EADS astrium

Test Procedure

Herschel

SPIRE-AST-PRC-003097

Title: **SPIRE IST Specific Performance Test**

CI-No: 125200

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Issue	Date	Sheet	Description of Change	Release
1.0	25.01.08	All	First Formal Issue	
1.1	24.07.08	14, 100, 92	Implementation of updated RAL procedure, ref. SPIRE-RAL-PRC-2704, issue 3.2 SPIRE I-EGSE Disconnection procedure adapted	
1.2	13.08.08	14 23 25 33 34 93	Implementation of updated RAL procedure, ref. SPIRE-RAL-PRC-2704, issue 3.4 note: Temperature for JFET switch on "~~will~~ **may**" be adjusted EGSE / OBSW versions updated Step 7.5.1.6 - new Step 7.5.1.7 - new Step 7.5.1.11: test script name updated Step 7.5.1.12: typo in parameter removed Step 7.5.7.5 - new Step 7.5.7.6 - new	

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1 Scope

This test procedure defines the instructions for the conducting of the SPIRE Specific Performance Test (SPT) to be performed in He II conditions. The corresponding as-run procedure will become part of the test report.

This procedure covers only operational aspects, as e.g. commanding and monitoring of the instrument and science data acquisition. The real time analysis of the acquired science data concerning performance aspects will be done by RAL using separate procedures and tools (e.g. on the I-EGSE) in parallel.

This procedure is based on the requirements of the Test Specification for HERSCHEL Instruments FM tests performed at satellite level (AD6). The EMC tests run overnight require a specific test set-up which will be covered by a separate procedure.

Major input to this test procedure is the SPIRE IST Specific Performance Test Procedure from RAL. The relevant test steps of the RAL procedure (AD9, attached as ANNEX 2) are called up in section 7 (step-by-step procedure). No redundancies are tested within this sequence.

The following tests from the SPIRE procedure (AD9) are not included:

Tests not included in schedule	Reason
SPEC high resolution mode SOF1	Cannot be done with cryostat vertical
Spectrometer Mechanism Microvibration Test	Cannot be done with cryostat vertical
EMC - Photometer most sensitive mode	N/A - to be used during EMC testing
EMC – Spectrometer most sensitive mode	N/A - to be used during EMC testing
EMC – SPIRE most Emissive mode	N/A - to be used during EMC testing
300mk Stage Decontamination	No time
Photometer noise stability versus bias frequency under flight ambient condition	No time
Phot scan mode POF5	No time

Constraints

- This procedure requires the presence of SPIRE personnel as the I-EGSE will be required to assess the results online as part of the pass/fail criteria.
- Before carrying out the next procedure within the test sequence, always ask for the go ahead by the RAL staff.

- Chapter 4 of this document specifies the sequence to be executed. Each of the steps in the sequence corresponds to procedures in section 7.5.
- The procedure tables in section 7.5 include blank boxes where the actual values of parameters can be noted. Based on the comparison with the expected values the success or failure of a step should be recorded in the final column of the table.
- The last two columns in a procedure table shall be used to record the overall Pass/Fail result of each test.
- Any text in boldface in the procedural steps generally indicates an action which may have to be performed manually by the CCS staff.
- The total available test duration are 3 days for SPT and 2 nights for EMC testing?
- For the micro-vibration test the accelerometer acquisition needs to be activated and the test coordinated with the ETS team.
- To perform the overnight EMC tests, the test adapter for the noise injection must have been installed between the PCDU and the SPIRE FCU.

1.1 Objective

The objective of the SPIRE SPT is:

- Verification of the correct performance of the SPIRE instrument and the compatibility with the spacecraft and
- Verification of operation procedures which will be executed during the mission

1.2 Test Flow

This test flow is structured to reflect nominal operations of the FM SPIRE.

