



## Test Procedure

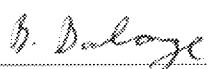
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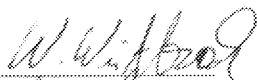
Title: **Unit Functional Test of Integrated FM SPIRE Warm Units**

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## 1 Scope

This document describes the set of functional tests to be performed on the FM SPIRE Instrument to check correct operation using the Herschel CCS after it has been electrically integrated with the FM SVM.

Specifically the functional test will verify the following for both prime and redundant SPIRE warm units:

- **Power on/off of FM SPIRE (CDMS/PCDU Interface) warm unit and DRCU (FCU)**
- **Health Status HKTM Acquisition from SPIRE (CDMS Interface)**
- **Check of SCU Prime Low & High Speed Links**
- **Check of MCU Prime Low & High Speed Links**
- **Check of DCU Prime Low & High Speed Links**

### Constraint

This test shall only be executed upon successful completion of the FM SPIRE integration activities as defined in ref. AD1.

### 1.1 Objective

The objective of the test is twofold:

1. To check as much as possible the correct functional operation of the integrated FM SPIRE warm units.
2. To act as baseline procedure on which the SPIRE specific aspects of the satellite level SFT and IST procedures can be developed.

### 1.2 Test Flow

This test flow is structured to reflect nominal operations of the FM SPIRE as much as possible to enable re-use for higher-level Satellite tests (SFT and IST).

The flow is as follows:

1. Power on and configure EGSE for test
2. Power on and configure SVM for test
3. Power on NOMINAL SPIRE Prime DPU and enable Mil1553B-bus interface
4. Power on DRCU(FCU) Prime

5. Check of SCU Prime Low & High Speed Links
6. Check of MCU Prime Low & High Speed Links
7. Check of DCU Prime Low & High Speed Links
8. Power off MCU Prime
9. Power off DRCU(FCU) Prime
10. Disable Mil1553B-bus interface and Power off SPIRE Prime DPU
11. Repeat Steps 3 – 10 for Spire Redundant including bus
12. Power off SVM
13. Switch off all EGSE



## 2 Documents/Drawings

### 2.1 Applicable Documents

AD 1	FM SPIRE Integration to Herschel SVM Procedure	HP-2-ASED-TP-125
AD 2	Herschel PCDU & CDMS Nominal Switch On/Off Procedure	HP-2-ASED-PR-070 in preparation
AD 3	Herschel SAT Emergency Switch Off Procedure	HP-2-ASED-PR-071
AD 4	PA Plan	HP-2-ASED-PL-0007
AD 5	I-EGSE Switch ON/OFF Procedure	TBI
AD 6	Test Specification for Herschel Instrument AVM & FM Tests Performed at Satellite Level	H-P-2-ASP-TS-1083
AD 7	H-P GDIR	H-P-1-ASPI-SP-0027
AD 8	SPIRE I-EGSE Set-Up, Issue 1.2	SPIRE-RAL-DOC-002841

### 2.2 Reference Documents

RD 1	Herschel Planck Central Checkout System System User Manual	H-P-4-TE-MA-0010
RD 2	N/A	N/A
RD 3	Herschel CDMU ASW S/W Interface Control Document	H-P-4-SSF-IC-0001
RD 4	Herschel CDMU BSW S/W Interface Control Document	H-P-4-SES-NT-0076
RD 5	SPIRE IID-B	SCI-PT-IIDB/SPIRE-02124
RD 6	SPIRE Warm Units Integration Test Procedures Iss. 1.3	SPIRE-RAL-PRC-2680
RD 7	SPIRE Functional Test Specification Iss. 1.4	SPIRE-RAL-DOC-001652
RD 8	SPIRE ILT Warm Unit Functional Test Procedure Iss. 1.2	SPIRE-RAL-PRC-002322
RD 9	SPIRE Instrument User Manual Iss. 1.0	SPIRE-RAL-PRJ-002395

RD 10	H/P OBT-UTC Time Synchronisation Technical Note Iss. 1.3	PT-CMOC-OPS-TN-6604- OPS- OGH
RD 11	Operating Manual DRCU Simulator, Iss 1	SPIRE-STK-PRC-001744

### 2.3 Other Documents

None

### 2.4 Acronyms & Abbreviations

1553	MIL-STD-1553B conform communication interface
AAD	Attitude Anomaly Detector
ACC	ACMS Control Computer
ACMS	Attitude Control and Measurement Subsystem
AD	Applicable Document
AIR	ACC In Reconfiguration
AIT	Assembly, Integration and Test
AIV	Assembly, Integration and Verification
APID	Application Process ID
ASW	Application Software
AVM	Avionics Model
BOLC	BOLometer Control unit (PACS)
BSW	Basic Software
CBH	Catalyst Bed Heater
CCS	Central Check-out System
CCSDS	Consultative Committee for Space Data Systems
CDMU	Control and Data Management Unit
CDMS	Control and Data Management Sub-system
CIR	CDMU In Reconfiguration
CLCW	Command Link Control Word
CLTU	Command Link Transmission Unit
CPDU	Command Pulse Distribution Unit
CRS	Coarse Rate Sensor
CTR	Central on board Reference Time

DCU	Detector Control Unit (SPIRE)
DEC	Detectors Electronics Control unit (PACS)
DMC	Detector and Mechanism Control unit (PACS)
DPU	Digital Processing Unit
DRCU	Detector Readout & Control Unit (SPIRE)
EEPROM	Electrically Erasable PROM
EGSE	Electrical Ground Support Equipment
FCL	Fold-back Current Limiter
FCU	FPU Control Unit (Spire)
FCV	Flow Control Valves
FDIR	Failure Detection, Isolation, and Recovery
FPU	Focal Plane Unit
GDIR	General Design and Interface Requirement
GRP	Group Heaters Switch
HBR	High Bit Rate
HL/HLC	High Level command
HP/HPC	High Priority commands
HPLM	Herschel PayLoad Module
HPADB	Herschel Planck System Data Base
HW	Hardware
i.a.w.	In accordance with
I/F	InterFace
I/O	Input/Output
ICD	Interface Control Document
IST	Integrated System Test
LCL	Latching Current Limiter
LV	Latching Valves
LBR	Low Bit Rate
MAP	Multiplexed Access Point
MBR	Medium Bit Rate
MCU	Mechanisms Control Unit (SPIRE)
MEC	Mechanisms Electronics Control unit (PACS)

ML 16	Memory Load command (ML 16)
MM	Memory Module
MOIS	Mission Operations Information System
MTL	Mission Timeline
NRZ-L	Non Return to Zero – Litton
OBCP	On-Board Control Procedure
OBDAH	On-Board Data Handling
OBFM	On-Board Monitoring Function
OBRT/OBT	On-Board Reference Time
OIRD	Operation Interface Requirement Document
PACS	Photodetector Array Camera & Spectrometer
P/L	Payload
PCDU/PCS	Power Control Distribution Unit/Power Control Subsystem
PM	Processor Module
PROM	Programmable Read Only Memory
PSK	Phase Shift Keying
RA	Rate Anomaly
RAM	Random Access Memory
RCS	Reaction Control Subsystem
RD	Reference Document
RF	Radio Frequency
RM	Reconfiguration Module
RT	1553 Remote Terminal
RTU	RT Unit
RTA	RTU
RWL	Reaction Wheel Assembly
SA	1553 Remote Terminal Sub Address
SAS	Sun Acquisition Sensor
SCOE	Special Check-out Equipment
SCU	Subsystems Control Unit (SPIRE)
SIR	S/C In Reconfiguration
SIT	Subsystem Integrated Test

SP	Sun Pointing
SPIRE	Spectral & Photometric Imaging Receiver
SPU	Signal Processing Unit (PACS)
SSMM	Solid State Mass Memory
STR	Star Tracker
SVM	Service Module
SW	Software
TAI	International Atomic Time
TC	TeleCommand
TFG	Transfer Frame Generator
TM	TeleMetry
TTC	Telemetry Tracking & Command subsystem
TTR	Telemetry Telecommand and Reconfiguration
UFT	Unit Functional Test
VC	Virtual Channel
WD	Watchdog

### 3 Configuration

The figure below shows the overall EGSE/Satellite configuration for the test.

