KCDE_RESTART
FDIR5-4 (Loss of DPU-DCE communication)	5,2	134 (EVENT_NEED_DCE_RESTART_ON)	Restart the DCE	DB_OBCP_P_HFI_DCE_RESTART

Table 5.1.1-1 : HFI internal FDIR Event Reports

Note that FDIR5-1 deals with S/C 1553B Bus FDIR and as such is treated in section 5.1.1.2.1.



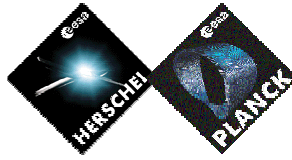
From the previous table, one can define the following EAT entries to support HFI Internal FDIR.

Note that HFI Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0580 for HFI Prime
- 0x0581 for HFI Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0580 (HFI Prime)	128 (EVENT_REU_FPGA_ERROR_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_REU_RESYNCH N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0581 (HFI Red.)	128 (EVENT_REU_FPGA_ERROR_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_REU_RESYNCH N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0580 (HFI Prime)	130 (EVENT_NEED_REU_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_REU_RESTART N1=0x0001 OBCP-PID= 0xXXXX = <HFI_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <HFI_PL_SIDE_NOM> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0581 (HFI Red.)	130 (EVENT_NEED_REU_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_REU_RESTART N1=0x0001 OBCP-PID= 0xXXXX = <HFI_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <HFI_PL_SIDE_RED> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0580 (HFI Prime)	132 (EVENT_NEED_4KCDE_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_4KCDE_RESTART N1=0x0001 OBCP-PID= 0xXXXX = <HFI_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <HFI_PL_SIDE_NOM> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0581 (HFI Red.)	132 (EVENT_NEED_4KCDE_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_4KCDE_RESTART N1=0x0001 OBCP-PID= 0xXXXX = <HFI_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <HFI_PL_SIDE_RED> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0580 (HFI Prime)	134 (EVENT_NEED_DCE_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_DCE_RESTART N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0581 (HFI Red.)	134 (EVENT_NEED_DCE_RESTART_ON)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_DCE_RESTART N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 5.1.1-2 : EAT for HFI Internal FDIR

### 5.1.1.2 HFI S/C FDIR

#### 5.1.1.2.1 HFI S/C 1553B Bus FDIR

The following table summarises what HFI requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with HFI triggers (see FDIR2 & FDIR5-1 in [RD6]). Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	154	Switch Off ME, REU processor and REU analogue belts (FDIR2-1) <sup>61</sup>	DB_OBCP_P_HFI_OFF
TFL TC FDIR	5,x	173	Do nothing (FDIR2-2)	None <sup>62</sup>
TFL TM FDIR	5,x	187	Reset the ME (FDIR2-3 = FDIR5-1)	DB_OBCP_P_HFI_DPU_RESTART

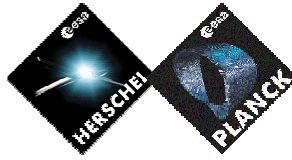
Table 5.1.1-3 : HFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support HFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	154 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

<sup>61</sup> TBC: It is assumed that FDIR2-1 as defined in [RD6] is equivalent to FDIR0.

<sup>62</sup> TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending authorised? If confirmed then an additional OBCP is needed.



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	187 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_DPU_RESTART N1=0 <sup>63</sup>	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 5.1.1-4 : EAT for HFI S/C 1553B Bus FDIR

### 5.1.1.2.2 HFI Science Data Monitoring

**TBW**

### 5.1.1.2.3 HFI Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to HFI.

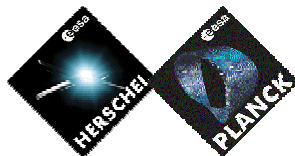
## 5.1.2 HFI S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, HFI will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP. This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing (FDIR1)	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_SM_OBCP

Table 5.1.2-1 : HFI OBCP vs. S/C Mode transition

<sup>63</sup> TBC: this has to be refined according to decision on how to identify which side has failed.



### 5.1.3 HFI OBCP

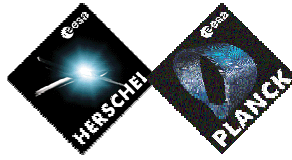
#### 5.1.3.1 List of HFI OBCP

According to sections 5.1.1 and 5.1.2, the following OBCP are needed to support HFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_HFI_REU_RESYNCH	X					0x0580 (HFI Prime)	5,2	0x0080 128	
	X					0x0581 (HFI Red.)	5,2	0x0080 128	
DB_OBCP_P_HFI_REU_RESTART	X					0x0580 (HFI Prime)	5,2	0x0082 130	
	X					0x0581 (HFI Red.)	5,2	0x0082 130	
DB_OBCP_P_HFI_4KCDE_RESTART	X					0x0580 (HFI Prime)	5,2	0x0084 132	
	X					0x0581 (HFI Red.)	5,2	0x0084 132	
DB_OBCP_P_HFI_DCE_RESTART	X					0x0580 (HFI Prime)	5,2	0x0086 134	
	X					0x0581 (HFI Red.)	5,2	0x0086 134	
DB_OBCP_P_HFI_OFF		X				0x0010 (CDMS)	5,x	0x009A 154 (DLL)	
DB_OBCP_P_HFI_DPU_RESTART		X				0x0010 (CDMS)	5,x	0x00BB 187 (TFL TM)	

Table 5.1.3-1 : List of HFI OBCP





### 5.1.3.2 HFI OBCP Specification

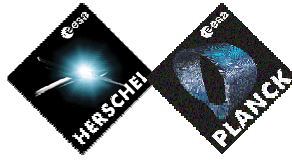
#### 5.1.3.2.1 DB\_OBCP\_P\_HFI\_REU\_RESYNCH

OBCP DB_OBCP_P_HFI_REU_RESYNCH		
ID	DB_OBCP_P_HFI_REU_RESYNCH	TBD
Triggered by	Event 0x0080 from HFI Nom. or Red.	Internal FDIR - REU FPGA synchronisation failure
Type		TBD
Time-Out		300 seconds TBD
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0080 from HFI Nom. & Red. As they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0580 / 0x0080 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0080 (HFI Red.)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution:  - None <sup>64</sup>	
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>65</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> TBD (HFI command sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_META> TBD (HFI meta subschedule) - M = 0 ( All APID)
Isolate two of the 12 analog belts which produces a de-synchronisation (i.e. bad data transmission) with the REU processor belt) according to procedure "REU FPGA synchronisation failure" defined in [RD6]		Get the LCL_Status of the HFI REU Analog Belts from the Datapool: - 0 & 1 : LCL 39 : DID_PCDU_DM04_ITLM_LCL39 - 2 & 3 : LCL 40 : DID_PCDU_DM07_ITLM_LCL40 - 4 & 5 : LCL 41 : DID_PCDU_DM07_ITLM_LCL41 - 6 & 7 : LCL 42 : DID_PCDU_DM04_ITLM_LCL42 - 8 & 9 : LCL 43 : DID_PCDU_DM08_ITLM_LCL43 - 10 & 11 : LCL 44 : DID_PCDU_DM03_ITLM_LCL44  If (REU ABL = LCL_Status) <sup>66</sup> then { Send TC(8,4) "Performing an activity of a function" to HFI with

<sup>64</sup> TBD: it is assumed that a request to reset REU should execute even if REU resynchronisation is in progress.

<sup>65</sup> According to [RD10]

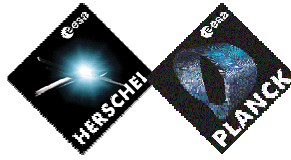
<sup>66</sup> TBD : It is assumed that REU ABL is included in Parameter\_A field of EVENT\_REU\_FPGA\_ERROR\_ON. Format and content of event reports to be given by HFI.



		<p>the following parameters:</p> <ul style="list-style-type: none"> <li>- Function ID / Activity ID = 0x4054 ("TCREU-FPGAreset-4054")</li> <li>- SID = 0x0000<sup>67</sup></li> <li>- P01 = 0x0XXX with XXX = LCL_Status<sup>68</sup></li> </ul> <p>}</p> <p>Else</p> <p>{</p> <p>/* Switch OFF all analog belts LCL except the 1<sup>st</sup> pair */</p> <p>For (LCL_Index = 40; LCL_Index &lt;= 44 ; LCL_Index++)</p> <p>{</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_Index</li> </ul> <p>Update LCL_Status accordingly</p> <p>}</p> <p>For (LCL_Index = 39; LCL_Index &lt;= 44 ; LCL_Index++)</p> <p>{</p> <p>/* Switch ON LCL */</p> <p>Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_Index</li> </ul> <p>Update LCL_Status accordingly</p> <p>Send TC(8,4) "Performing an activity of a function" to HFI with the following parameters:</p> <ul style="list-style-type: none"> <li>- Function ID / Activity ID = 0x4054 ("TCREU-FPGAreset-4054")</li> <li>- SID = 0x0000</li> <li>- P01 = 0x0XXX with XXX = LCL_Status</li> </ul> <p>Wait until REU_FPGA_ERROR_OFF event from HFI is received or Time-out (TBD) has elapsed</p> <p>If Time-out has elapsed then</p> <p>{</p> <p>/* Switch OFF LCL */</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_Index</li> </ul> <p>Update LCL_Status accordingly</p> <p>} /* Else Do Nothing */</p> <p>}</p>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x0080 from HFI Nom. &amp; Red.</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0580 / 0x0080 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0080 (HFI Red.)</li> </ul>

<sup>67</sup> TBC : Note that according to [AD1], if SID = 0 then no parameter are sent. Several Instruments TC do not comply with this requirement. This has to be discussed.

<sup>68</sup> TBC: The ordering of the LCL status has to be clarified in the description of the TC



<p>If recovery succeeds, restart the HFI MTL<sup>69</sup></p>		<p>Send TC(11,1) "Enable Release of Telecommands" with the following parameters:<sup>70</sup></p> <ul style="list-style-type: none"> <li>- N = 1 (One sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt; (TBD) (HFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
---	--	--

There are 6 LCL to power up the 12 REU analog belts.

i gives the number of the "REU belt" LCL with  $0 \leq i \leq 5$ .

A REU runs a resynchronisation in case default between Master FPGA and Preprocessor FPGA.

ABL (Active Belt List) indicates to REU which belt is used. Then the synchronisation is done only on ABL.

A "REU\_FPGA\_ERROR\_ON" event is generated by the ME

The CDMU sends to the ME the TC REU-FPGAreset-4054 with the ABL updated to LCL ON.

The CDMU sends to the ME the TC REU-FPGAreset-4054 with the ABL updated to LCL ON.