The flow is as follows:

1. Power ON and configure SPIRE I-EGSE for test
2. Power ON SPIRE Prime and enable Mil1553B-bus interface
3. Run test sequence according to AD6, chapter 4.7.3.3

SPIRE SPT Day 1

Step	Test Name	Description/Purpose	Time Required (nominal)	Start Mode	End Mode	Lid Temp
1	Cooler recycle (manual)	First time the cooler is recycled we take it one step at a time	2	REDY	REDY	<15 K
2	Switch to PHOT STBY	Switch the instrument on in photometer mode using ILT settings and Vss from CFT DCU-07P	0,25	REDY	PHOT STBY	<15 K
3	Wait for stabilisation	Need to wait until 300 mK stage is drifting slowly enough to allow detector characterisation	0	PHOT STBY	PHOT STBY	<15 K
4	BSM Control Loop Setting	Sets up the parameters of the BSM control loop - can be carried out during stabilisation	1	PHOT STBY	PHOT STBY	<15 K
5	Photometer bias phase optimisation	Sets up a grid of phase versus bias frequency for photometer BDAs	2	PHOT STBY	PHOT STBY	<15 K
	SHIFT 1 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR HANDOVER**	**1**			
6	Photometer noise stability versus bias frequency	Determination of the noise spectrum versus bias frequency under dark conditions	2	PHOT STBY	PHOT STBY	<15 K
7	Photometer bias noise optimisation	Sets up the optimum bias setting for lowest noise in the photometer	2	PHOT STBY	PHOT STBY	<15 K

		BDAs				
8	Photometer Ambient Background Verification	First loadcurve to determine straylight environment under standard ground conditions	1	PHOT STBY	PHOT STBY	<15 K
9	PTC Headroom Characterisation	Provides data necessary for evaluation of PTC operations	3	PHOT STBY	PHOT STBY	<15 K
10	PCAL Photometer Characterisation	Verification that PCAL illumination levels are as expected compared to EQM and ILT	0,5	PHOT STBY	PHOT STBY	<15 K
	SHIFT 2 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR OVERNIGHT**	**1**			**TBD**
11	**Overnight Hold on Test Activities**		7,25	PHOT STBY	PHOT OBSV	TBD

SPIRE SPT Day 2

Step	Test Name	Description/Purpose	Time Required (nominal)	Start Mode	End Mode	Lid Temp
	Test preparation	Get cryostat into correct state for continuation of SPIRE testing. Low drifts and lid <15 K	2	PHOT STBY	PHOT STBY	TBC
12	PCAL Flash	Standard PCAL flash sequence to check detector operation	0,25	PHOT STBY	PHOT STBY	<15 K
13	Photometer thermal stability versus bias amplitude	Determine thermal response of the detectors to a step change bias	3	PHOT STBY	PHOT STBY	<15 K
14	Change lid temperature	Move lid to nominal telescope flight temperature	2	PHOT STBY	PHOT STBY	Variable
15	Photometer Thermal Control Verification	First test of PTC VM using predetermined parameters from Day 1	0	PHOT STBY	PHOT STBY	Variable
	SHIFT 1 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR HANDOVER**	**1**			
16	Photometer bias phase optimisation	Sets up a grid of phase versus bias frequency for photometer BDAs under flight conditions	1	PHOT STBY	PHOT STBY	70<T<90K
17	Photometer Ambient Background Verification	Loadcurve to determine environment under close to flight conditions	1	PHOT STBY	PHOT STBY	70<T<90K
18	SPIRE to REDY Mode	Switches off spectrometer mode and switches to REDY	0,25	PHOT STBY	REDY	70<T<90K
19	Switch to SPEC STBY	Switch the instrument to in spectrometer mode (sans SMEC) using ILT settings and Vss from CFT DCU-07P	0,25	REDY	SPEC STBY	70<T<90K