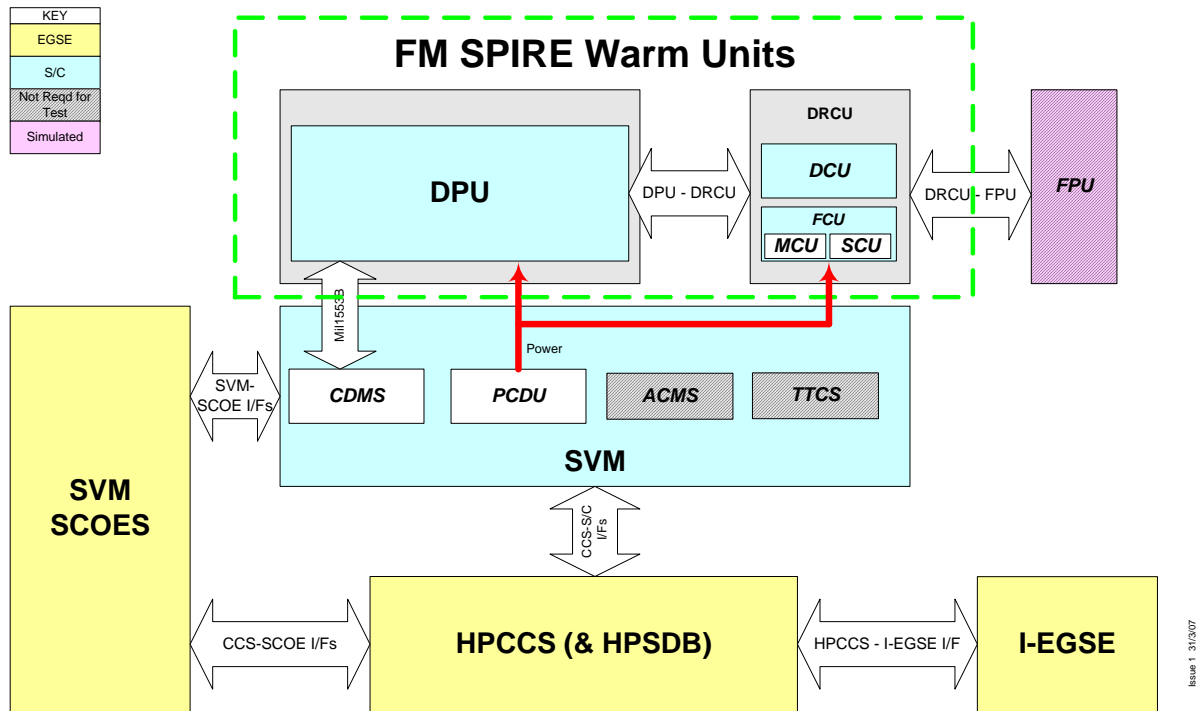


Figure 3-1: FM SPIRE UFT Configuration

#### 3.1 Satellite Configuration

The test requires use of the FM SVM powered on in its basic test mode (i.e. quick switch on (PCDU & CDMS) in accordance with AD 2.

#### 3.2 EGSE Configuration

This test requires the EGSE to be configured and elements powered on in accordance with AD 2.

I-EGSE shall be configured and connected to the HPCCS in accordance with AD 5 & AD 9.

#### 3.3 Set-up

SPIRE Test Scripts for the test must be loaded on to the HPCCS and checked in to the **H\_FM\_ASTRUM\_ENV** Environment and compiled prior to start of test.

The following test scripts are required for execution on the HPCCS:

No.	Tcl Script Name	Comment	Confirmed
1	SPIRE-WU-INT-DPU-ON-P	DPU Prime power on sequence	
2	SPIRE-WU-INT-DRCU-START-P-STEP1	DRCU PRIME Power up step 1	
3	SPIRE-WU-INT-DRCU-START-P-STEP2	DRCU PRIME Power up step 1	
4	SPIRE-WU-INT-SCU-01-P	SCU Low Speed Link check	
5	SPIRE-WU-INT-SCU-02-P	SCU High Speed Link check	
6	SPIRE-WU-INT-MCU-01-P	MCU Low Speed Link check	
7	SPIRE-WU-INT-MCU-02-P	MCU High Speed Link check	
8	SPIRE-WU-INT-DCU-01-P	DCU Low Speed Link check	
9	SPIRE-WU-INT-DCU-02-P	DCU High Speed Link check	
10	SPIRE-WU-INT-MCU-OFF-P	MCU power off	
11	SPIRE-WU-INT-DRCU-OFF-P	DRCU PRIME power off	
12	SPIRE-WU-INT-DPU-ON-R	DPU Prime power on sequence	
13	SPIRE-WU-INT-DRCU-START-R-STEP1	DRCU PRIME Power up step 1	
14	SPIRE-WU-INT-DRCU-START-R-STEP2	DRCU PRIME Power up step 1	
15	SPIRE-WU-INT-SCU-01-R	SCU Low Speed Link check	
16	SPIRE-WU-INT-SCU-02-R	SCU High Speed Link check	
17	SPIRE-WU-INT-MCU-01-R	MCU Low Speed Link check	
18	SPIRE-WU-INT-MCU-02-R	MCU High Speed Link check	
19	SPIRE-WU-INT-DCU-01-R	DCU Low Speed Link check	
20	SPIRE-WU-INT-DCU-02-R	DCU High Speed Link check	
21	SPIRE-WU-INT-MCU-OFF-R	MCU power off	
22	SPIRE-WU-INT-DRCU-OFF-R	DRCU PRIME power off	
23	SubscribeParams	Subscribe Parameters sequence	

The HPCSS must also have the following MIB files for SPIRE loaded:

HPCCS Software	Version	Comment	Confirmed Installed
SPIRE MIB version	2.2.G2	Valid for both versions of DPU software.	

The SPIRE I-EGSE will be running the following software for the test:

I-EGSE Software	Version	Comment
SPIRE MIB version	2.2.G2	Valid for both versions of DPU software.
SCOS version	2.3e patch 5	

## 4 Conditions

### 4.1 Personnel

Responsibility	Name / Organisation
Test Director	
Test Conductor	
EGSE Operator	
Electrical Engineer	
Specialist Engineer	
Element Cognizant	
PA Responsible	
Instrument Representative	
Customer Representative	
ESA Representative	

### 4.2 Environmental

The actual clean room environmental conditions for the test shall be recorded below.

Environmental	Nominal	Actual	P	N
Clean Room Class	class 100000 or better			
Temperature	22°C ± 3°C			
Rel. Humidity	40 % - 60 %			
Pressure	Ambient			



### **4.3 General Precautions and Safety**

Non-test specific precautions and safety considerations are detailed in section 5.3 of AD 2. Specific safety issues and general precautions for the tests to be performed are detailed in the following sections.

#### **4.3.1 General Safety Requirements, Precautions**

In the event of unrecoverable anomaly requiring emergency switch off of the satellite, the switch off shall be performed in accordance with AD 3.