A "REU\_FPGA\_ERROR\_OFF" event is generated or not by the ME

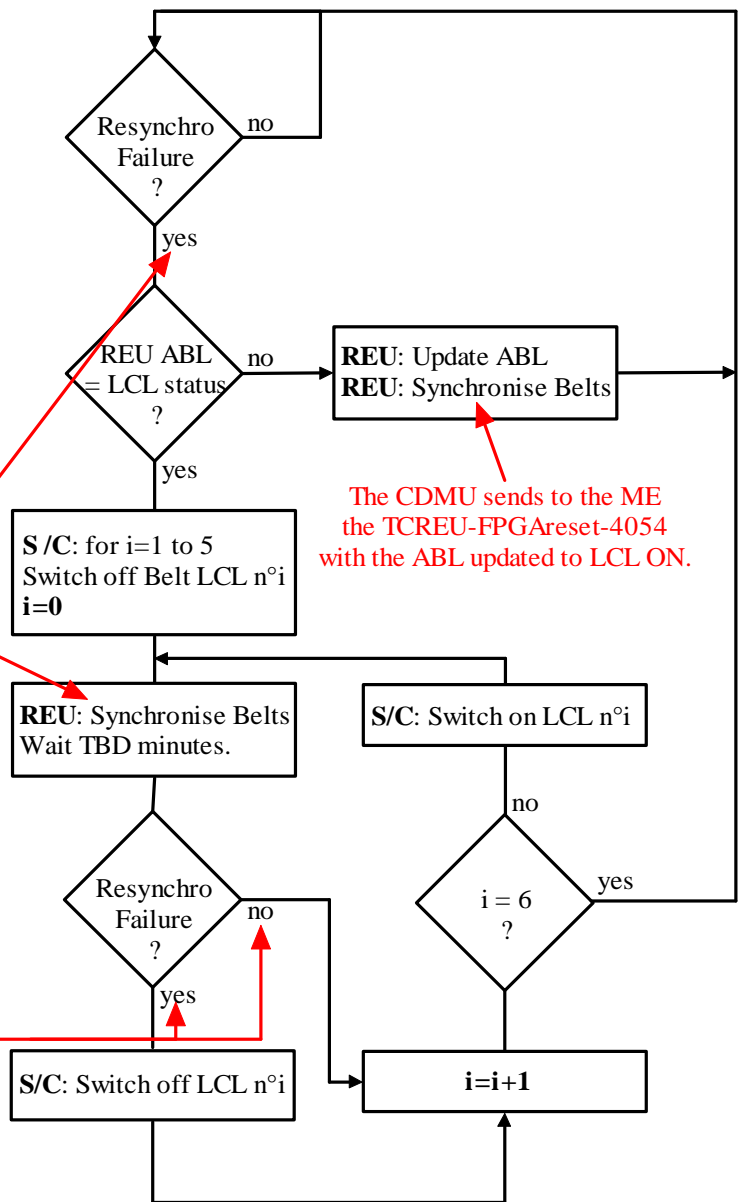
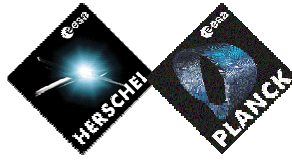


Figure 5.1.3-1 : HFI « REU FPGA synchronisation failure » procedure

<sup>69</sup> TBC: By default, it is assumed that the recovery has succeeded. It is also assumed that MTL shall be restarted at the next sub-schedule.

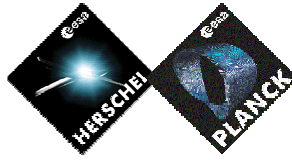
<sup>70</sup> According to [RD10]



### 5.1.3.2.2 DB\_OBCP\_P\_HFI\_REU\_RESTART

OBCP DB_OBCP_P_HFI_REU_RESTART		
ID	DB_OBCP_P_HFI_REU_RESTART	TBD
Triggered by	Event 0x0082 from HFI Nom. or Red.	Internal FDIR - Loss of DPU-REU communication
Type		TBD
Time-Out		300 seconds TBD
OBCP Parameters	Max_Nb_Restart_Attempt	Maximum number of attempts to restart the REU Default value = 1 (TBD)
	PL_Side	Indicates whether anomaly is on nominal or redundant side Default value = NOM (TBD)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0082 from HFI Nom. & Red. as they trigger the current OBCP - 0x0080 from HFI Nom. & Red. as they would switch ON/OFF REU belts	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0004 - APID / Event ID = 0x0580 / 0x0082 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0082 (HFI Red.) - APID / Event ID = 0x0580 / 0x0080 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0080 (HFI Red.)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution:  - DB_OBCP_P_HFI_REU_RESYNCH as it would switch ON/OFF REU belts	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_P_HFI_REU_RESYNCH
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>71</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (TBD) (HFI command sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_META> (TBD) (HFI meta subschedule) - M = 0 ( All APID)
Restart the REU according to procedure "Loss of DPU-REU communication" defined in [RD6]		Restart_Index = Max_Nb_Restart_Attempt;  If (PL_Side == NOM) then LCL_Index = 11; Else LCL_Index = 12;  While (Restart_Index>0) { /* Switch OFF REU Proc*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Index

<sup>71</sup> According to [RD10]



		<pre> Wait 1 minute  /* Switch ON REU Proc */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Index  Wait until NEED_REU_RESTART_OFF event from HFI <sup>72</sup>is received or Time-out (TBD) has elapsed  If Time-out has elapsed then { Restart_Index = Restart_Index -1;  Wait 1 minute  if (Restart_Index &lt;= 0) then { /* Switch OFF REU Proc */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Index  /* Switch OFF the 12 Analog Belts */ For (Belt_LCL_Index = 39; Belt_LCL_Index &lt;= 44 ; Belt_LCL_Index++) { Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0xXXXX = Belt_LCL_Index }  /* Mark HFI REU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*<sup>73</sup> Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0306 (HFI REU) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x030A (HFI PAU)<sup>74</sup>  } /* Else Do Nothing */ } Else /* Else recovery successful =&gt; no retry */ { Restart_Index = 0<sup>75</sup>;  /* Restart HFI MTL */ Send TC(11,1) "Enable Release of Telecommands" with the following parameters:<sup>76</sup> - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt; (TBD) (HFI meta subschedule) - M = 0 ( All APID) } } </pre>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x0082 from HFI Nom. &amp; Red.</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0004</li> <li>- APID / Event ID = 0x0580 / 0x0082 (HFI Nom.)</li> </ul>

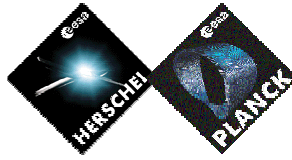
<sup>72</sup> **PL\_Side** has to be taken into account to define APID of event report from HFI

<sup>73</sup> **TBC:** It is assumed there is no need to declare REU OFF/ON during the retries sequence as Thermal Control should not be impacted during such delays.

<sup>74</sup> **TBC:** HFI PAU is powered via the HFI REU.

<sup>75</sup> **TBC:** It is assumed the procedure has to stop here and no REU switch OFF is needed contrary to what [RD6] specifies

<sup>76</sup> According to [RD10]



	- and re-enable entries to REU resynchronisation	- APID / Event ID = 0x0581 / 0x0082 (HFI Red.) - APID / Event ID = 0x0580 / 0x0080 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0080 (HFI Red.)
If recovery succeeds, restart the HFI MTL <sup>77</sup>		Already covered.

This procedure can be armed "ArmCount" times.  
i is initialised to ArmCount by TC.

2 events are generated after 10 seconds:  
- NEED\_REU\_RESTART\_ON  
- NEED\_REU\_RESTART\_OFF.

"REU communication Off" is generated after a configurable delay (around 10 seconds) of lost of REU communication in order to allow a REU watch-dog reset.

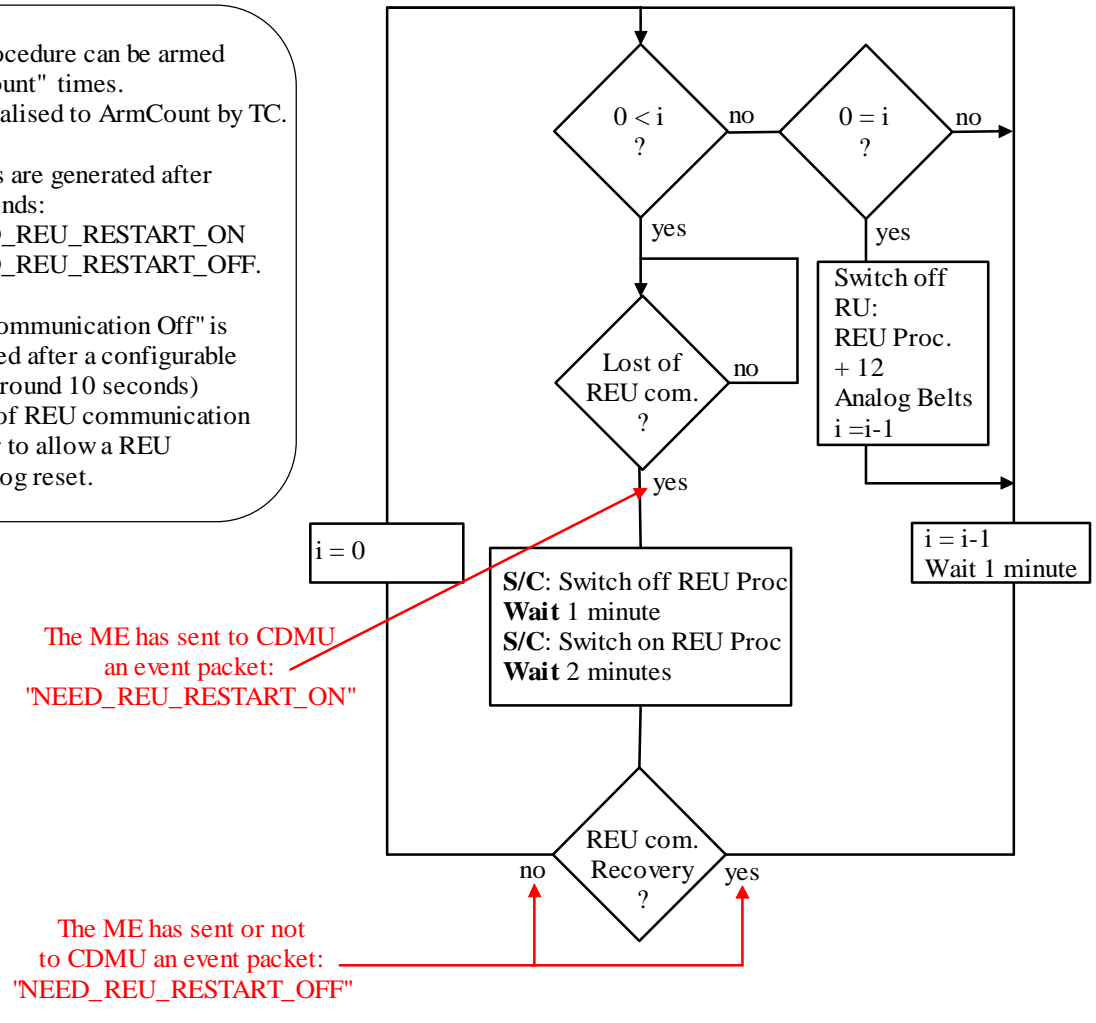
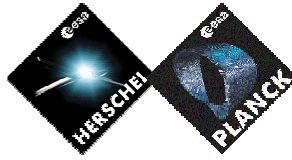


Figure 5.1.3-2 : HFI « Loss of DPU-REU communication » procedure

<sup>77</sup> TBC: It is assumed that MTL shall be restarted at the next sub-schedule.

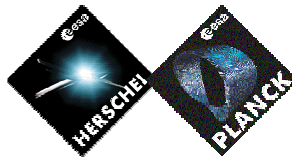


### 5.1.3.2.3 DB\_OBCP\_P\_HFI\_4KCDE\_RESTART

OBCP DB_OBCP_P_HFI_4KCDE_RESTART		
ID	DB_OBCP_P_HFI_4KCDE_RESTART	TBD
Triggered by	Event 0x0084 from HFI Nom. or Red.	Internal FDIR - Loss of DPU-4KCDE communication
Type		TBD
Time-Out		300 seconds TBD
OBCP Parameters	Max_Nb_Restart_Attempt	Maximum number of attempts to restart the 4KCDE Default value = 1 (TBD)
	PL_Side	Indicates whether anomaly is on nominal or redundant side Default value = NOM (TBD)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0084 from HFI Nom. & Red. as they trigger the current OBCP -	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0580 / 0x0084 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0084 (HFI Red.)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution:  - None	
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>78</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (TBD) (HFI command sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_META> (TBD) (HFI meta subschedule) - M = 0 ( All APID)
Restart the 4KCDE according to procedure "Loss of DPU-4KCDE communication" defined in [RD6]		Restart_Index = Max_Nb_Restart_Attempt;  If (PL_Side == NOM) then { LCL_Compressor = 59; <sup>79</sup> LCL_Processor = 37; } Else /* Redundant side */ { LCL_Compressor = 61; LCL_Processor = 38; }  While (Restart_Index>0)

<sup>78</sup> According to [RD10]

<sup>79</sup> The 4KCDE compressor is powered by two // OP-LCL (59-60 for Nom. & 61-62 for Red.). Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time.