20	Spectrometer bias phase optimisation	Sets up a grid of phase versus bias frequency for spectrometer BDAs under flight conditions	1	SPEC STBY	SPEC STBY	70<T<90K
21	Spectrometer bias noise optimisation	Sets up the optimum bias setting for lowest noise in the spectrometer BDAs under flight conditions	1	SPEC STBY	SPEC STBY	70<T<90K
22	Spectrometer noise stability versus bias frequency	Determination of the noise spectrum versus bias frequency close to flight conditions	1	SPEC STBY	SPEC STBY	70<T<90K
23	Spectrometer Ambient Background Verification	Loadcurve to determine environment under close to flight conditions	1	SPEC STBY	SPEC STBY	70<T<90K
24	PCAL Spectrometer Characterisation	Verification that PCAL illumination levels are as expected compared to ILT	0,5	SPEC STBY	SPEC STBY	70<T<90K
	SHIFT 2 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR OVERNIGHT**	1	SPEC STBY	SPEC STBY	TBD
25	**Overnight Hold on Test Activities**		7,75	SPEC STBY	SPEC STBY	TBD

SPIRE SPT Day 3

Step	Test Name	Description/Purpose	Time Required (nominal)	Start Mode	End Mode	Lid Temp
	Test preparation	Get cryostat into correct state for continuation of SPIRE testing. Low drifts and lid <15 K	0	SPEC STBY	SPEC STBY	TBC
26	Switch to REDY	Switch from SPEC STBY (assumed overnight status) to REDY mode in prep for cooler recycle	0,25	PHOT STBY	REDY	<15 K
27	Cooler recycle (automatic)	First automatic cooler recylce	2	REDY	REDY	<15 K
28	Wait for stabilisation	Need to wait until 300 mK stage is drifting slowly enough to allow detector characterisation	1	SPEC STBY	SPEC STBY	<15 K
29	Spectrometer bias phase optimisation	Sets up a grid of phase versus bias frequency for spectrometer BDAs	1	SPEC STBY	SPEC STBY	<15 K
30	Spectrometer bias noise optimisation	Sets up the optimum bias setting for lowest noise in the spectrometer BDAs	1	SPEC STBY	SPEC STBY	<15 K
31	Spectrometer noise stability versus bias frequency	Determination of the noise spectrum versus bias frequency under dark conditions	2	SPEC STBY	SPEC STBY	<15 K
	SHIFT 1 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR HANDOVER**	**1**			

32	SCAL Characteristion	Check of SCAL operation and illumination	2	SPEC STBY	SPEC STBY	<15 K
33	Microphonics Prep	Switch ON ACMS, RWLs and initiate ETS recording of accelerometers	0.5			
34	Spectometer Detector Microphonics Test	Not fully defined - requires discussion with S/C operators	1,5	SPEC STBY	SPEC STBY	<15 K
35	SPIRE to REDY Mode	Switches off spectrometer mode and switches to REDY	0,25	SPEC STBY	REDY	<15 K
36	SPIRE to PHOT STBY Mode	Switches on photometer	0,25	REDY	PHOT STBY	<15 K
37	Photometer Detector Microphonics Test	Not fully defined - requires discussion with S/C operators	1,5	PHOT STBY	PHOT STBY	<15 K
38	Microphonics De-Prep	Stop ACMS and stop ETS accelerometer recording	0.5			
	SHIFT 2 CONTINGENCY	**END OF SHIFT TIDY UP READY FOR OVERNIGHT**	**2**			
39	**Switch SPIRE to OFF**	Switch the instrument off and go home	0,5	SPEC STBY	OFF	