#### **4.3.2 ESD constraints**

Normal ESD constraints are to be observed when handling SPIRE units.

#### **4.3.3 Special QA Requirements**

None.

### **4.4 GSE**

Non-test specific GSE details are provided in section 5.4 of AD 2. Specific GSE needs for the tests to be performed are detailed in the following sections.

#### **4.4.1 MGSE**

None.

#### **4.4.2 CVSE**

None.

#### **4.4.3 EGSE**

The I-EGSE is required for this test and will be connected to the HPCCS in accordance with AD 5.

#### **4.4.4 OGSE**

None.

#### **4.4.5 Special Equipment**

None.

## 5 Verification Requirements and Test Criteria

This is purely a functional health check of the FM SPIRE warm units and interfaces. No specific requirements are to be verified.

Functional performance and status parameter actual values recorded will be checked during the test and must be the same as the nominal status value indicated.

The test will only be deemed successful once all offline analysis of the results has been performed. Typically, the PTR will be held before completion of this activity and therefore only a preliminary assessment of the test success can be provided to allow disconnection of any specific GSE required for the test and which needs to be removed before further activities can be performed.

## 6 Test Procedure

### 6.1 Initial EGSE and Satellite Configuration for the Test

Spire FM Warm Units Integration to Herschel SVM Test Procedure ref. AD 1 SHALL be successfully completed before execution of this procedure.

The EGSE and Satellite SHALL be configured according to AD 2 prior to start of test.

***In the event of emergency the Satellite SHALL be switched down according to AD 3.***

### 6.2 Step by Step Procedure

#### 6.2.1 EGSE & Satellite Switch On

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>Install Test Box and Satellite &amp; EGSE Switch On</b>						
1.1	Confirm I-EGSE physically connected to HPCCS	OK					
1.2	If not already on, switch on HPCCS, SCOEs and Satellite/SVM and configure into Basic Test Mode i.a.w. AD 2 Section 7.1 to 7.5						
1.3	Record Test Session Name:						
1.4	Confirm that EGSE and Satellite are in the correct configuration as per AD 2	OK					
1.5	If not already selected, from HPCCS command CDMU to use SPIRE Bus Profile (Profile 3):  <div style="text-align: right;"> <b>DC819160</b>                      SelectActiveSCBP <b>DH049160</b> =3                 </div>	OK			AND: ZAD07999  SPIRE Bus Profile		
1.6	Verify correct bus profile selected:  <div style="text-align: right;"> <b>DEF5F160</b> 3                 </div>						

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
1.7	Switch on & configure SPIRE I-EGSE i.a.w. <b>AD5 &amp; AD 9</b>						
1.8	Confirm SPIRE I-EGSE is in the correct configuration as per AD5 & AD 9	OK					
1.9	From HPCCS Test Conductor console issue command to connect to SPIRE I-EGSE  <b>connect HIEGSE</b>						
1.10	Confirm from HPCCS and SPIRE I-EGSE that the connection has been established	OK					
<b>START OF SPIRE UFT</b>							
1.11	Load Synoptics INSTRUMENTS on HPCCS to display SPIRE status overview						

**6.2.2 Switch On SPIRE PRIME DPU**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
<b>SWITCH ON DPU PRIME</b>							
<b>DPU-A Power On</b>							
Initial Conditions: DPU-A OFF							
2.1	Verify the following PCDU telemetry to verify DPU-A Off: LCL11 Status <b>SpireHsdN_L11</b>  LCL11 current <b>SpireHsN_L11</b>	<b>WM32C565</b> OFF  <b>WM308565</b> =0.0A			AND: ZAD03999 MIM: LCL_HERSCHEL		
			+/-0.046A				

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
2.2	Disable CDMU FDIR while DPU switched ON and forced boot (RTA SPIRE used but not relevant) by issuing the following CMDs telecommand and verify on-board execution (x = don't care, either 0 or 1) :						
	<b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	<b>RTA</b>	<b>DH011161</b>	<b>=21</b>		<b>SPIRE-A</b>		
	<b>F0</b>	<b>DH018161</b>	<b>=x</b>		RTA ON		
	<b>F1</b>	<b>DH019161</b>	<b>=x</b>		RTA Alive		
	<b>F2</b>	<b>DH020161</b>	<b>=x</b>		RTA Well_TC		
	<b>F3</b>	<b>DH021161</b>	<b>=x</b>		RTA Well_TM		
	<b>F4</b>	<b>DH022161</b>	<b>=x</b>		RTA Valid		
	<b>F5</b>	<b>DH023161</b>	<b>=x</b>		RTA Vital/Non-vital		
	<b>F6</b>	<b>DH024161</b>	<b>=x</b>		RT Nominal Unit		
	<b>F7</b>	<b>DH025161</b>	<b>=x</b>		RT TM Retry On/Off		
	<b>F8</b>	<b>DH026161</b>	<b>=x</b>		Bus A Active		
	<b>F9</b>	<b>DH027161</b>	<b>=x</b>		Bus A Healthy/Unhealthy		
	<b>F10</b>	<b>DH028161</b>	<b>=x</b>		Bus B Healthy/Unhealthy		
	<b>F11</b>	<b>DH029161</b>	<b>=0</b>		SDBFDIR Disable		
	<b>M0</b>	<b>DH030161</b>	<b>=0</b>		Mask F0		
	<b>M1</b>	<b>DH031161</b>	<b>=0</b>		Mask F1		
	<b>M2</b>	<b>DH032161</b>	<b>=0</b>		Mask F2		
	<b>M3</b>	<b>DH033161</b>	<b>=0</b>		Mask F3		
	<b>M4</b>	<b>DH034161</b>	<b>=0</b>		Mask F4		
	<b>M5</b>	<b>DH035161</b>	<b>=0</b>		Mask F5		
	<b>M6</b>	<b>DH036161</b>	<b>=0</b>		Mask F6		

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =0				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =1				Mask F11		
	CNT DH042161 =1				<b>Vital RT Loop (1)</b>		
	M_C DH043161 =0				<b>Mask for CNT</b>		
2.3	Verify FDIR disabled  <b>DEFJ4160</b>	<b>DISABLED</b>			AND: ZAD07999		
2.4	Switch on RTA and enable Bus A on SPIRE DPU-A (RTA=21) by issuing the following CMDs telecommand and verify on-board execution (x = don't care, either 0 or 1) :  <b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	RTA DH011161 =21				<b>SPIRE-A</b>		
	F0 DH018161 =1				<b>RTA ON</b>		
	F1 DH019161 =1				<b>RTA Alive</b>		
	F2 DH020161 =1				<b>RTA Well_TC</b>		
	F3 DH021161 =1				<b>RTA Well_TM</b>		
	F4 DH022161 =1				<b>RTA Valid</b>		
	F5 DH023161 =x				RTA Vital/Non-vital		
	F6 DH024161 =0				<b>RT Nominal Unit</b>		
	F7 DH025161 =x				RT TM Retry On/Off		
	F8 DH026161 =0				<b>Bus A Active</b>		
	F9 DH027161 =x				Bus A Healthy/Unhealthy		
F10 DH028161 =x				Bus B Healthy/Unhealthy			