		<pre> { /* Switch OFF 4KCDE Compressor */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Compressor  Wait 1 minute  /* Switch OFF 4KCDE Processor */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Processor  Wait 1 minute  /* Switch ON 4CDE Processor */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Processor  Wait 1 minute  /* Switch ON 4KCDE Compressor */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Compressor  Wait until NEED_4KCDE_RESTART_OFF event from HFI<sup>80</sup> is received or Time-out (TBD) has elapsed<sup>81</sup>  If Time-out has elapsed then { Restart_Index = Restart_Index -1;  Wait 1 minute  if (Restart_Index &lt;= 0) then { /* Switch OFF 4KCDE Processor and Compressor ??*/<sup>82</sup> } /* Else Do Nothing */ } Else /* Else recovery successful =&gt; no retry */ { Restart_Index = 0;  /* Restart HFI MTL */ Send TC(11,1) "Enable Release of Telecommands" with the following parameters:<sup>83</sup> - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt; (TBD) (HFI meta subschedule) - M = 0 ( All APID) } } </pre>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x0084 from HFI Nom. &amp; Red.</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0580 / 0x0084 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0084 (HFI Red.)</li> </ul>

<sup>80</sup> PL\_Side has to be taken into account to define APID of event report from HFI

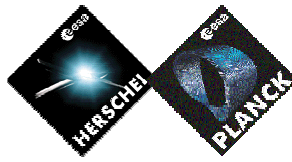
<sup>81</sup> TBC: It shall be confirmed that NEED\_4KCDE\_RESTART\_OFF event can not be received before 4KCDE Compressor is ON.

<sup>82</sup> TBC: Contrary to HFI REU there is no request to switch OFF the 4KCDE if the recovery failed. It is correct?

<sup>83</sup> According to [RD10]

<sup>84</sup> TBC: It is assumed that MTL shall be restarted at the next sub-schedule.





If recovery succeeds, restart the HFI MTL <sup>84</sup>		Already covered.
---	--	------------------

This procedure can be armed "ArmCount" times.  
i is initialised to ArmCount by TC.

3 events are generated:  
- NEED\_4KCDE\_RESTART\_ON  
- NEED\_4KCDE\_RESTART\_OFF.

"NEED\_4KCDE\_RESTART\_ON" event is generated only if:  
- the temperature of the FPU 4K stage read by REU is above the threshold n°1 (close to 5K).  
- a lost of DPU-4KCDE communication is detected after a configurable delay (close to 10 seconds) in order to allow a 4KCDE watch-dog reset.

The ME has sent to CDMU an event packet: "NEED\_4KCDE\_RESTART\_ON"

The ME has sent or not to CDMU an event packet: "NEED\_4KCDE\_RESTART\_OFF"

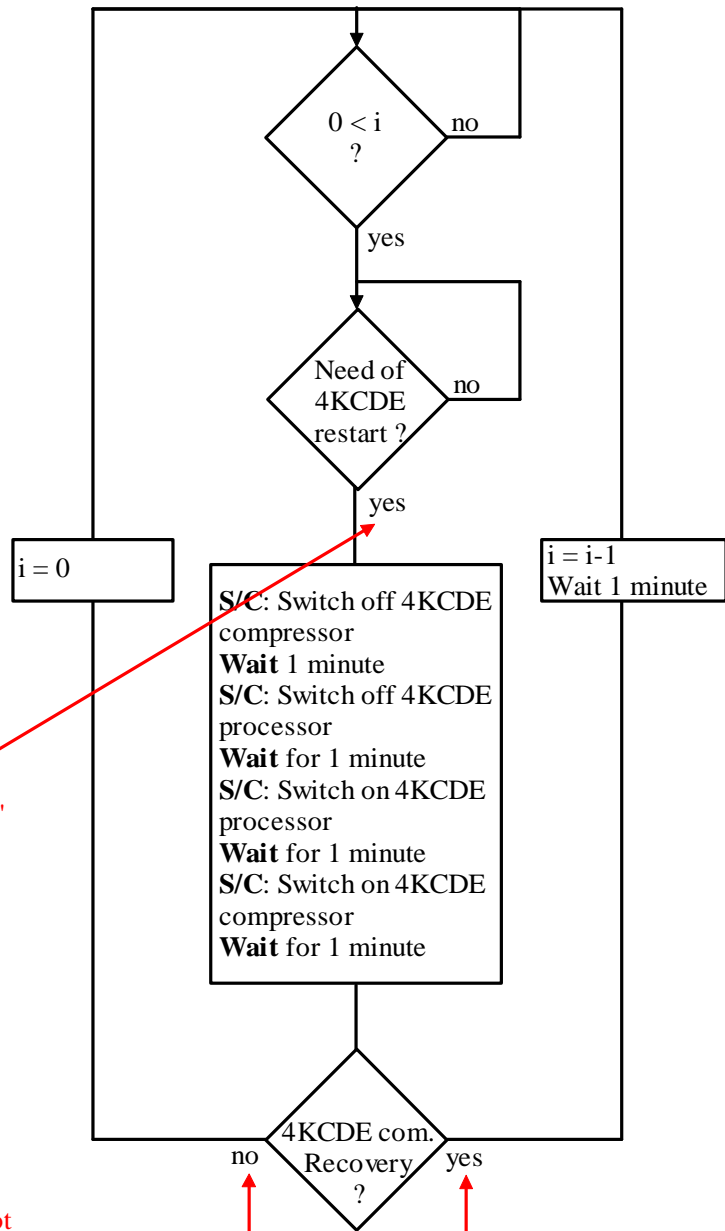
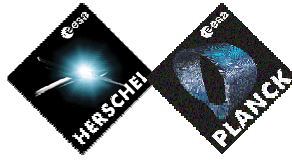


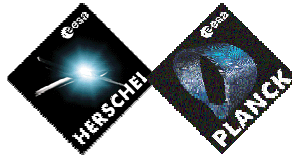
Figure 5.1.3-3 : HFI « Loss of DPU-4KCDE communication » procedure



### 5.1.3.2.4 DB\_OBCP\_P\_HFI\_DCE\_RESTART

OBCP DB_OBCP_P_HFI_DCE_RESTART		
ID	DB_OBCP_P_HFI_DCE_RESTART	TBD
Triggered by	Event 0x0086 from HFI Nom. or Red.	Internal FDIR - Loss of DPU-DCE communication
Type		TBD
Time-Out		300 seconds (TBC)
OBCP Parameters	Max_Nb_Restart_Attempt	Maximum number of attempts to restart the DCE Default value = 1 (TBC)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0086 from HFI Nom. & Red. as they trigger the current OBCP -	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0580 / 0x0086 (HFI Nom.) - APID / Event ID = 0x0581 / 0x0086 (HFI Red.)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution:  - None	
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>85</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (TBD) (HFI command sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_META> (TBD) (HFI meta subschedule) - M = 0 ( All APID)
Restart the DCE according to procedure "Loss of DPU-DCE communication" defined in [RD6]		Restart_Index = Max_Nb_Restart_Attempt;  While (Restart_Index>0) { /* Switch OFF DCE */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = HFI DCE)  Wait 1 minute  /* Switch ON DCE */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = HFI DCE)  Wait until NEED_DCE_RESTART_OFF event from HFI <sup>86</sup> is received or Time-out (TBD) has elapsed

<sup>85</sup> According to [RD10]



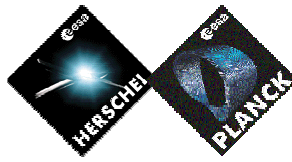
		<pre> If Time-out has elapsed then {   Restart_Index = Restart_Index -1;    Wait 1 minute    if (Restart_Index &lt;= 0) then   {     /* Switch OFF DCE Processor and Compressor     ??*/<sup>87</sup>     } /* Else Do Nothing */   } Else /* Else recovery successful =&gt; no retry */ {   Restart_Index = 0;    /* Restart HFI MTL */   Send TC(11,1) "Enable Release of Telecommands" with the following parameters:<sup>88</sup>   - N = 1 (One sub-schedules)   - SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt;   (TBD) (HFI meta subschedule)   - M = 0 (All APID) } </pre>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x0086 from HFI Nom. &amp; Red.</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0002</li> <li>- APID / Event ID = 0x0580 / 0x0086 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0086 (HFI Red.)</li> </ul>
<p>If recovery succeeds, restart the HFI MTL<sup>89</sup></p>		<p>Already covered.</p>

<sup>86</sup> PL\_Side has to be taken into account to define APID of event report from HFI

<sup>87</sup> TBC: Contrary to HFI REU there is no request to switch OFF the DCE if the recovery failed. Is it correct?

<sup>88</sup> According to [RD10]

<sup>89</sup> TBC: It is assumed that MTL shall be restarted at the next sub-schedule.



This procedure can be armed "ArmCount" times.  
i is initialised to ArmCount by TC.

2 events are generated:  
- NEED\_DCE\_RESTART\_ON  
- NEED\_DCE\_RESTART\_OFF.

"NEED\_DCE\_RESTART\_ON" event is generated only if:  
- the temperature of the FPU 0.1K stage read by REU is above the threshold n°2 (close to 150mK).  
- a lost of DPU-DCE communication is detected after a configurable delay (close to 10 seconds).