4. Power OFF SPIRE Prime and disable Mil1553B-bus interface
5. Power OFF SPIRE I-EGSE

2 Documents/Drawings

2.1 Applicable Documents

AD 1	FM SPIRE PFM Final Electrical Integration Procedure	HP-2-ASED-TP-0166
AD 2	Herschel PCDU & CDMS Nominal Switch On/Off Procedure	HP-2-ASED-PR-0070
AD 3	Herschel SAT Emergency Switch Off Procedure	HP-2-ASED-PR-0071
AD 4	PA Plan	HP-2-ASED-PL-0007
AD 5	SPIRE I-EGSE Set-Up	SPIRE-RAL-DOC-002841, iss. 2.2
AD 6	Test Specification for Herschel Instrument AVM & FM Tests Performed at Satellite Level	H-P-2-ASP-TS-1083, issue 2
AD 7	H-P GDIR	H-P-1-ASPI-SP-0027
AD 8	HERSCHEL Instrument Power ON-OFF and Mode Switching Procedure for Functional Testing	HP-2-ASED-TP-0206, Iss.1
AD 9	SPIRE IST Specific Performance Test Procedures	SPIRE-RAL-PRC-2704, iss. 3.4
AD 10	SPIRE System Level CS Test Procedure	SPIRE-RAL-PRC-003040, iss. 1.0

2.2 Reference Documents

RD 1	Herschel Planck Central Checkout System System User Manual	H-P-4-TE-MA-0010
RD 2	Herschel CDMU ASW S/W Interface Control Document	H-P-4-SSF-IC-0001
RD 3	Herschel CDMU BSW S/W Interface Control Document	H-P-4-SES-NT-0076
RD 4	SPIRE IID-B	SCI-PT-IIDB/SPIRE-02124
RD 5	SPIRE Functional Test Specification Iss. 1.4	SPIRE-RAL-DOC-001652
RD 6	SPIRE Instrument User Manual Iss. 1.0	SPIRE-RAL-PRJ-002395
RD 7	H/P OBT-UTC Time Synchronisation Technical Note Iss. 1.3	PT-CMOC-OPS-TN-6604-OPS-OGH
RD8	HERSCHEL FM Micro-vibration Test Specification	H-P-2-ASP-SP-1280, iss. 1

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
HPSDB	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
OBDH	On-Board Data Handling
OBMF	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	Subsytems 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

3.1 Satellite Configuration

The test requires use of the HERSCHEL S/C integrated with HSS and telescope, powered on in its basic test mode (i.e. quick switch on (PCDU & CDMS), in accordance with AD 2. SPIRE FM units will be powered ON as per this procedure on the basis that the FPU has already been successfully integrated and tested including the warm units.

The test shall be executed at He-II conditions and its duration shall not exceed three days of testing.

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 AD5.

3.3 Set-up

SPIRE Test Scripts for the test must be loaded on to the HPCCS and checked in prior to start of test.

4 Test Sequence

4.1 Test Flow

The SPIRE Special Performance Test sequence during IST 1 including EMC CS shall be executed following chapter 4.7.3.2 of AD6, recalled hereafter:

SPIRE Special Performance Test (SPT/IMT) during IST1 (3 days) + EMC CS				69:15:00	SPIRE-RAL-PRC-002704_2.4 - SPIRE_SPT_Procedures	section
SPIRE SPT Day 1				24:00:00		
			SVM and SPIRE Switch ON	1:00:00		
D1		1	Cooler recycle (manual)	2:00:00	Procedure: Cooler recycle (manual)	2.2
D1		2	Switch to PHOT STBY	0:15:00		
D1		3	Wait for stabilisation	0:00:00		
D1		4	BSM Control Loop Setting	1:00:00	Procedure: BSM Control Loop Setting	2.1
D1		5	Photometer bias phase optimisation	2:00:00	Procedure: Photometer bias phase optimisation	2.4
D1			SHIFT 1 CONTINGENCY	1:00:00		
D1		6	Photometer noise stability versus bias frequency	2:00:00	Procedure: Photometer noise stability versus bias frequency	2.6
D1		7	Photometer bias noise optimisation	2:00:00	Procedure: Photometer bias noise optimisation	2.5
D1		8	Photometer Ambient Background Verification	1:00:00	Procedure: Photometer Ambient Background Verification	2.8
D1		9	PTC Headroom Characterisation	3:00:00	Procedure: PTC Headroom Characterisation	2.9
D1		10	PCAL Photometer Characterisation	0:30:00	Procedure: PCAL Photometer Characterisation	2.11
D1			SHIFT 2 CONTINGENCY	1:00:00		
D1		11	Overnight EMC CS test (frequency search)	8:15:00		
SPIRE SPT Day 2				22:00:00		
D2			Test preparation	0:00:00		
D2		12	PCAL Flash	0:15:00		
D2		13	Photometer thermal stability versus bias amplitude	3:00:00	Procedure: Photometer thermal stability versus bias amplitude	2.7
D2		14	Change lid temperature	2:00:00		
D2		15	Photometer Thermal Control Verification	0:00:00	Procedure: Photometer Thermal Control Verification	2.10
D2			SHIFT 1 CONTINGENCY	1:00:00		
D2		16	Photometer bias phase optimisation	1:00:00	Procedure: Photometer bias phase optimisation	2.4
D2		17	Photometer Ambient Background Verification	1:00:00	Procedure: Photometer Ambient Background Verification	2.8
D2		18	SPIRE to REDY Mode	0:15:00		
D2		19	Switch to SPEC STBY	0:15:00		
D2		20	Spectrometer bias phase optimisation	1:00:00	Procedure: Spectrometer bias phase optimisation	2.12
D2		21	Spectrometer bias noise optimisation	1:00:00	Procedure: Spectrometer bias noise optimisation	2.13
D2		22	Spectrometer noise stability versus bias frequency	1:00:00	Procedure: Spectrometer noise stability versus bias frequency	2.14
D2		23	Spectrometer Ambient Background Verification	1:00:00	Procedure: Spectrometer Ambient Background Verification	2.15
D2		24	PCAL Spectrometer Characterisation	0:30:00	Procedure: PCAL Spectrometer Characterisation	2.16
D2			SHIFT 2 CONTINGENCY	1:00:00		
D2		25	Overnight Hold on Test Activities	7:45:00		
SPIRE SPT Day 3				22:15:00		
D3			Test preparation	0:00:00		
D3		26	Switch to REDY	0:15:00		
D3		27	Cooler recycle (automatic)	2:00:00	Procedure: Cooler recycle (automatic)	2.3
D3		28	Wait for stabilisation	1:00:00		
D3		29	Spectrometer bias phase optimisation	1:00:00	Procedure: Spectrometer bias phase optimisation	2.12
D3		30	Spectrometer bias noise optimisation	1:00:00	Procedure: Spectrometer bias noise optimisation	2.13
D3		31	Spectrometer noise stability versus bias frequency	2:00:00	Procedure: Spectrometer noise stability versus bias frequency	2.14
D3			SHIFT 1 CONTINGENCY	1:00:00		
D3		32	SCAL Characteristion	2:00:00		
D3		33	Spectometer Detector Microphonics Test	1:30:00	Procedure: Spectometer Detector Microphonics Test	2.21
D3		34	SPIRE to REDY Mode	0:15:00		
D3		35	SPIRE to PHOT STBY Mode	0:15:00		
D3		36	Photometer Detector Microphonics Test	1:30:00	Procedure: Photometer Detector Microphonics Test	2.20
D3			SHIFT 2 CONTINGENCY	2:00:00		
D3			Overnight EMC CS test (susceptibility level at spot	6:00:00		
D3		37	Switch SPIRE to OFF	0:30:00		

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

HPCCS Software	Version	Comment	Confirmed Installed
SPIRE MIB version			

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

I-EGSE Software	Version	Comment
SPIRE MIB version		
SCOS version		

5 Conditions

5.1 Personnel

Responsibility	Name / Organisation
Test Director	
Test Conductor	
EGSE Operator	
PA Responsible	
Instrument Representative	
Customer Representative	
ESA Representative	

5.2 Environmental

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

Environmental	Nominal	Actual
Clean Room Class	class 100 000 or better	
Temperature	22°C ± 3°C	
Rel. Humidity	40 % - 60 %	
Pressure	Ambient	

5.3 Cryostat

During the SPT the HTT shall be closed (i.e. V102/V104 closed), and the cooling of the OBA and shields shall be provided by an external Dewar (baseline) or HOT (optional), with Helium flow rate adjusted to about 100 mg/s to 1 g/s.