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F11 DH029161 =x				SDBFDIR Enable/Disable		
	M0 DH030161 =1				Mask F0		
	M1 DH031161 =1				Mask F1		
	M2 DH032161 =1				Mask F2		
	M3 DH033161 =1				Mask F3		
	M4 DH034161 =1				Mask F4		
	M5 DH035161 =0				Mask F5		
	M6 DH036161 =1				Mask F6		
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =1				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =0				Mask F11		
	CNT DH042161 =1				<b>Vital RT Loop (1)</b>		
	M_C DH043161 =0				<b>Mask for CNT</b>		
2.5	After 10secs verify SPIRE-A RTA ON: SPIREA_OnOff DED1G161 ON SPIREA_DeadAliv DED1H161 Alive SPIREA_WellStiTM DED1J161 Well SPIREA_ValidInval DED1K161 Valid SPIREA_WellStiTC DED1Z161 Well				AND: ZAD12999		
2.6	Power on DPU-A by issuing the following <b>SwOn_SpireHSPDU_N_L11</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution: DC11D170 OK						
2.7	Verify the following PCDU telemetry to verify DPU-A ON:						



Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	LCL11 (DPU-A) Status <b>STS_LCL11</b>  LCL11 (DPU-A) current <b>ITLM_LCL11</b>	<b>WM32C565</b> ON  <b>WM308565</b> 0.46 A					
2.8	HPCCS Operator to inform SPIRE Responsible that SPIRE DPU Nominal powered	OK					
2.9	On HPCCS start test script <b>SubscribeParams.tcl</b> to handle command parameter packets sent from the I-EGSE	OK					
2.10	On HPCCS start <b>SPIRE-WU-INT-DPU-START-P.tcl</b> test script to configure DPU	OK					
2.11	Enable CDMU FDIR (RTA SPIRE used but not relevant) by issuing the following CMDS telecommand and verify on-board execution (x = don't care, either 0 or 1) :						
	<b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	<b>RTA</b>	<b>DH011161</b>	<b>=21</b>		<b>SPIRE-A</b>		
	<b>F0</b>	<b>DH018161</b>	<b>=X</b>		RTA ON		
	<b>F1</b>	<b>DH019161</b>	<b>=X</b>		RTA Alive		
	<b>F2</b>	<b>DH020161</b>	<b>=X</b>		RTA Well_TC		
	<b>F3</b>	<b>DH021161</b>	<b>=X</b>		RTA Well_TM		
	<b>F4</b>	<b>DH022161</b>	<b>=X</b>		RTA Valid		
	<b>F5</b>	<b>DH023161</b>	<b>=X</b>		RTA Vital/Non-vital		
	<b>F6</b>	<b>DH024161</b>	<b>=X</b>		RT Nominal Unit		
	<b>F7</b>	<b>DH025161</b>	<b>=X</b>		RT TM Retry On/Off		
	<b>F8</b>	<b>DH026161</b>	<b>=X</b>		Bus A Active		
	<b>F9</b>	<b>DH027161</b>	<b>=X</b>		Bus A Healthy/Unhealthy		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F10 DH028161 =x				Bus B Healthy/Unhealthy		
	F11 DH029161 =1				<b>SDBDIR Enable</b>		
	M0 DH030161 =0				Mask F0		
	M1 DH031161 =0				Mask F1		
	M2 DH032161 =0				Mask F2		
	M3 DH033161 =0				Mask F3		
	M4 DH034161 =0				Mask F4		
	M5 DH035161 =0				Mask F5		
	M6 DH036161 =0				Mask F6		
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =0				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =1				<b>Mask F11</b>		
	CNT DH042161 =1				<b>Vital RT Loop (1)</b>		
	M_C DH043161 =0				Mask for CNT		
2.12	Verify FDIR (re-)enabled  <b>DEFJ4160</b>	<b>ENABLED</b>			AND: ZAD07999		
2.13	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>(type ,subtype) : (3,25)</li> <li>APID : 0x502 (1282)</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>(type ,subtype) : (3,25)</li> <li>APID: 0x500 (1280)</li> </ul>	OK					

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
2.14	On I-EGSE check that THSK parameter is refreshing every second	OK					
2.15	On I-EGSE check that TM2N parameter is incrementing by 1 every second	OK					
2.16	On I-EGSE check that TM1N parameter is incrementing by 1 every 2 second	OK					
2.17	On CCS check the consistency of the SPIRE on board time to the HCDMU time and the CCS.	OK					
2.18	On IEGSE check the consistency between SCOS time and THSK and QLA time.	OK					
<b>SPIRE PRIME DPU POWER ON COMPLETE</b>							

**6.2.3 Switch On DRCU Prime**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
<b>SWITCH ON DRCU PRIME</b>							
<b>DRCU-A Power On</b>							
Initial Conditions: DRCU-A OFF							
3.1	Verify the following PCDU telemetry to verify FCU-A Off: LCL51 Status <b>SpireHsfN_L51</b>  LCL51 current <b>SpireHsfN_L51</b>	<b>WM42C565</b> OFF  <b>WM408565</b> =0.0A			AND: ZAD03999 MIM: LCL_HERSCHEL		
			+/-0.28A				

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
3.2	Power on FCU-A by issuing the following <b>SwOn_SpireHSPDU_N_L51</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution:  <b>DC51D170</b>	OK					
3.3	Verify the following PCDU telemetry to verify FCU-A ON: LCL51 (FCU-A) Status <b>STS_LCL51</b>  <b>WM42C565</b> LCL51 (FCU-A) current <b>ITLM_LCL51</b>  <b>WM408565</b>	ON  2.8A	  +/- 0.28 A				
3.4	HPCCS Operator to inform SPIRE Responsible that SPIRE DRCU Nominal powered	OK					
3.5	On HPCCS start <b>SPIRE-WU-INT-DRCU-START-P-STEP1.tcl</b> test script to configure DRCU	OK					
3.6	On I-EGSE check that THSK parameter is not refreshing anymore	OK					
3.7	On I-EGSE check that TM2N parameter is not incrementing anymore	OK					
3.8	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DRCU-START-P-STEP2.tcl</b>						
3.9	On I-EGSE check that THSK parameter is refreshing every second	OK					
3.10	On I-EGSE check that TM2N parameter is incrementing by 1 every second	OK					
3.11	Check that the SCU/DCU voltages show nominal values:  <b>SCUP5V</b> <b>SCUP9V</b> <b>SCUM9V</b>	~ 5.2 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V					

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	BIASP5V BIASP9V BIASM9V	~ 5.1 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V					
	<b>SPIRE PRIME DRCU POWER ON COMPLETE</b>						

**6.2.4 Check correct functioning of the SCU PRIME Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/ Fail
4.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-SCU-01-P.tcl</b>		OK			
4.2	On I-EGSE verify:	SCUTEMPSTAT SUBKSTAT	0/0xFFFF 0/1			

**6.2.5 Check correct functioning of the SCU PRIME High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
5.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-SCU-02-P.tcl</b>		OK			
5.2	On I-EGSE verify:	SCUFRAMECNT TM5N	0/31 0x3FFF/1			
5.3	Verify that two telemetry packets with : <ul style="list-style-type: none"> <li>(type,subtype): (21,1).</li> <li>APID : 0x508 (1288)</li> </ul> have been received at CCS		OK			

**6.2.6 Check correct functioning of the MCU PRIME Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
6.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-01-P.tcl</b>		OK			
6.2	On I-EGSE check that the MCU is booted up successfully	<b>MCUBITSTAT</b> <b>MCUP5V</b> <b>MCUP14V</b> <b>MCUM14V</b>	0/-1 ~ 5.0 ± 0.2V ~ 14.0 ± 0.5V ~ -14.0 ± 0.5V			

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
		MCUP15V	~ 15.0 ± 0.5V			
		MCUM15V	~ -15.0 ± 0.5V			