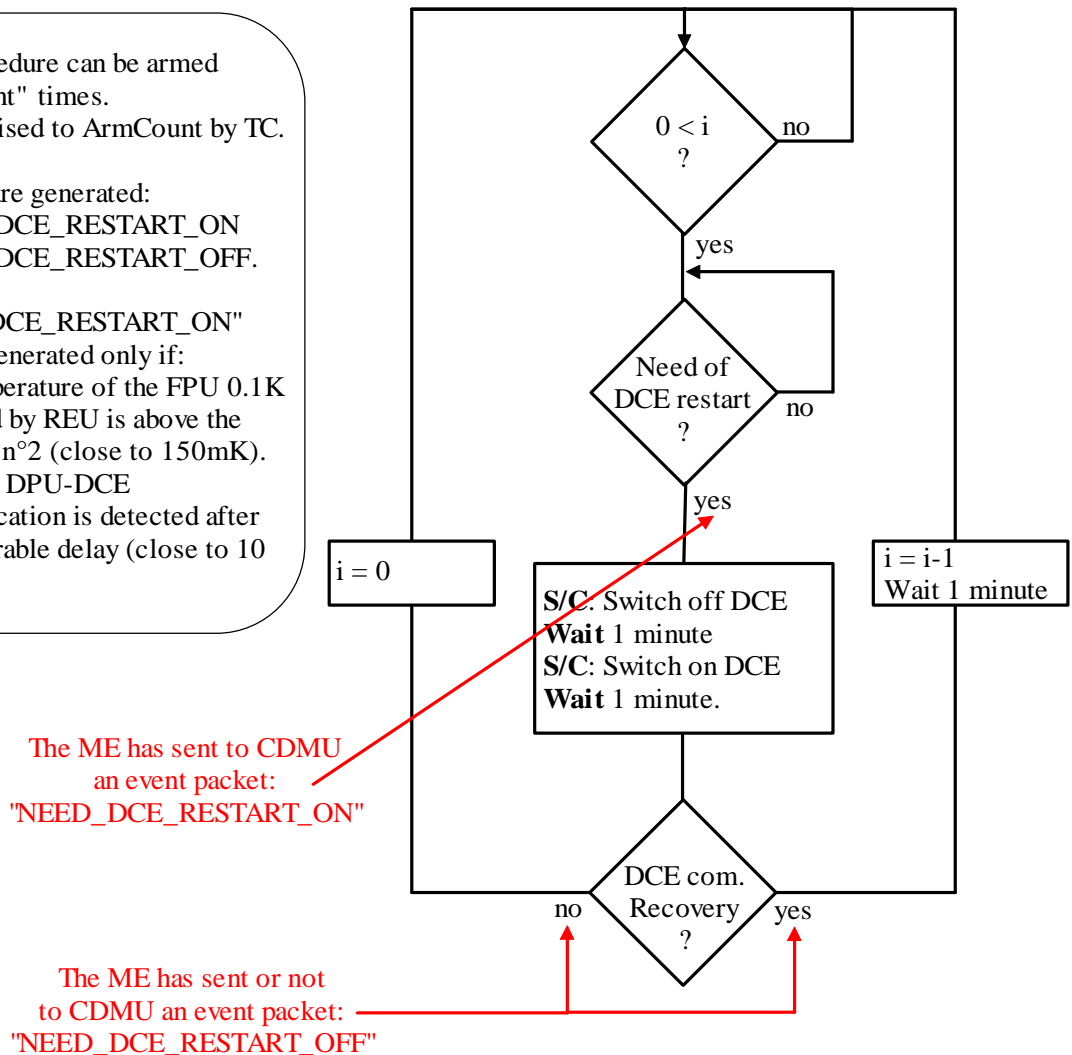
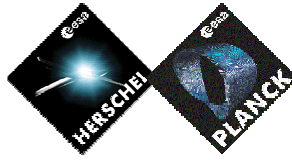
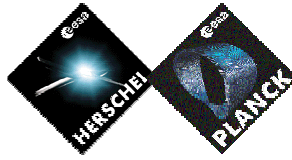


Figure 5.1.3-4 : HFI « Loss of DPU-DCE communication » procedure



### 5.1.3.2.5 DB\_OBCP\_P\_HFI\_OFF

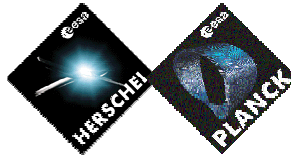
OBCP DB_OBCP_P_HFI_OFF		
ID	DB_OBCP_P_HFI_OFF	TBD
Triggered by	Event 0x009A from CDMS	DLL FDIR
Type		TBD
Time-Out		180 seconds (TBD)
OBCP Parameters		
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	<p>Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. :</p> <ul style="list-style-type: none"> <li>- 0x009A from CDMS as it triggers the current OBCP</li> <li>- 0x00BB from CDMS as it would restart the DPU</li> <li>- 0x0080 from HFI Nom. &amp; Red. as they would switch ON the REU belts</li> <li>- 0x0082 from HFI Nom. &amp; Red. as they would restart the REU</li> <li>- 0x0084 from HFI Nom. &amp; Red. as they would restart the 4KCDE</li> <li>- 0x0086 from HFI Nom. &amp; Red. as they would restart the DCE</li> <li>-</li> </ul>	<p>Send TC(19,5) "Disable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x000A</li> <li>- APID / Event ID = 0x0010 / 0x009A (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM)</li> <li>- APID / Event ID = 0x0580 / 0x0080 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0080 (HFI Red.)</li> <li>- APID / Event ID = 0x0580 / 0x0082 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0082 (HFI Red.)</li> <li>- APID / Event ID = 0x0580 / 0x0084 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0084 (HFI Red.)</li> <li>- APID / Event ID = 0x0580 / 0x0086 (HFI Nom.)</li> <li>- APID / Event ID = 0x0581 / 0x0086 (HFI Red.)</li> <li>-</li> </ul>
	<p>Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution:</p> <ul style="list-style-type: none"> <li>- DB_OBCP_P_HFI_DPU_RESTART as it would restart the DPU</li> <li>- DB_OBCP_P_HFI_REU_RESYNCH as it would switch ON the REU belts</li> <li>- DB_OBCP_P_HFI_REU_RESTART as it would restart the REU</li> <li>- DB_OBCP_P_HFI_4KCDE_RESTART as it would restart the 4KCDE</li> <li>- DB_OBCP_P_HFI_DCE_RESTART as it would restart the DCE</li> <li>-</li> </ul>	<p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_HFI_DPU_RESTART</li> </ul> <p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_HFI_REU_RESYNCH</li> </ul> <p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_HFI_REU_RESTART</li> </ul> <p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_HFI_4KCDE_RESTART</li> </ul> <p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_HFI_DCE_RESTART</li> </ul>



<p>Disable all commanding of HFI from the MTL</p>		<p>Send TC(11,2) "Disable Release of Telecommands" with the following parameters:<sup>90</sup></p> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_CMD&gt; (TBD) (HFI command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt; (TBD) (HFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
	<p>Declare the two HFI RT as OFF</p>	<p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_A_VALUE &gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_B_VALUE &gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
<p>Switch off HFI according to "FDIRO" defined in [RD6]</p>		<p>/* Switch OFF all analog belts LCL */ For (LCL_Index = 39; LCL_Index &lt;= 44 ; LCL_Index++) {     Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:     - PCDU Unit Code = 0xXXXX = LCL_Index }</p> <p>/* Switch OFF 4KCDE Compressors (Nominal and Redundant)*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x003C (LCL 59 = HFI 4KC Drive Bus Nom 2)<sup>91</sup> Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x003E (LCL 61 = HFI 4KC Drive Bus Red 2)<sup>92</sup></p>

<sup>90</sup> According to [RD10]

<sup>91</sup> The 4KCDE compressor is powered by two // OP-LCL (59-60 for Nom. & 61-62 for Red.). Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time.



		<p>/* Mark HFI 4KCDE Compressor as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0307 (HFI CCU/CEU) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0307 (HFI CRU)<sup>93</sup></p> <p>Wait <b>TBD</b><sup>94</sup></p> <p>/* Switch OFF 4KCDE Processors (Nominal and Redundant)*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0025 (LCL 37 = HFI 4KCDE Nom)</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0026 (LCL 38 = HFI 4KCDE Red)</p> <p>/* Mark HFI CAU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0307 (HFI CAU)<sup>95</sup></p> <p>Wait <b>TBD</b><sup>96</sup></p> <p>/* Switch OFF DCE */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = HFI DCE)</p> <p>/* The DCE is not individually thermally controlled, so there is no need to mark it as OFF */</p> <p>Wait <b>TBD</b><sup>97</sup></p> <p>/* Switch OFF REU Processors (Nominal and Redundant)*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x000B (LCL 11 = HFI REU Proc Nom)</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x000C (LCL 12 = HFI REU Proc Red)</p> <p>/* Mark HFI REU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) "Mark Unit OFF" with the following</p>
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<sup>92</sup> The 4KCDE compressor is powered by two // OP-LCL (59-60 for Nom. & 61-62 for Red.). Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time.

<sup>93</sup> TBC: The 4KCDE Compressor is powered via the HFI CRU. As the CRU is passive, it might not be necessary to mark it OFF.

<sup>94</sup> TBC: No wait is specified by HFI in this sequence contrary to the others.

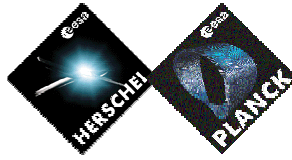
<sup>95</sup> TBC: The HFI CAU is powered by the 4KCDE Processor

<sup>96</sup> TBC: No wait is specified by HFI in this sequence contrary to the others.

<sup>97</sup> TBC: No wait is specified by HFI in this sequence contrary to the others.

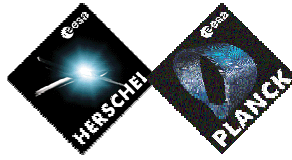
<sup>98</sup> TBC: HFI PAU is powered via the HFI REU.

<sup>99</sup> TBC: No wait is specified by HFI in this sequence contrary to the others.



		<p>parameters:          - Status Unit ID = 0x0306 (HFI REU)          Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:          - Status Unit ID = 0x030A (HFI PAU)<sup>98</sup></p> <p>Wait <b>TBD</b>*</p> <p>/* Switch OFF the DPU (Nominal and Redundant)*/          Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:          - PCDU Unit Code = 0x001D (LCL 29= HFI DPU Nom)</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:          - PCDU Unit Code = 0x001E (LCL 30 = HFI DPU Red)</p> <p>/* Mark HFI DPU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/          Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:          - Status Unit ID = 0x0304 (HFI DPU1)          Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters:          - Status Unit ID = 0x0305 (HFI DPU2)</p>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x009A from CDMS</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x009A (CDMS DLL FDIR)</li> </ul>



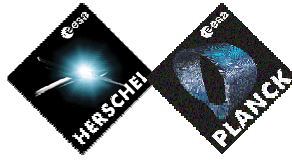


### 5.1.3.2.6 DB\_OBCP\_P\_HFI\_DPU\_RESTART

OBCP DB_OBCP_P_HFI_DPU_RESTART		
ID	DB_OBCP_P_HFI_DPU_RESTART	TBD
Triggered by	Event 0x00BB from CDMS	TFL TM FDIR
Type		TBD
Time-Out		300 seconds (TBC)
OBCP Parameters	Max_Nb_Restart_Attempt	Maximum number of attempts to restart the DPU Default value = 1 (TBC)
	PL_Side <sup>100</sup>	Indicates whether anomaly is on nominal or redundant side Default value = NOM (TBC)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. : <ul style="list-style-type: none"> <li>- 0x00BB from CDMS as it triggers the current OBCP</li> <li>-</li> </ul>	Send TC(19,5) "Disable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM FDIR)</li> </ul>
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution: <ul style="list-style-type: none"> <li>- None</li> </ul>	
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>101</sup> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_CMD&gt; (TBD) (HFI command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt; (TBD) (HFI meta subschedule)</li> <li>- M = 0 ( All APID)</li> </ul>
Restart the REU according to procedure "Loss of S/C-DPU communication" defined in [RD6]		Restart_Index = Max_Nb_Restart_Attempt;  If (PL_Side == NOM) then LCL_Index = 29; Else LCL_Index = 30;  While (Restart_Index > 0) { /* Declare the two HFI RT as OFF */ Send TC(8,4,10,1) with the following parameters: <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_A_VALUE &gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

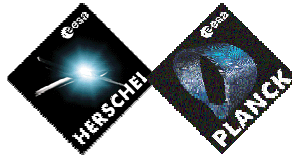
<sup>100</sup> TBC: PL\_Side could either be determined from the content of the event that triggered the OBCP (in this case parameter passing has to be enabled) or given as parameter of the OBCP directly in the EAT (then it would be under ground responsibility to set the EAT accordingly when there is an instrument switch-over).