The test will be performed on the MPT with the S/C vertical and tilted by 20° from z-axis and +y-axis down.

The cryo-cover mirror shall be cooled down to < 20 K by He flushing from an external Dewar. The cryo-cover temperature shall be controlled by adjusting the He flow with valves at the Dewar and the transfer line.

The relevant parameters shall be adjusted such that the following conditions are achieved for the duration of a day shift:

Level	Requirements acc. to IID-A, Table 7.3.5-1 [K]	Test Specification (AD6) [K]	Temperature Sensors	Actual Values		
				Day 1	Day 2	Day 3
SPIRE L0	T < 2.0 K	T < 1.9	T225, T226, T227			
SPIRE L1	T < 6.2 K	4.3 < T <4.5	T235, T236			
SPIRE L2	T < 12 K	T < 6.0	T254, T256, T258			
SPIRE L3	T < 15 K	10 < T <15 *)	T246, T247			

*) may be adjusted for JFET switch ON only

5.4 Operational

The SPIRE commanding shall be performed using the delivered and released set of scripts which are generated from the SPIRE database. The instrument HK telemetry packets shall be received and visualized on the instrument SCOS 2000 monitors. Real time analysis shall be performed by means of IEGSE by RAL. The entire related TC and TM of each test step shall be stored and made available for further analysis within a few minutes after the end of the particular test step.

All SCOS 2000 displays are defined as part of the SPIRE MIB, which will be delivered via the HPSDB. All TC´s which are send during the execution of the TOPE-Tcl scripts are defined in this database as well.

- **Note: FDIR is not required for this SPIRE test.**

5.5 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.

5.5.1 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.

5.5.2 ESD constraints

Normal ESD constraints are to be observed during the test.

5.5.3 Special QA Requirements

None.

5.6 GSE

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

5.6.1 MGSE

S/C on MPT

5.6.2 CVSE

Dewar to flush shield and cover

5.6.3 EGSE/Software

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

The SPIRE IEGSE shall be running with the following software version for the test:

- HPSDB: HP-ASP-LI-1441_10
- SPIRE scripts with release note: SPIRE_FM_SPTs_12August2008_release_note.txt, dated 16th July 2008
- SPIRE merged MIB: Release note H-P-2-ASP-LI-1424_4, “SPIRE –cryo- Merged Database”

On-Board S/W:

CDMS ASW: Version 3.4.0.9

SPIRE OBS version:

Version DPU 2.2.H Partition 1 ; main and redundant
Version DPU 2.2.H partition 2 ; main and redundant

5.6.4 OGSE

None.

5.6.5 Special Equipment

For the EMC tests overnight specific equipment is required which is, however, detailed in the respective EMC procedure.

6 Requirements to be verified and Test Criteria

This is a performance check of the SPIRE FM under He II conditions.

This test is a specific performance test (SPT) of the SPIRE PFM instrument integrated on the HERSCHEL spacecraft under He II conditions. The instrument performance requirements to be verified by this test are specified by ESA versus RAL. Specific restrictions for this test are highlighted in chapter 7.4 of this procedure.

This test procedure covers the operational aspect of the SPT only. The related pass/fail criteria is to compare for each test step the actual (achieved) results with the nominal (expected) results, as defined in chapter 7 (step-by-step procedure).

The real time analysis of the acquired science data concerning performance aspects will be done by RAL. Also the evaluation of the scientific data and reporting of the evaluation results will be done by RAL. RAL will finally assess the achieved performance versus the requirements.