**6.2.7 Check correct functioning of the MCU PRIME High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
7.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-02-P.tcl</b>		OK			
7.2	On I-EGSE Record the values of MCUFRAMECNT at the start and end of the test	MCUFRAMECNT	FM: 0/297			
7.3	Verify that the following type of MCU telemetry packets have been received at the CCS : ENG: - (type,subtype): (21,3). - APID 0x508 (1288) BSM - (type,subtype): (21,1). - APID 0x508 (1288) SMEC -(type,subtype): (21,1).		OK			

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/ Fail
	- APID 0x508 (1288)					



**6.2.8 Check correct functioning of the DCU PRIME Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
8.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DCU-01-P.tcl</b>		OK			
8.2	On I-EGSE check that:	PSWBIAS PMWBIAS PLWBIAS	0/0xff/0 0/0xff/0 0/0xff/0			

**6.2.9 Check correct functioning of the DCU PRIME High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
9.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DCU-02-P.tcl</b>		OK			
9.2	On I-EGSE check that:	DCUFRAMECNT	FM: 0/700			
9.3	Verify that the following type of DCU science telemetry packets have been received at the CCS : Full Photometer: - (type,subtype): (21,1). - APID 0x504 (1284) PSW - (type,subtype): (21,2). - APID 0x504 (1284) PMW -(type,subtype): (21,2). - APID 0x504 (1284) PLW -(type,subtype): (21,2). - APID 0x504 (1284) Full Spectrometer: - (type,subtype): (21,1). - APID 0x506 (1286) SSW - (type,subtype): (21,2). - APID 0x506 (1286) SLW -(type,subtype): (21,2). - APID 0x506 (1286)		OK			

**6.2.10 Switch Off MCU Prime**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
10.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-OFF-P.tcl</b>		OK			
10.2	On I-EGSE check that the MCU is switched off:	MCUBITSTAT	1/-/0			

**6.2.11 Switch Off DRCU PRIME**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>SWITCH OFF DRCU PRIME</b>						
	<b>DRCU-A Power Off</b>						
	Initial Conditions: DRCU-A ON						
11.1	Verify the following PCDU telemetry to verify FCU-A On: LCL51 Status <b>SpireHsfN_L51</b>  LCL51 current <b>SpireHsfN_L51</b>	<b>WM42C565</b> ON  <b>WM408565</b> =2.8A			AND: ZAD03999 MIM: LCL_HERSCHEL		
11.2	On HPCCS start <b>SPIRE-WU-INT-DRCU-OFF-P.tcl</b> test script to configure DRCU for switch off	OK					
11.3	On I-EGSE check that THSK parameter is not refreshing anymore	OK					

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
11.4	On I-EGSE check that TM2N parameter is not incrementing anymore	OK					
11.5	Power off FCU-A by issuing the following <b>SwOff_SpireHSPDU_N_L51</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution:  <b>DC51B170</b>	OK					
11.6	Verify the following PCDU telemetry to verify FCU-A OFF: LCL51 (FCU-A) Status <b>STS_LCL51</b>  <b>WM42C565</b> LCL51 (FCU-A) current <b>ITLM_LCL51</b>  <b>WM408565</b>	OFF  0.0 A	  +/- 0.28 A				
11.7	HPPCCS Operator to inform SPIRE Responsible that SPIRE DRCU/FCU Prime powered off	OK					
<b>SPIRE PRIME DRCU POWER OFF COMPLETE</b>							

**6.2.12 Switch Off SPIRE DPU Prime Unit**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
<b>SWITCH OFF DPU PRIME</b>							
<b>DPU-A Power Off</b>							
	Initial Conditions: DPU-A ON						
12.1	Verify the following PCDU telemetry to verify DPU-A On: LCL11 Status <b>SpireHsdN_L11</b>				AND: ZAD03999 MIM: LCL_HERSCHEL		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	LCL11 current <b>SpireHsN_L11</b>	<b>WM32C565</b> ON					
		<b>WM308565</b> 0.46 A	+/- 0.046 A				
12.2	Disable and Switch off RTA SPIRE DPU-A (RTA=21) by issuing the following CMDs telecommand and verify on-board execution (x = don't care) :						
	<b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	<b>RTA DH011161 =21</b>				<b>SPIRE-A</b>		
	<b>F0 DH018161 =0</b>				<b>RTA OFF</b>		
	<b>F1 DH019161 =x</b>				RTA Alive		
	<b>F2 DH020161 =x</b>				RTA Well_TC		
	<b>F3 DH021161 =x</b>				RTA Well_TM		
	<b>F4 DH022161 =0</b>				<b>RTA Invalid</b>		
	<b>F5 DH023161 =x</b>				RTA Vital/Non-vital		
	<b>F6 DH024161 =x</b>				RT Nominal Unit		
	<b>F7 DH025161 =x</b>				RT TM Retry On/Off		
	<b>F8 DH026161 =x</b>				Bus A Active		
	<b>F9 DH027161 =x</b>				Bus A Healthy/Unhealthy		
	<b>F10 DH028161 =x</b>				Bus B Healthy/Unhealthy		
	<b>F11 DH029161 =x</b>				SDBFDIR Enable/Disable		
	<b>M0 DH030161 =1</b>				<b>Mask F0</b>		
	<b>M1 DH031161 =0</b>				Mask F1		
	<b>M2 DH032161 =0</b>				Mask F2		
	<b>M3 DH033161 =0</b>				Mask F3		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>M4 DH034161 =1</b>				<b>Mask F4</b>		
	<b>M5 DH035161 =0</b>				Mask F5		
	<b>M6 DH036161 =0</b>				Mask F6		
	<b>M7 DH037161 =0</b>				Mask F7		
	<b>M8 DH038161 =0</b>				Mask F8		
	<b>M9 DH039161 =0</b>				Mask F9		
	<b>M10 DH040161 =0</b>				Mask F10		
	<b>M11 DH041161 =0</b>				Mask F11		
	<b>CNT DH042161 =1</b>				<b>Vital RT Loop (1)</b>		
	<b>M_C DH043161 =0</b>				<b>Mask for CNT</b>		
12.3	After 10secs verify SPIRE-A RTA OFF: <b>SPIREA_OnOff DED1G161</b> OFF <b>SPIREA_ValidInval DED1K161</b> Invalid				AND: ZAD12999		
12.4	Power off DPU-A by issuing the following <b>SwOff_SpireHSPDU_N_L11</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution: <b>DC11B170</b> OK						
12.5	Verify the following PCDU telemetry to verify DPU-A OFF: LCL11 (DPU-A) Status <b>STS_LCL11</b> <b>WM32C565</b> OFF LCL11 (DPU-A) current <b>ITLM_LCL11</b> <b>WM308565</b> 0.0 A				AND: ZAD03999 MIM: LCL_HERSCHEL		
12.6	HPCSS Operator to inform SPIRE Responsible that SPIRE DPU Prime powered off	OK					
12.7	On HPCSS terminate SubscribeParams test script.	OK					
	<b>SPIRE DPU PRIME POWER OFF COMPLETE</b>						