<sup>101</sup> According to [RD10]

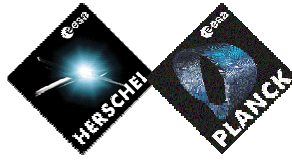


		<ul style="list-style-type: none"> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_B_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>/* Switch OFF DPU */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_Index</li> </ul> <p>Wait 1 minute</p> <p>/* Switch ON DPU */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0xXXXX = LCL_Index</li> </ul> <p>/* Declare HFI RT (Nom. and Red.) as ON and Well_TM in order to be able to receive TM, and to check later on if anomaly is still present */</p> <p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_A_VALUE&gt;</li> <li>- F0 / M0 = 1<sub>b</sub> / 1<sub>b</sub> (RTA ON)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 1<sub>b</sub> / 1<sub>b</sub> (RTA Well_TM)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_HFI_B_VALUE&gt;</li> <li>- F0 / M0 = 1<sub>b</sub> / 1<sub>b</sub> (RTA ON)</li> </ul>
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<sup>102</sup> The information can be extracted from DID\_BSW\_SDB\_RTA\_CFG\_HFI\_A and DID\_BSW\_SDB\_RTA\_CFG\_HFI\_B  
<sup>103</sup> TBC: It is assumed that the DPU has to be switched OFF and not the RU as specified in [RD6].  
<sup>104</sup> TBC: It is assumed the procedure has to stop here and no REU switch OFF is needed contrary to what [RD6] specifies  
<sup>105</sup> According to [RD10]

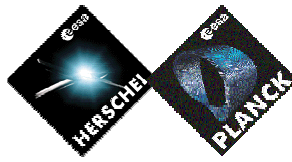


		<ul style="list-style-type: none"> <li>- F1 / M1 = 0b / 0b (Flag ignored)</li> <li>- F2 / M2 = 0b / 0b (Flag ignored)</li> <li>- F3 / M3 = 1b / 1b (RTA Well_TM)</li> <li>- F4 / M4 = 0b / 0b (Flag ignored)</li> <li>- F5 / M5 = 0b / 0b (Flag ignored)</li> <li>- F6 / M6 = 0b / 0b (Flag ignored)</li> <li>- F7 / M7 = 0b / 0b (Flag ignored)</li> <li>- F8 / M8 = 0b / 0b (Flag ignored)</li> <li>- F9 / M9 = 0b / 0b (Flag ignored)</li> <li>- F10 / M10 = 0b / 0b (Flag ignored)</li> <li>- F11 / M11 = 0b / 0b (Flag ignored)</li> <li>- CNT / M_C = 00b / 0b (Flag ignored)</li> </ul> <p><b>Wait (TBD) seconds</b></p> <p>If HIFI RT is declared Sick_TM<sup>102</sup> then /* Anomaly is still there */</p> <pre>{   Restart_Index = Restart_Index -1;    Wait 1 minute    if (Restart_Index &lt;= 0) then   {     /* Declare the two HFI RT as OFF */     Send TC(8,4,10,1) with the following parameters:     - RTA = &lt;SDB_RT_A_HFI_A_VALUE&gt;     - F0 / M0 = 0b / 1b (RTA OFF)     - F1 / M1 = 0b / 0b (Flag ignored)     - F2 / M2 = 0b / 0b (Flag ignored)     - F3 / M3 = 0b / 0b (Flag ignored)     - F4 / M4 = 0b / 0b (Flag ignored)     - F5 / M5 = 0b / 0b (Flag ignored)     - F6 / M6 = 0b / 0b (Flag ignored)     - F7 / M7 = 0b / 0b (Flag ignored)     - F8 / M8 = 0b / 0b (Flag ignored)     - F9 / M9 = 0b / 0b (Flag ignored)     - F10 / M10 = 0b / 0b (Flag ignored)     - F11 / M11 = 0b / 0b (Flag ignored)     - CNT / M_C = 00b / 0b (Flag ignored)      Send TC(8,4,10,1) with the following parameters:     - RTA = &lt;SDB_RT_B_HFI_B_VALUE&gt;     - F0 / M0 = 0b / 1b (RTA OFF)     - F1 / M1 = 0b / 0b (Flag ignored)     - F2 / M2 = 0b / 0b (Flag ignored)     - F3 / M3 = 0b / 0b (Flag ignored)     - F4 / M4 = 0b / 0b (Flag ignored)     - F5 / M5 = 0b / 0b (Flag ignored)     - F6 / M6 = 0b / 0b (Flag ignored)     - F7 / M7 = 0b / 0b (Flag ignored)     - F8 / M8 = 0b / 0b (Flag ignored)     - F9 / M9 = 0b / 0b (Flag ignored)     - F10 / M10 = 0b / 0b (Flag ignored)     - F11 / M11 = 0b / 0b (Flag ignored)     - CNT / M_C = 00b / 0b (Flag ignored)      /* Switch OFF DPU<sup>103</sup> */     Send TC(8,4,112,3) "Switch PCDU Unit OFF" with     the following parameters:     - PCDU Unit Code = 0xXXXX = LCL_Index      /* Mark HFI DPU as OFF in order to inform the     Thermal Control Management function that OFF thresholds have     to be used.*/     Send TC(8,4,116,25) "Mark Unit OFF" with the     following parameters:     - Status Unit ID = 0x0304 (HFI DPU1)     Send TC(8,4,116,25) "Mark Unit OFF" with the     following parameters:</pre>
--	--	---



		<pre> - Status Unit ID = 0x0305 (HFI DPU2)  } /* Else Do Nothing */ } Else /* Else recovery successful =&gt; no retry */ { Restart_Index = 0<sup>104</sup>;  /* Restart HFI MTL */ Send TC(11,1) "Enable Release of Telecommands" with the following parameters:<sup>105</sup> - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = &lt;HFI_SUBS_ID_META&gt;   (TBD) (HFI meta subschedule) - M = 0 ( All APID) } } </pre>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x00BB from CDMS</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM FDIR)</li> </ul>
<p>If recovery succeeds, restart the HFI MTL<sup>106</sup></p>		<p>Already covered.</p>

<sup>106</sup> TBC: It is assumed that MTL shall be restarted at the next sub-schedule.



This procedure can be armed "ArmCount" times.  
i is initialised to ArmCount by TC.

1 events can be generated by S/ C:  
- Lost of DPU communication.

"Lost of DPU communication" event is generated after 90 seconds of no packet transmission (the internal watchdog had time to reset the DPU). This event is associated to the FDIR of FDIR2 type which is specified by HP-SOFDIR-1553-REQ-0260 with (TRT and Min\_RT\_TM\_nb).

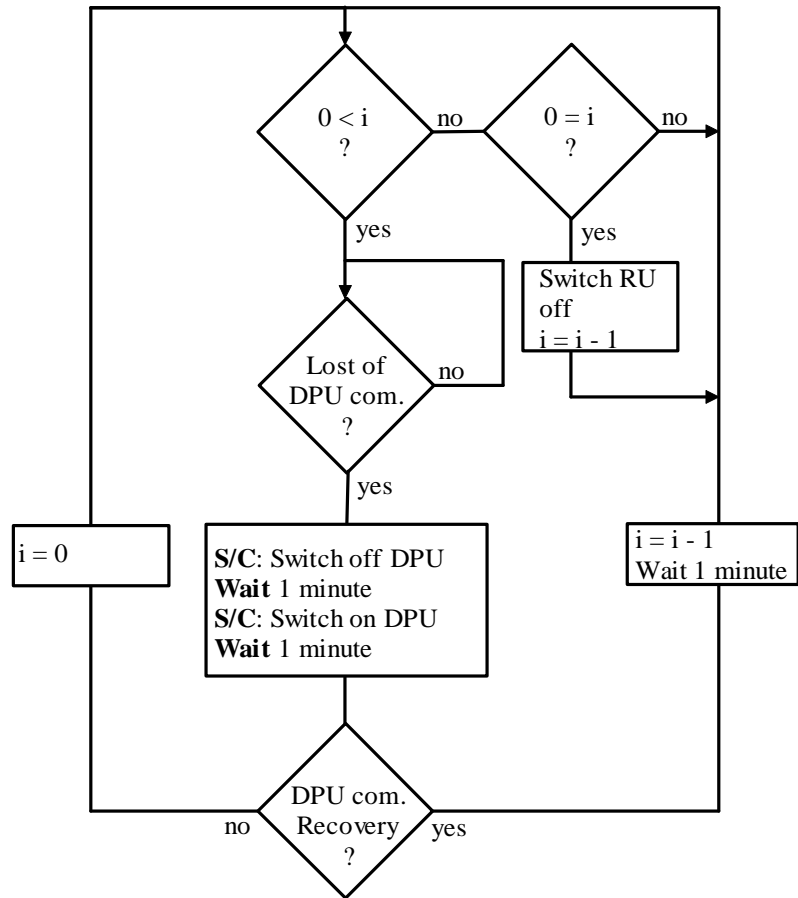
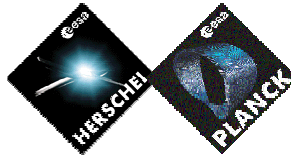


Figure 5.1.3-5 : HFI « Loss of S/C-DPU communication » procedure



## 5.2 LFI

### 5.2.1 LFI FDIR

#### 5.2.1.1 LFI internal FDIR

According to [RD7], LFI generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity. Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
Loss of HK Data from DAE	5,2	5105 <sup>107</sup>	Switch OFF the RAA	DB_OBCP_P_LFI_RAA_OFF

Table 5.2.1-1 : LFI internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support LFI Internal FDIR. Note that LFI Event Reports can have only one APID as specified in [AD1], i.e.:

- 0x0600 for LFI Prime and Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0600 (LFI Prime and Red.)	5105	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_LFI_RAA_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

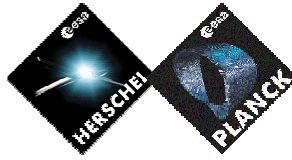
Table 5.2.1-2 : EAT for LFI Internal FDIR

#### 5.2.1.2 LFI S/C FDIR

##### 5.2.1.2.1 LFI S/C 1553B Bus FDIR

The following table summarises what LFI requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with LFI triggers.

<sup>107</sup> TBC: 5105 is said to be the SID in [RD7]. Event ID shall be specified.



Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	155	Do nothing	None <sup>108</sup>
TFL TC FDIR	5,x	174	Do nothing	None <sup>109</sup>
TFL TM FDIR	5,x	188	Check whether the REBA restarted its operations from the Startup SW execution	DB_OBCP_P_LFI_CHECK_REBA_TM

Table 5.2.1-3 : LFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support LFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	188 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_LFI_CHECK_REBA_TM N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 5.2.1-4 : EAT for LFI S/C 1553B Bus FDIR

#### 5.2.1.2.2 LFI Science Data Monitoring

**TBW**

#### 5.2.1.2.3 LFI Class B Heater Loop FDIR

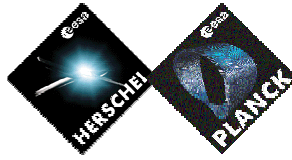
No Class B Thermal Control Loop is applicable to LFI.

### 5.2.2 LFI S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, LFI will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP. This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

<sup>108</sup> TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending and TM transfer authorised? If confirmed then an additional OBCP is needed.

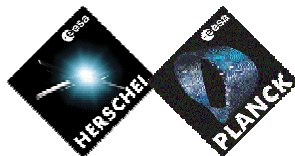
<sup>109</sup> TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending authorised? If confirmed then an additional OBCP is needed.



S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_SM_OBCP

Table 5.2.2-1 : LFI OBCP vs. S/C Mode transition





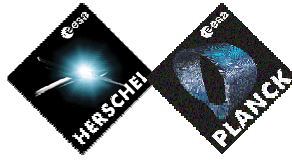
## 5.2.3 LFI OBCP

### 5.2.3.1 List of LFI OBCP

According to sections 5.2.1 and 5.2.2, the following OBCP are needed to support LFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_LFI_RAA_OFF	X					0x0600 (LFI Prime and Red.)	5,2	5105	
DB_OBCP_P_LFI_CHECK_REBA_TM		X				0x0010 (CDMS)	5,x	0x00BC 188 (TFL TM)	

Table 5.2.3-1 : List of LFI OBCP



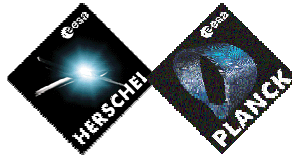
## 5.2.3.2 LFI OBCP Specification

### 5.2.3.2.1 DB\_OBCP\_P\_LFI\_RAA\_OFF

OBCP DB_OBCP_P_LFI_RAA_OFF		
ID	DB_OBCP_P_LFI_RAA_OFF	TBD
Triggered by	Event 0x5105 (TBC) from LFI	Internal FDIR - Loss of HK Data from DAE
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters		
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with LFI related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x5105 (TBC) from LFI as it triggers the current OBCP  -	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0600 / 0x5105 (TBC) (LFI Nom. or Red.)
	Stop execution of all running LFI OBCP that could contradict or interfere with current OBCP execution:  - None	
Switch off RAA according to procedure "Loss of DAE HK" defined in [RD7]		/* Disable all commanding of LFI from the MTL */ Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>110</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <LFI_SUBS_ID_CMD> (TBD) (HFI command sub-schedule) - SUBSCHEDULE-ID = <LFI_SUBS_ID_META> (TBD) (LFI meta subschedule) - M = 0 ( All APID)  /* Switch OFF the RAA <sup>111</sup> */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = LFI DAE Power Box Nom) Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = LFI DAE Power Box Red)  /* (TBC) There is no need to mark LFI RAA as OFF as it is not thermally controlled */
	Enable EAT entries that triggered the current	Send TC(19,4) "Enable Actions" with the following parameters:

<sup>110</sup> According to [RD10]

<sup>111</sup> [RD7] requests to check if RAA is OFF or not before switching it OFF. This is assumed to be useless.



	<p>OBCP:</p> <ul style="list-style-type: none"> <li>- 0x5105 (TBC) from LFI</li> <li>-</li> </ul>	<ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0600 / 0x5105 (TBC) (LFI Nom. or Red.)</li> </ul>
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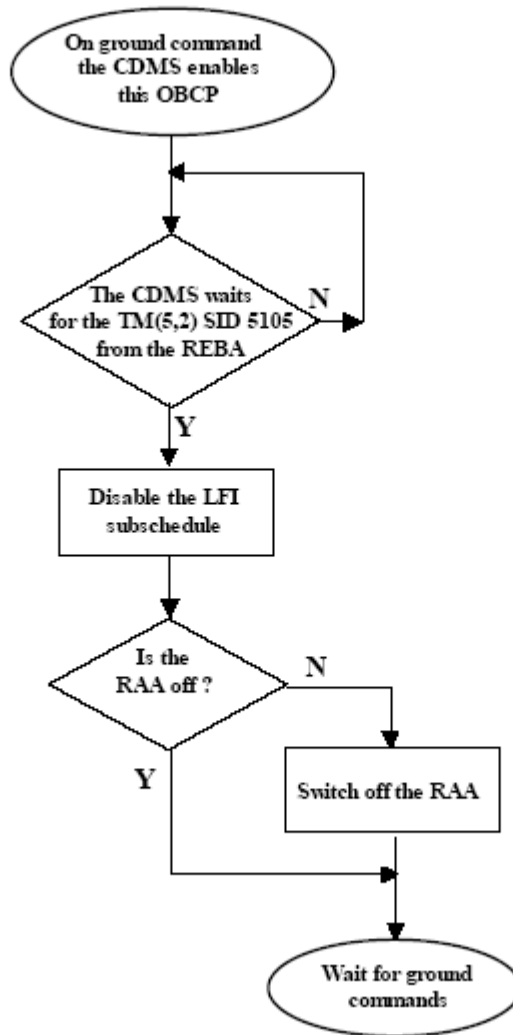
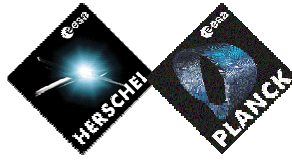


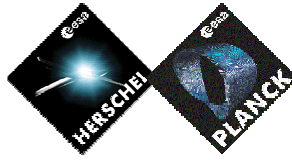
Figure 5.2.3-1 : LFI « Loss of DAE HK » procedure



### 5.2.3.2.2 DB\_OBCP\_P\_LFI\_CHECK\_REBA\_TM

OBCP DB_OBCP_P_LFI_CHECK_REBA_TM		
ID	DB_OBCP_P_LFI_CHECK_REBA_TM	TBD
Triggered by	Event 0x00BC from CDMS.	TFL TM FDIR
Type		TBD
Time-Out		900 seconds TBD
OBCP Parameters		
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with LFI related events that could contradict or interfere with current OBCP execution, i.e. : <ul style="list-style-type: none"> <li>- 0x00BC from CDMS as it triggers the current OBCP</li> <li>-</li> </ul>	Send TC(19,5) "Disable Actions" with the following parameters: <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x00BC (CDMS TFL TM)</li> </ul>
	Stop execution of all running LFI OBCP that could contradict or interfere with current OBCP execution: <ul style="list-style-type: none"> <li>- None</li> </ul>	
Detect whether the REBA restarted its operations from the Startup SW execution. according to procedure "Loss of TM from LFI" defined in [RD7]		<pre> /* Disable all commanding of LFI from the MTL */ Send TC(11,2) "Disable Release of Telecommands" with the following parameters:<sup>112</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = &lt;LFI_SUBS_ID_CMD&gt; (TBD) (HFI command sub-schedule) - SUBSCHEDULE-ID = &lt;LFI_SUBS_ID_META&gt; (TBD) (LFI meta subschedule) - M = 0 ( All APID)  Continue_TM_Check = 0;  While (Continue_TM_Check &lt; 10 (TBC) ) {   /* Declare LFI RT (Nom. and Red.) as Well_TM in order to be able to receive TM */    Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:   - RTA = &lt;SDB_RTA_LFI_A_VALUE&gt;   - F0 / M0 = 0b / 0b (Flag ignored)   - F1 / M1 = 0b / 0b (Flag ignored)   - F2 / M2 = 0b / 0b (Flag ignored)   - F3 / M3 = 1b / 1b (RTA Well_TM)   - F4 / M4 = 0b / 0b (Flag ignored)   - F5 / M5 = 0b / 0b (Flag ignored)   - F6 / M6 = 0b / 0b (Flag ignored)   - F7 / M7 = 0b / 0b (Flag ignored)   - F8 / M8 = 0b / 0b (Flag ignored)   - F9 / M9 = 0b / 0b (Flag ignored)   - F10 / M10 = 0b / 0b (Flag ignored) </pre>

<sup>112</sup> According to [RD10]



		<pre> - F11 / M11 = 0b / 0b (Flag ignored) - CNT / M_C = 00b / 0b (Flag ignored)  Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = &lt;SDB_RTA_LFI_B_VALUE&gt; - F0 / M0 = 0b / 0b (Flag ignored) - F1 / M1 = 0b / 0b (Flag ignored) - F2 / M2 = 0b / 0b (Flag ignored) - F3 / M3 = 1b / 1b (RTA Well_TM) - F4 / M4 = 0b / 0b (Flag ignored) - F5 / M5 = 0b / 0b (Flag ignored) - F6 / M6 = 0b / 0b (Flag ignored) - F7 / M7 = 0b / 0b (Flag ignored) - F8 / M8 = 0b / 0b (Flag ignored) - F9 / M9 = 0b / 0b (Flag ignored) - F10 / M10 = 0b / 0b (Flag ignored) - F11 / M11 = 0b / 0b (Flag ignored) - CNT / M_C = 00b / 0b (Flag ignored)  Wait 58 s (TBC)  /* Check if LFI produced any TM during the last 2 seconds */ LFI_TM_Nr_1 = &lt;DID_BSW_SDB_NOF_LFI_TM&gt;<sup>113</sup> Wait 2 seconds LFI_TM_Nr_2 = &lt;DID_BSW_SDB_NOF_LFI_TM&gt;<sup>114</sup>  If (LFI_TM_Nr_2 ≠ LFI_TM_Nr_1) then { /* TM from LFI received */      /* Check if LFI is producing Event TM */     Wait until event from LFI is received or Time-out (TBD) has elapsed      If /* Event received from LFI */     {         Continue_TM_Check = Continue_TM_Check + 1;          If (Continue_TM_Check == 10 (TBC) )         { /* TM Check completed */              /* Reset the REBA writing in SA28R */             Action TBD<sup>115</sup>              /* Send TM(5,4) signalling "LFI Standby" */             Issue a TM(5,4) with the following parameters:             - Event ID = &lt;LFI_STANDBY_EID&gt; (TBD)             - SID = 0x0000             - Parameters A = 0x0000_0000_0000_FFFF             - Event Sequence Counter = Generated autonomously by the CDMU OBSW             - Parameters B = None          } /* End TM Check completed */      } /* End Event received from LFI */  Else /* Time-out has elapsed */ { /* No event received from LFI */ </pre>
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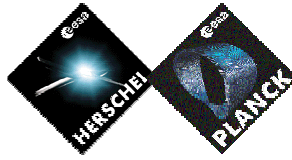
<sup>113</sup> DID\_BSW\_SDB\_NOF\_LFI\_TM is read from the CDMU datapool. It corresponds to the number of successful TM packet transfers from LFI. Failed TM transfers are not included. It is assumed it satisfies the request from LFI (TBC).

<sup>114</sup> DID\_BSW\_SDB\_NOF\_LFI\_TM is read from the CDMU datapool. It corresponds to the number of successful TM packet transfers from LFI. Failed TM transfers are not included. It is assumed it satisfies the request from LFI (TBC).

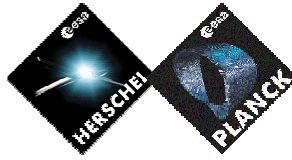
<sup>115</sup> TBD: the command to be sent has to be clearly described

<sup>116</sup> TBD: it is assumed that it is preferable to mark LFI as OFF in order to trigger again S/C 1553B bus FDIR. This would mean that no communication with LFI would be performed (no TM/ TC). This has to be confirmed.

<sup>117</sup> [RD7] requests to check if RAA is OFF or not before switching it OFF. This is assumed to be useless.