**6.2.13 Switch On Redundant SPIRE Units**

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
<b>SWITCH ON DPU REDUNDANT</b>							
<b>DPU-B Power On</b>							
Initial Conditions: DPU-A OFF							
13.1	Verify the following PCDU telemetry to verify DPU-B Off: LCL12 Status <b>SpireHsdN_L12</b>  LCL12 current <b>SpireHsN_L12</b>	<b>WM82C565</b> OFF  <b>WM808565</b> =0.0A			AND: ZAD03999 MIM: LCL_HERSCHEL		
13.2	Disable CDMU FDIR while DPU switched ON and forced boot (RTA SPIRE used but not relevant) by issuing the following CMDS telecommand and verify on-board execution (x = don't care, either 0 or 1) :	<b>DC005161</b>	OK				
	<b>ConfigureSDBFDIR</b>						
	<b>RTA</b> <b>DH011161</b> <b>=22</b>				<b>SPIRE-B</b>		
	<b>F0</b> <b>DH018161</b> <b>=x</b>				RTA ON		
	<b>F1</b> <b>DH019161</b> <b>=x</b>				RTA Alive		
	<b>F2</b> <b>DH020161</b> <b>=x</b>				RTA Well_TC		
	<b>F3</b> <b>DH021161</b> <b>=x</b>				RTA Well_TM		
	<b>F4</b> <b>DH022161</b> <b>=x</b>				RTA Valid		
	<b>F5</b> <b>DH023161</b> <b>=x</b>				RTA Vital/Non-vital		
	<b>F6</b> <b>DH024161</b> <b>=x</b>				RT Nominal Unit		
	<b>F7</b> <b>DH025161</b> <b>=x</b>				RT TM Retry On/Off		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F8 DH026161 =x				Bus A Active		
	F9 DH027161 =x				Bus A Healthy/Unhealthy		
	F10 DH028161 =x				Bus B Healthy/Unhealthy		
	F11 DH029161 =0				SDBFDIR Disable		
	M0 DH030161 =0				Mask F0		
	M1 DH031161 =0				Mask F1		
	M2 DH032161 =0				Mask F2		
	M3 DH033161 =0				Mask F3		
	M4 DH034161 =0				Mask F4		
	M5 DH035161 =0				Mask F5		
	M6 DH036161 =0				Mask F6		
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =0				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =1				Mask F11		
	CNT DH042161 =1				<b>Vital RT Loop (1)</b>		
	M_C DH043161 =0				<b>Mask for CNT</b>		
13.3	Verify FDIR disabled <b>DEFJ4160</b>	<b>DISABLED</b>			AND: ZAD07999		
13.4	Switch on RTA and enable Bus A on SPIRE DPU-A (RTA=22) by issuing the following CMDs telecommand and verify on-board execution (x = don't care, either 0 or 1) : <b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	<b>RTA DH011161 =22</b>				<b>SPIRE-B</b>		



Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F0 DH018161 =1				RTA ON		
	F1 DH019161 =1				RTA Alive		
	F2 DH020161 =1				RTA Well_TC		
	F3 DH021161 =1				RTA Well_TM		
	F4 DH022161 =1				RTA Valid		
	F5 DH023161 =x				RTA Vital/Non-vital		
	F6 DH024161 =0				RT Nominal Unit		
	F7 DH025161 =x				RT TM Retry On/Off		
	F8 DH026161 =0				Bus A Active		
	F9 DH027161 =x				Bus A Healthy/Unhealthy		
	F10 DH028161 =x				Bus B Healthy/Unhealthy		
	F11 DH029161 =x				SDBFDIR Enable/Disable		
	M0 DH030161 =1				Mask F0		
	M1 DH031161 =1				Mask F1		
	M2 DH032161 =1				Mask F2		
	M3 DH033161 =1				Mask F3		
	M4 DH034161 =1				Mask F4		
	M5 DH035161 =0				Mask F5		
	M6 DH036161 =1				Mask F6		
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =1				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =0				Mask F11		

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>CNT DH042161 =1</b>				<b>Vital RT Loop (1)</b>		
	<b>M_C DH043161 =0</b>				<b>Mask for CNT</b>		
13.5	After 10secs verify SPIRE-B RTA ON:  <div style="text-align: right;"> <b>SPIREB_OnOff DED21161</b> ON  <b>SPIREB_DeadAliv DED22161</b> Alive  <b>SPIREB_WellStiTC DED23161</b> Well  <b>SPIREB_WellStiTM DED24161</b> Well  <b>SPIREB_ValidInval DED25161</b> Valid </div>				AND: ZAD12999		
13.6	Power on DPU-B by issuing the following <b>SwOn_SpireHSPDU_N_L12</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution:  <div style="text-align: right;"><b>DC12D170</b> OK</div>						
13.7	Verify the following PCDU telemetry to verify DPU-B Off: LCL12 Status <b>SpireHsdN_L12</b>  <div style="text-align: right;"><b>WM82C565</b> ON</div> LCL12 current <b>SpireHsN_L12</b>  <div style="text-align: right;"><b>WM808565</b> 0.46 A</div>		+/- 0.046 A				
13.9	On HPCCS start test script SubscribeParams.tcl to handle command parameter packets sent from the I-EGSE	OK					
13.10	On HPCCS start <b>SPIRE-WU-INT-DPU-START-R.tcl</b> test script to configure DPU	OK					
13.11	Enable CDMU FDIR (RTA SPIRE used but not relevant) by issuing the following CMDS telecommand and verify on-board execution (x = don't care, either 0 or 1) :  <div style="text-align: right;"><b>ConfigureSDBFDIR DC005161</b> OK</div>						
	<b>RTA DH011161 =22</b>				<b>SPIRE-B</b>		
	<b>F0 DH018161 =x</b>				RTA ON		

Step- No.	Test-Step-Description			Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F1	DH019161	=X				RTA Alive		
	F2	DH020161	=X				RTA Well_TC		
	F3	DH021161	=X				RTA Well_TM		
	F4	DH022161	=X				RTA Valid		
	F5	DH023161	=X				RTA Vital/Non-vital		
	F6	DH024161	=X				RT Nominal Unit		
	F7	DH025161	=X				RT TM Retry On/Off		
	F8	DH026161	=X				Bus A Active		
	F9	DH027161	=X				Bus A Healthy/Unhealthy		
	F10	DH028161	=X				Bus B Healthy/Unhealthy		
	F11	DH029161	=1				<b>SDBFDIR Enable</b>		
	M0	DH030161	=0				Mask F0		
	M1	DH031161	=0				Mask F1		
	M2	DH032161	=0				Mask F2		
	M3	DH033161	=0				Mask F3		
	M4	DH034161	=0				Mask F4		
	M5	DH035161	=0				Mask F5		
	M6	DH036161	=0				Mask F6		
	M7	DH037161	=0				Mask F7		
	M8	DH038161	=0				Mask F8		
	M9	DH039161	=0				Mask F9		
	M10	DH040161	=0				Mask F10		
	M11	DH041161	=1				<b>Mask F11</b>		
	CNT	DH042161	=1				<b>Vital RT Loop (1)</b>		
	M_C	DH043161	=0				Mask for CNT		

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
13.12	Verify FDIR (re-)enabled  <b>DEFJ4160 ENABLED</b>	ENABLED			AND: ZAD07999		
13.13	HPCCS Operator to inform SPIRE Responsible that SPIRE DPU Redundant powered	OK					
13.14	Check that Nominal and Critical HK packets are arriving at the CCS: <b>SPIRE Nominal HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID : 0x503 (1283)</li> </ul> <b>SPIRE Critical HK:</b> <ul style="list-style-type: none"> <li>• (type ,subtype) : (3,25)</li> <li>• APID: 0x501 (1281)</li> </ul>	OK					
13.15	On I-EGSE check that THSK parameter is refreshing every second	OK					
13.16	On I-EGSE check that TM2N parameter is incrementing by 1 every second	OK					
13.17	On I-EGSE check that TM1N parameter is incrementing by 1 every 2 second	OK					
13.18	On CCS check the consistency of the SPIRE on board time to the HCDMU time and the CCS.	OK					
13.19	On IEGSE check the consistency between SCOS time and THSK and QLA time.	OK					
<b>SPIRE REDUNDANT DPU POWER ON COMPLETE</b>							