		<pre> */ Continue_TM_Check = 10 (TBC); /* Exit from while  /* Send TM(5,4) signalling "LFI Standby" */ Issue a TM(5,4) with the following parameters: - Event ID = &lt;LFI_STANDBY_EID&gt; (TBD) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously   by the CDMU OBSW - Parameters B = None  } /* End No event received from LFI */  } /* End TM from LFI received */  Else { /* No TM from LFI */  /* Declare the two LFI RT as OFF */<sup>116</sup> Send TC(8,4,10,1) with the following parameters: - RTA = &lt;SDB_RTA_LFI_A_VALUE&gt; - F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF) - F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)  Send TC(8,4,10,1) with the following parameters: - RTA = &lt;SDB_RTA_LFI_B_VALUE&gt; - F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF) - F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored) - CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)  /* Send TM(5,4) signalling "LFI off" */ Issue a TM(5,4) with the following parameters: - Event ID = &lt;LFI_OFF_EID&gt; (TBD) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously   by the CDMU OBSW - Parameters B = None  Continue_TM_Check = 10 (TBC); /* Exit from while */  } /* End No TM from LFI */  } /* End While Continue_TM_Check */ </pre>
--	--	---



		<p>/* Switch OFF the RAA <sup>117*</sup>/</p> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0033 (LCL 51 = LFI DAE Power Box Nom)</li> </ul> <p>Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:</p> <ul style="list-style-type: none"> <li>- PCDU Unit Code = 0x0034 (LCL 52 = LFI DAE Power Box Red)</li> </ul> <p>/* There is no need to mark LFI RAA as OFF as it is not thermally controlled */</p>
	<p>Enable EAT entries that triggered the current OBCP:</p> <ul style="list-style-type: none"> <li>- 0x00BC from CDMS</li> <li>-</li> </ul>	<p>Send TC(19,4) "Enable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0001</li> <li>- APID / Event ID = 0x0010 / 0x00BC (CDMS TFL TM FDIR)</li> </ul>

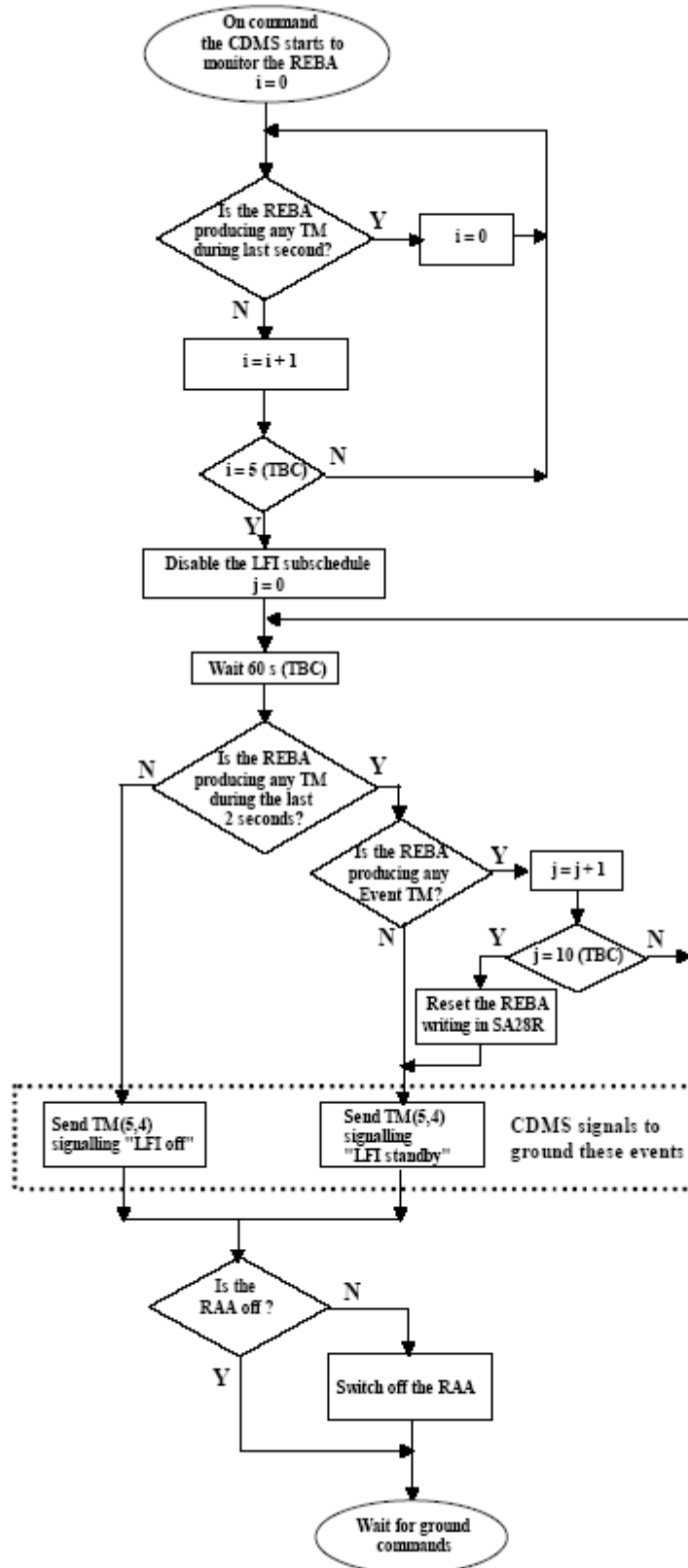
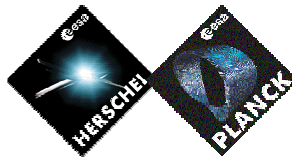
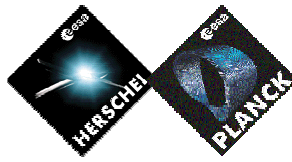


Figure 5.2.3-2 : LFI « Loss of TM from LFI » procedure





## 5.3 SCE

### 5.3.1 SCE FDIR

#### 5.3.1.1 SCE internal FDIR

According to [RD8], SCE generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity<sup>118</sup>.

Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
Boot Mode entered	5,1	1	Switch OFF the 20A power line	DB_OBCP_P_SCE_20A_POWER_OFF
Init Mode entered	5,1	2	Switch OFF the 20A power line <sup>119</sup>	DB_OBCP_P_SCE_20A_POWER_OFF
Ready Mode entered	5,1	3	Switch ON the 20A power line <sup>120</sup>	DB_OBCP_P_SCE_20A_POWER_ON
Shutdown Mode entered	5,1	8 <sup>121</sup>	Switch OFF the 20A power line	DB_OBCP_P_SCE_20A_POWER_OFF
Electronics over temperature	5,4	11	Switch OFF both power lines	DB_OBCP_P_SCE_OFF

Table 5.3.1-1 : SCE internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support SCE Internal FDIR.

Note that SCE Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0680 for SCE Prime
- 0x0681 for SCE Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

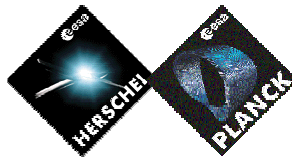
APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
------	----------	--------------------	--------------------	--------------------------	---------------

<sup>118</sup> TBC: [RD8] section 6.2.3 specifies that Event ID 10 is sent to ask the CDMS for a shutdown. However, this case does not appear in sections 6.6 and 6.6.1.1 (figure 1). This shall be clarified.

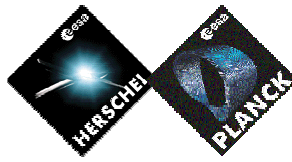
<sup>119</sup> TBC: The need for this autonomous action shall be confirmed as Init Mode is commanded by Ground and there is no tight timing constraint to switch OFF the 20A power line such that it would required support from the CDMS OBSW.

<sup>120</sup> TBC: The need for this autonomous action shall be confirmed as Ready Mode is commanded by Ground and there is no tight timing constraint to switch ON the 20A power line such that it would required support from the CDMS OBSW.

<sup>121</sup> TBC: [RD8] and previous issue of [AD9] specifies Event ID = 8 whereas last issue of [AD9] specifies Event ID = 9 though it is not traced in change record. This shall be clarified. In addition, the need for this autonomous action shall be confirmed as Shutdown is commanded by Ground and there is no tight timing constraint to switch OFF the 20A power line such that it would required support from the CDMS OBSW.



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0680 (SCE Prime)	1	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	1	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	2	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	2	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	3	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_ON N1=0x0001 OBCP-PID= 0xXXXX = <SCE_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <SCE_PL_SIDE_NOM> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	3	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_ON N1=0x0001 OBCP-PID= 0xXXXX = <SCE_PL_SIDE_PID> (TBD) VALUE = 0XXXXXXXXX = <SCE_PL_SIDE_NOM> (TBD)	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	8	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	8	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	11	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0681 (SCE Red.)	11	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	01 <sub>b</sub> (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 5.3.1-2 : EAT for SCE Internal FDIR

### 5.3.1.2 SCE S/C FDIR

#### 5.3.1.2.1 SCE S/C 1553B Bus FDIR

The following table summarises what SCE requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with SCE triggers.

Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	156	Switch OFF SCE <sup>122</sup>	DB_OBCP_P_SCE_OFF
TFL TC FDIR	5,x	175	Switch OFF SCE <sup>123</sup>	DB_OBCP_P_SCE_OFF
TFL TM FDIR	5,x	189	Switch OFF SCE <sup>124</sup>	DB_OBCP_P_SCE_OFF

Table 5.3.1-3 : SCE S/C 1553B Bus FDIR

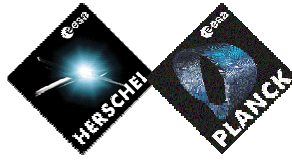
From the previous table, one can define the following EAT entries to support HFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	156 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	175 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	189 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	11 <sub>b</sub> (Enabled in both AFS &	0 (Disabled)	1 (Enabled)

<sup>122</sup> TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.

<sup>123</sup> TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.

<sup>124</sup> TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.



APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
			AFO)		

Table 5.3.1-4 : EAT for SCE S/C 1553B Bus FDIR

### 5.3.1.2.2 SCE Science Data Monitoring

**TBW**

### 5.3.1.2.3 SCE Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to SCE.

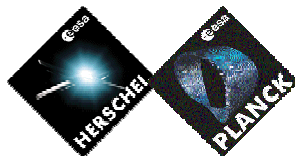
## 5.3.2 SCE S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, SCE will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP. This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing <sup>125</sup>	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_SM_OBCP

Table 5.3.2-1 : SCE OBCP vs. S/C Mode transition

<sup>125</sup> TBC: It shall be confirmed that there is no need to go to Ready Mode.

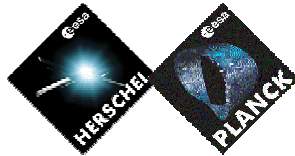


### 5.3.3 SCE OBCP

#### 5.3.3.1 List of SCE OBCP

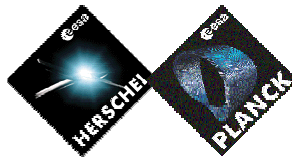
According to sections 5.3.1 and 5.3.2, the following OBCP are needed to support SCE activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_SCE_20A_POWER_OFF	X					0x0680 (SCE Prime)	5,1	0x0001 1	
	X					0x0681 (SCE Red.)	5,1	0x0001 1	
	X					0x0680 (SCE Prime)	5,1	0x0002 2	
	X					0x0681 (SCE Red.)	5,1	0x0002 2	
	X					0x0680 (SCE Prime)	5,1	0x0008 8	
	X					0x0681 (SCE Red.)	5,1	0x0008 8	
DB_OBCP_P_SCE_20A_POWER_ON	X					0x0680 (SCE Prime)	5,1	0x0003 3	
	X					0x0681 (SCE Red.)	5,1	0x0003 3	
DB_OBCP_P_SCE_OFF	X					0x0680 (SCE Prime)	5,4	0x000B 11	
	X					0x0681 (SCE Red.)	5,4	0x000B 11	
			X			0x0010 (CDMS)	5,x	0x009C 156 (DLL FDIR)	



OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
		X				0x0010 (CDMS)	5,x	0x00AF 175 (TFL TC FDIR)	
		X				0x0010 (CDMS)	5,x	0x00BD 189 (TFL TM FDIR)	

Table 5.3.3-1 : List of SCE OBCP



### 5.3.3.2 SCE OBCP Specification

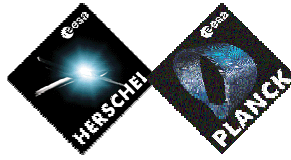
#### 5.3.3.2.1 DB\_OBCP\_P\_SCE\_20A\_POWER\_OFF

OBCP DB_OBCP_P_SCE_20A_POWER_OFF		
ID	DB_OBCP_P_SCE_20A_POWER_OFF	TBD
Triggered by	Event 0x0001 from SCE Nom. Or Red.	Internal FDIR - Boot Mode entered
	Event 0x0002 from SCE Nom. Or Red.	Internal FDIR - Init Mode entered
	Event 0xs0008 from SCE Nom. Or Red.	Internal FDIR - Shutdown Mode entered
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0001, 0x0002, 0x0008 from SCE Nom. & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0006 (6 entries) - APID / Event ID = 0x0680 / 0x0001 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0001 (SCE Red.) - APID / Event ID = 0x0680 / 0x0002 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0002 (SCE Red.) - APID / Event ID = 0x0680 / 0x0008 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0008 (SCE Red.) -
	Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution:  - None <sup>126</sup> -	
	Disable all commanding of SCE from the MTL <sup>127</sup>	Send TC(11,2) "Disable Release of Telecommands" with the following parameters: <sup>128</sup> - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SCE_SUBS_ID_CMD> (TBD) (SCE command sub-schedule) - SUBSCHEDULE-ID = <SCE_SUBS_ID_META> (TBD) (PACS meta subschedule) - M = 0 ( All APID)
Shutdown the 20A power line	OPEN LCL related to both nominal and redundant Sorption Cooler Compressors	/* SCC A */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:

<sup>126</sup> TBC: it is assumed Switch ON request following entering in Ready Mode can not occur while Boot, Init or Shutdown mode is entered.