**6.2.14 Switch On DRCU REDUNDANT**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
<b>SWITCH ON DRCU REDUNDANT</b>							
<b>DRCU-B Power On</b>							
Initial Conditions: DRCU-B OFF							
14.1	Verify the following PCDU telemetry to verify FCU-B Off: LCL52 Status <b>SpireHsfN_L52</b>  LCL52 current <b>SpireHsfN_L52</b>	<b>WM72C565</b> OFF  <b>WM708565</b> =0.0A			AND: ZAD03999 MIM: LCL_HERSHEL		
14.2	Power on FCU-B by issuing the following <b>SwOn_SpireHSPDU_N_L52</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution:  <b>DC52D170</b>	OK					
14.3	Verify the following PCDU telemetry to verify FCU-B ON: LCL52 (FCU-B) Status <b>STS_LCL52</b>  LCL52 (FCU-B) current <b>ITLM_LCL52</b>	<b>WM72C565</b> ON  <b>WM708565</b> 2.8A					
14.4	HPPCCS Operator to inform SPIRE Responsible that SPIRE DRCU Redundant powered	OK					
14.5	On HPPCCS start <b>SPIRE-WU-INT-DRCU-START-R-STEP1.tcl</b> test script to configure DRCU	OK					
14.6	On I-EGSE check that THSK parameter is not refreshing anymore	OK					
14.7	On I-EGSE check that TM2N parameter is not incrementing anymore	OK					

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
14.8	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DRCU-START-R-STEP2.tcl</b>						
14.9	On I-EGSE check that THSK parameter is refreshing every second	OK					
14.10	On I-EGSE check that TM2N parameter is incrementing by 1 every second	OK					
14.11	Check that the SCU/DCU voltages show nominal values:  <b>SCUP5V</b> ~ 5.2 ± 0.5V <b>SCUP9V</b> ~ 9.0 ± 0.2V <b>SCUM9V</b> ~ -9.0 ± 0.2V <b>BIASP5V</b> ~ 5.1 ± 0.5V <b>BIASP9V</b> ~ 9.0 ± 0.2V <b>BIASM9V</b> ~ -9.0 ± 0.2V						
<b>SPIRE REDUNDANT DRCU POWER ON COMPLETE</b>							

**6.2.15 Check correct functioning of the SCU REDUNDANT Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
15.1	On HPCCS Execute <b>TCL script SPIRE-WU-INT-SCU-01-R.tcl</b>		OK			
15.2	On I-EGSE verify:	SCUTEMPSTAT SUBKSTAT	0/0xFFFF 0/1			

**6.2.16 Check correct functioning of the SCU REDUNDANT High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
16.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-SCU-02-R.tcl</b>		OK			
16.2	On I-EGSE verify:	SCUFRAMECNT TM5N	0/31 0x3FFF/1			
16.3	Verify that two telemetry packets with : <ul style="list-style-type: none"> <li>• (type,subtype): (21,1).</li> <li>• APID : 0x509 (1289)</li> </ul> have been received at CCS		OK			

**6.2.17 Check correct functioning of the MCU REDUNDANT Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
17.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-01-R.tcl</b>		OK			
17.2	On I-EGSE check that the MCU is booted up successfully	<b>MCUBITSTAT</b> <b>MCUP5V</b> <b>MCUP14V</b> <b>MCUM14V</b> <b>MCUP15V</b>	0/-1 ~ 5.0 ± 0.2V ~ 14.0 ± 0.5V ~ -14.0 ± 0.5V ~ 15.0 ± 0.5V			

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
		MCUM15V	~ -15.0 ± 0.5V			

**6.2.18 Check correct functioning of the MCU REDUNDANT High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
18.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-02-R.tcl</b>		OK			
18.2	On I-EGSE Record the values of MCUFRAMECNT at the start and end of the test	MCUFRAMECNT	FM: 0/297			
18.3	Verify that the following type of MCU telemetry packets have been received at the CCS : ENG: - (type,subtype): (21,3). - APID 0x509 (1289) BSM - (type,subtype): (21,1). - APID 0x509 (1289) SMEC -(type,subtype): (21,1). - APID 0x509 (1289)		OK			



**6.2.19 Check correct functioning of the DCU REDUNDANT Low Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
19.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DCU-01-R.tcl</b>		OK			
19.2	On I-EGSE check that:	PSWBIAS PMWBIAS PLWBIAS	0/0xff/0 0/0xff/0 0/0xff/0			

**6.2.20 Check correct functioning of the DCU REDUNDANT High Speed Link**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
20.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-DCU-02-R.tcl</b>		OK			
20.2	On I-EGSE check that:	DCUFRAMECNT	FM: 0/700			
20.3	Verify that the following type of DCU science telemetry packets have been received at the CCS : Full Photometer: - (type,subtype): (21,1). - APID 0x505 PSW - (type,subtype): (21,2). - APID 0x505 PMW -(type,subtype): (21,2). - APID 0x505		OK			

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
	PLW -(type,subtype): (21,2). - APID 0x505 (1285) Full Spectrometer: - (type,subtype): (21,1). - APID 0x507 (1287) SSW - (type,subtype): (21,2). - APID 0x507 (1287) SLW -(type,subtype): (21,2). - APID 0x507 (1287)					

**6.2.21 Switch Off MCU REDUNDANT**

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Remark	Pass/Fail
21.1	On HPCCS Execute TCL script <b>SPIRE-WU-INT-MCU-OFF-R.tcl</b>		OK			
21.2	On I-EGSE check that the MCU is switched off:	MCUBITSTAT	1/-/0			

**6.2.22 Switch Off DRCU REDUNDANT**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>SWITCH OFF DRCU REDUNDANT</b>						
	<b>DRCU-B Power Off</b>						
	Initial Conditions: DRCU-B ON						
22.1	Verify the following PCDU telemetry to verify FCU-B On: LCL52 Status <b>SpireHsfN_L52</b>  LCL52 current <b>SpireHsfN_L52</b>	<b>WM72C565</b> ON  <b>WM708565</b> =2.8A			AND: ZAD03999 MIM: LCL_HERSHEL		
22.2	On HPCCS start <b>SPIRE-WU-INT-DRCU-OFF-R.tcl</b> test script to configure DRCU for switch off	OK					
22.3	On I-EGSE check that THSK parameter is not refreshing anymore	OK					
22.4	On I-EGSE check that TM2N parameter is not incrementing anymore	OK					
22.5	Power off FCU-B by issuing the following <b>SwOff_SpireHSPDU_N_L52</b> telecommand (CDMS-TC(8,4,112,5)) and verify on-board execution:	<b>DC51D170</b> OK					
22.6	Verify the following PCDU telemetry to verify FCU-B OFF: LCL52 (FCU-B) Status <b>STS_LCL52</b>  LCL52 (FCU-B) current <b>ITLM_LCL52</b>	<b>WM72C565</b> OFF  <b>WM708565</b> 0.0 A					
22.7	HPCCS Operator to inform SPIRE Responsible that SPIRE DRCU/FCU Redundant powered off	OK					

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>SPIRE REDUNDANT DRCU POWER OFF COMPLETE</b>						

**6.2.23 Switch Off Redundant SPIRE Units**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	<b>SWITCH OFF DPU REDUNDANT</b>						
	<b>DPU-B Power Off</b>						
	Initial Conditions: DPU-B ON						
23.1	Verify the following PCDU telemetry to verify DPU-B On: LCL12 Status <b>SpireHsdN_L12</b>  LCL12 current <b>SpireHsN_L12</b>	<b>WM82C565</b> ON  <b>WM808565</b> 0.46 A			AND: ZAD03999 MIM: LCL_HERSCHEL		
23.2	Disable and Switch off RTA SPIRE DPU-B (RTA=22) by issuing the following CMDS telecommand and verify on-board execution (x = don't care) :						
	<b>ConfigureSDBFDIR</b>	<b>DC005161</b>	OK				
	<b>RTA DH011161 =22</b>				<b>SPIRE-B</b>		
	<b>F0 DH018161 =0</b>				<b>RTA OFF</b>		
	<b>F1 DH019161 =X</b>				RTA Alive		
	<b>F2 DH020161 =X</b>				RTA Well_TC		
	<b>F3 DH021161 =X</b>				RTA Well_TM		
	<b>F4 DH022161 =0</b>				<b>RTA Invalid</b>		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	F5 DH023161 =x				RTA Vital/Non-vital		
	F6 DH024161 =x				RT Nominal Unit		
	F7 DH025161 =x				RT TM Retry On/Off		
	F8 DH026161 =x				Bus A Active		
	F9 DH027161 =x				Bus A Healthy/Unhealthy		
	F10 DH028161 =x				Bus B Healthy/Unhealthy		
	F11 DH029161 =x				SDBFDIR Enable/Disable		
	M0 DH030161 =1				<b>Mask F0</b>		
	M1 DH031161 =0				Mask F1		
	M2 DH032161 =0				Mask F2		
	M3 DH033161 =0				Mask F3		
	M4 DH034161 =1				<b>Mask F4</b>		
	M5 DH035161 =0				Mask F5		
	M6 DH036161 =0				Mask F6		
	M7 DH037161 =0				Mask F7		
	M8 DH038161 =0				Mask F8		
	M9 DH039161 =0				Mask F9		
	M10 DH040161 =0				Mask F10		
	M11 DH041161 =0				Mask F11		
	CNT DH042161 =1				<b>Vital RT Loop (1)</b>		
	M_C DH043161 =0				<b>Mask for CNT</b>		
23.3	After 10secs verify SPIRE-B RTA OFF: SPIREB_OnOff DED21161 OFF SPIREB_ValidInval DED25161 Invalid				AND: ZAD12999		

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
23.4	Power off DPU-B by issuing the following <b>SwOff_SpireHSPDU_N_L12</b> telecommand (CDMS- TC(8,4,112,5)) and verify on-board execution:  <b>DC12B170</b>	OK					
23.5	Verify the following PCDU telemetry to verify DPU-B OFF: LCL12 (DPU-B) Status <b>STS_LCL12</b>  <b>WM82C565</b> LCL12 (DPU-B) current <b>ITLM_LCL12</b>  <b>WM808565</b>	OFF  0.0 A	  +/- 0.046A		AND: ZAD03999 MIM: LCL_HERSCHEL		
23.6	HPCSS Operator to inform SPIRE Responsible that SPIRE DPU Redundant powered off	OK					
23.7	On HPCSS terminate SubscribeParams test script.	OK					
<b>SPIRE DPU REDUNDANT POWER OFF COMPLETE</b>							

**6.2.24 Satellite & EGSE Switch Off**

Step- No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value		P	N
	<b>Satellite &amp; EGSE Switch Off</b>						
	Initial Conditions: Nominal & Redundant SPIRE warm units OFF						
24.1	From HPCCS Test Conductor console issue command to disconnect from SPIRE I-EGSE  <b>disconnect HIEGSE</b>	OK					
24.2	Confirm from HPCSS and SPIRE I-EGSE that the disconnection was successful	OK					
24.3	Switch OFF I-EGSE i.a.w. AD 5						
24.4	Switch OFF Satellite/SVM, HPCCS and SCOEs i.a.w. procedure AD 2 Sections 7.7 to 7.11	OK					
24.5	Confirm both Satellite and EGSE powered down	OK					
	End Conditions: Satellite and EGSE OFF						
	<b>END OF TEST</b>						

## 7 Summary Sheets



**7.1 Procedure Variation Summary**

	Test Change	Curr. No.:	
		Date	
		Page	of
Test designation	Test Procedure	Issue	Rev.
Test step changed	Reason for Change		
Prepared by:	Resp. Test Leader	Project Engineer	
PA/QA	Prime	Customer	

Table 7.1-1: Procedure Variation Sheet

### 7.2 Non Conformance Report (NCR) Summary

NCR - No.	NCR - Title	Date	Open Closed	PA sig.

Table 7.2-1: Non-Conformance Record Sheet

7.3 Sign-off Sheet

	Date	Signature
Test Manager		
Operator		
PA Responsible		
ESA Representative		

END OF DOCUMENT

	Name	Dep./Comp.		Name	Dep./Comp.
X	Alberti von Mathias Dr.	ASG22		Schweickert Gunn	ASG22
	Baldock Richard	FAE12	X	Sonn Nico	ASG51
	Barlage Bernhard	AED13		Steininger Eric	AED32
	Bayer Thomas	ASA42	X	Stritter Rene	AED11
	Brune Holger	ASA45		Suess Rudi	OTN/ASA44
	Edelhoff Dirk	AED2		Wagner Klaus	ASG22
	Fehringer Alexander	ASG13	X	Wietbrock Walter	AET12
X	Fricke Wolfgang Dr.	AED 65		Wöhler Hans	ASG22
	Geiger Hermann	ASA42		Wössner Ulrich	ASE252
	Grasl Andreas	OTN/ASA44	X	Theunissen Martijn/Dutch Space	ASA43
	Grasshoff Brigitte	AET12	X	Martin Olivier	ASA43
X	Hamer Simon	Terma			
X	Hendry David	Terma			
	Hengstler Reinhold	ASA42			
	Hinger Jürgen	ASG22			
X	Hohn Rüdiger	AED65			
	Hölzle Edgar Dr.	AED32			
	Huber Johann	ASA42			
	Hund Walter	ASE252			
	Idler Siegmund	AED312			
	Ivány von András	FAE12			
	Jahn Gerd Dr.	ASG22			
	Kalde Clemens	ASM2			
	Kameter Rudolf	OTN/ASA42			
	Kettner Bernhard	AET42			
	Knoblauch August	AET32	X	Alcatel Alenia Space Cannes	AAS-F
X	Koelle Markus	ASA43		Alcatel Alenia Space Torino	AAS-I
X	Koppe Axel	AED312	X	ESA/ESTEC	ESA
X	Kroeker Jürgen	AED65			
X	La Gioia Valentina	Terma		<b>Instruments:</b>	
	Lang Jürgen	ASE252		MPE (PACS)	MPE
	Langenstein Rolf	AED15	X	RAL (SPIRE)	RAL
	Langfermann Michael	ASA41		SRON (HIFI)	SRON
X	Maukisch Jan	ASA43			
X	Much Christoph	ASA43			
	Müller Jörg	ASA42		<b>Subcontractors:</b>	
X	Müller Martin	ASA43		Alcatel Alenia Space Antwerp	ABSP
	Peltz Heinz-Willi	ASG13		Austrian Aerospace	AAE
	Pietroboni Karin	AED65		Austrian Aerospace	AAEM
	Platzer Wilhelm	AED2		BOC Edwards	BOCE
	Reichle Konrad	ASA42		Dutch Space Solar Arrays	DSSA
	Runge Axel	OTN/ASA44		EADS Astrium Sub-Subsyst. & Equipment	ASSE
	Schink Dietmar	AED32		EADS CASA Espacio	CASA
	Schlosser Christian	OTN/ASA44		EADS CASA Espacio	ECAS
	Schmidt Rudolf	FAE12		European Test Services	ETS
	Schmidt Thomas	ASA42		Patria New Technologies Oy	PANT
	Schuler Günter	ASA42		SENER Ingenieria SA	SEN