<sup>127</sup> TBC: This is not clearly requested by SCE but is done for consistency purpose.

<sup>128</sup> According to [RD10]



		<p>- PCDU Unit Code = 0x0043 (LCL 67 = SCC B1)<sup>129</sup></p> <p>/* SCC B */ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x003F (LCL 63 = SCC A1)<sup>130</sup></p>
	Declare the two SCE RT as OFF <sup>131</sup>	<p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_SCE_A_VALUE &gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul> <p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RTA_SCE_B_VALUE &gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F7 / M7 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F8 / M8 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F9 / M9 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F10 / M10 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F11 / M11 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- CNT / M_C = 00<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>
On CDMS watchdog on SCE time-out, shutdown both power lines <sup>132</sup>		TBD
	Mark SCC as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	N/A <sup>133</sup>
	Enable EAT entries that triggered the current OBCP: - 0x0001, 0x0002, 0x0008 from	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0006 (6 entries) - APID / Event ID = 0x0680 / 0x0001 (SCE Nom.)

<sup>129</sup> The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.

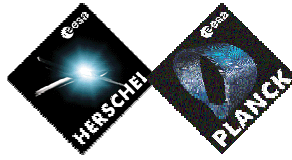
<sup>130</sup> The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.

<sup>131</sup> TBC: confirmation of this action pending clarification of CDMS watchdog on SCE time-out. If RT is declared as OFF, no communication with SCE is performed, i.e. no event from SCE is transferred. What should allow to detect the watchdog time-out?

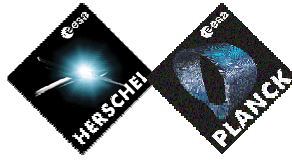
<sup>132</sup> TBC: It is not clear what SCE time-out means. Shall the CDMS OBSW check that an event from the SCE is received not later than a specific duration?

<sup>133</sup> The SCC is not thermally controlled so it is not possible (and not needed) to mark it OFF.





	SCE Nom. & Red.	<ul style="list-style-type: none"><li>- APID / Event ID = 0x0681 / 0x0001 (SCE Red.)</li><li>- APID / Event ID = 0x0680 / 0x0002 (SCE Nom.)</li><li>- APID / Event ID = 0x0681 / 0x0002 (SCE Red.)</li><li>- APID / Event ID = 0x0680 / 0x0008 (SCE Nom.)</li><li>- APID / Event ID = 0x0681 / 0x0008 (SCE Red.)</li></ul>
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### 5.3.3.2.2 DB\_OBCP\_P\_SCE\_20A\_POWER\_ON

OBCP DB_OBCP_P_SCE_20A_POWER_ON		
ID	DB_OBCP_P_SCE_20A_POWER_ON	TBD
Triggered by	Event 0x0003 from SCE Nom. Or Red.	Internal FDIR - Ready Mode entered
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	PL_Side	Indicates whether nominal or redundant SCC has to be switched ON Default value = NOM (TBC)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. :  - 0x0003 from SCE Nom. & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0680 / 0x0003 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0003 (SCE Red.)
	Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution:  - None	
Put ON the 20A power line	CLOSED LCL related to active Sorption Cooler Compressors	If (PL_Side <sup>134</sup> == NOM) then { LCL_SCC = 0x0043 (LCL 67 = SCC B1) <sup>135</sup> } Else /* Redundant side */ { LCL_SCC = 0x003F (LCL 63 = SCC A1) <sup>136</sup> }  /* Switch ON SCC */ Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_SCC ;
	Enable EAT entries that triggered the current OBCP:  - 0x0003 from SCE Nom. & Red.	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0680 / 0x0003 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0003 (SCE Red.)

<sup>134</sup> TBC: Instead of passing as a parameter the SCC to be switched ON, this could be deduced from reading which SCE is ON.

<sup>135</sup> The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.

<sup>136</sup> The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.



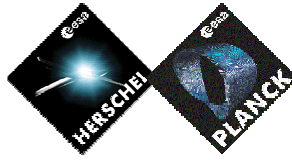
### 5.3.3.2.3 DB\_OBCP\_P\_SCE\_OFF

OBCP DB_OBCP_P_SCE_OFF		
ID	DB_OBCP_P_SCE_OFF	TBD
Triggered by	Event 0x000B from SCE Nom. Or Red.	Internal FDIR - Electronics over temperature
	Event 0x009C from CDMS	DLL FDIR
	Event 0x00AF from CDMS	TFL TC FDIR
	Event 0x00BD from CDMS	TFL TM FDIR
Type		TBD
Time-Out		30 seconds TBC
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	<p>Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. :</p> <ul style="list-style-type: none"> <li>- 0x000B from SCE Nom. &amp; Red. as they trigger the current OBCP</li> <li>- 0x009C, 0x00AF, 0x00BD from CDMS as they trigger the current OBCP</li> <li>- 0x0003 from SCE Nom. &amp; Red. as they would switch ON SCC</li> </ul>	<p>Send TC(19,5) "Disable Actions" with the following parameters:</p> <ul style="list-style-type: none"> <li>- N = 0x0007 (7 entries)</li> <li>- APID / Event ID = 0x0680 / 0x000B (SCE Nom.)</li> <li>- APID / Event ID = 0x0681 / 0x000B (SCE Red.)</li> <li>- APID / Event ID = 0x0010 / 0x009C (CDMS DLL FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00AF (CDMS TFL TC FDIR)</li> <li>- APID / Event ID = 0x0010 / 0x00BD (CDMS TFL TM FDIR)</li> <li>- APID / Event ID = 0x0680 / 0x0003 (SCE Nom.)</li> <li>- APID / Event ID = 0x0681 / 0x0003 (SCE Red.)</li> </ul>
	<p>Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution:</p> <ul style="list-style-type: none"> <li>- DB_OBCP_P_SCE_20A_POWER_ON as it would switch ON SCC</li> </ul>	<p>Send TC(18,4) "Stopping a procedure", with the following parameters:</p> <ul style="list-style-type: none"> <li>- Procedure-ID = DB_OBCP_P_SCE_20A_POWER_ON</li> </ul>
	<p>Disable all commanding of SCE from the MTL<sup>137</sup></p>	<p>Send TC(11,2) "Disable Release of Telecommands" with the following parameters:<sup>138</sup></p> <ul style="list-style-type: none"> <li>- N = 2 (Two sub-schedules)</li> <li>- SUBSCHEDULE-ID = &lt;SCE_SUBS_ID_CMD&gt; TBC (SCE command sub-schedule)</li> <li>- SUBSCHEDULE-ID = &lt;SCE_SUBS_ID_META&gt; TBC (PACS meta subschedule)</li> <li>- M = 0 (All APID)</li> </ul>
	<p>Declare the two SCE RT as OFF</p>	<p>Send TC(8,4,10,1) with the following parameters:</p> <ul style="list-style-type: none"> <li>- RTA = &lt;SDB_RT_A_SCE_A_VALUE&gt;</li> <li>- F0 / M0 = 0<sub>b</sub> / 1<sub>b</sub> (RTA OFF)</li> <li>- F1 / M1 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F2 / M2 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F3 / M3 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F4 / M4 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F5 / M5 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> <li>- F6 / M6 = 0<sub>b</sub> / 0<sub>b</sub> (Flag ignored)</li> </ul>

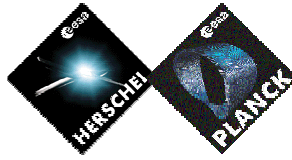
<sup>137</sup> TBC: This is not clearly requested by SCE but is done for consistency purpose.

<sup>138</sup> According to [RD10]





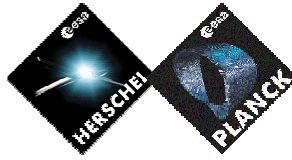
		- FDIR) - APID / Event ID = 0x0010 / 0x00BD (CDMS TFL TM FDIR)
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## 5.4 Common PLANCK OBCP

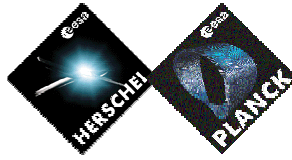
### 5.4.1 DB\_P\_PL\_SC\_MODE\_OBCP

OBCP DB_P_PL_SC_MODE_OBCP		
ID	DB_P_PL_SC_MODE_OBCP	TBD
Triggered by	S/C mode transition to EAM or SAM	
Type		TBD
Time-Out		30 seconds <b>TBC</b>
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
HFI : Do nothing		
LFI: Do nothing		
SCE: Do nothing		



#### 5.4.2 DB\_P\_PL\_SC\_SM\_OBCP

OBCP DB_P_PL_SC_SM_OBCP		
ID	DB_P_PL_SC_SM_OBCP	TBD
Triggered by	S/C mode transition to SM	
Type		TBD
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
HFI : Do nothing		
LFI: Do nothing		
SCE: Do nothing		



## 6. OPEN POINTS

In addition to the specific TBD/TBC identified in the previous sections, the following general issues need to be clarified.

### 6.1 OBCP Telecommand Verification Report

- What Verification Report shall be requested for all TC generated by the OBCP (i.e. what Ack Field shall be used in these TC)?
- In addition to Acceptance and Execution reports, shall the generation of a TM(1,9) "Telecommand Contents Report" be requested for each of these TC ?

### 6.2 OBCP TM/TC rate

- In order to minimise the number of TC and TM (mainly TM(1,x) depending on outcome of 6.1) sent by one OBCP, it is suggested not to send more than one TC per second by adding adequate delay between two consecutive TC. As no tight timing constraint is requested by Instruments and it was agreed to have low priority for OBCP execution, this is assumed to be acceptable.

### 6.3 OBCP simplification vs. P/L FDIR hierarchy

- A policy to avoid the interference/contradiction between recovery sequences executed by the P/L OBCP has been defined (stopping EAT entries and OBCP execution) based on the analysis of the content of these sequences. Simplification (e.g. only one recovery at a time, use of semaphore...) could be applied if FDIR hierarchy/criticality and likelihood to get parallel failures are specified by Instruments. This would also ease the maintenance of the P/L OBCP which will be more independent from each other.

END OF DOCUMENT