Typically, the Post Test Review (PTR) will be held before the completion of the scientific data evaluation and, therefore, only a preliminary assessment of the test success can be made at the PTR.

The test is considered as preliminary successful if all steps defined in the step-by-step procedure (chapter 7) reveal compliant results. If all commands have been successfully executed and the housekeeping data have not indicated any anomalies or faults, the science data could be correctly downloaded and the real time analyses performed by RAL have not revealed any degradation of the instrument performance.

The final conclusion of the test will be drawn after the completion of the post processing of the SPIRE science data and comparison of the results with the predictions.

It should be noted that the EMC CS procedures according to AD10 are attached (ANNEX 3). These allow the instrument been set up in the correct mode at the end of each test day for the overnight EMC test activities. The EMC test activities are described in a dedicated separate ASED procedure.

7 Test Procedure

7.1 Initial EGSE and Satellite Configuration for the Test

The Spire FM Final Integration according to the Test Procedure ref. AD 1 must be successfully completed before the execution of this procedure.
The EGSE and Satellite must be configured according to AD 2 prior to start of test. Before executing any of the procedures, please, always check with the Instrument-EGSE staff.

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

The CCS is only required to check changes in instrument configuration related HK parameters.
For each test the instrument will be in a pre-defined mode as listed in the IUM (RD07).
For the SPIRE Cooler recycle it is assumed that the Herschel cryostat will be tilted about the z-axis ≥ +20 degrees (such that the plane of the SOB is at least 20 degrees from the vertical with the +Y Spacecraft axis downwards).
The procedures should be suitable for operation of the Prime side of the instrument.
Several manual procedures are present in this document for which TCL scripts are used for command sequence generation. The procedures require minimal action from the CCS operator and will be clearly explained within this document.

The converted TM parameter values are extracted from the MIB in use for PFM ILT. These values are subject to change for both prime and redundant operations.

7.2 Open Issues

- The ability to operate the PTC control loop is not yet confirmed – some extra interactive testing may be required to allow this to happen
- The sequencing of the tests and under which phase of the test plan they are to be done is not implied by the order of the procedures in this note.

7.3 Duration

The allocated duration for executing the entire sequence of procedures, including switch off of the SPIRE instrument afterwards is 3 days according to AD6.

7.4 Operational Constraints for Procedures

The table given here lists the requirements for the cryo-operational conditions that must be met in order to carry out the SPT procedures listed in this document.

Colour coding
No restriction
Some Restriction
Very Restricted

Procedure	Description	Type	HeI	HeII	Orient	Cover	Notes
SPIRE-FM-DPU-ON-P	DPU PRIME Power up and OBS start	IST-FT	YES	YES	Any	Any	
SPIRE-FM-DRCU-ON-P	DRCU PRIME Power up	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SCU-02-P	SCU Nom. Science Contents check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SCU-03-P	SCU DC Thermometry check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SCU-06-P	SCU AC Thermometry check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SCU-07-P	Sorption Cooler Heaters Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-PCAL-01-P	PCAL Characterisation Test PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SCAL-01-P	SCAL Characterisation Test PRIME	IST-FT	YES	YES	Any	Any	

Procedure	Description	Type	Hel	Hell	Orient	Cover	Notes
SPIRE-FM-FUNC-SCAL-02-P (TBC)	SCAL PID Check PRIME (TBC)	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-MCU-01-P	MCU Boot Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-MCU-03-P	MCU Nom. Science Contents Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-BSM-01-P	BSM Chop/Jiggle Sensors check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-BSM-03-P	BSM Open Loop Dynamics Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-BSM-05A-P	BSM Open Loop Chop Test PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-BSM-05B-P	BSM Close Loop Chop Test PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-BSM-0FF-P	BSM switch OFF	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-SMEC-02A-P	Unlatch the SMEC	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-03-P	SMEC Encoder Levels Check PRIME	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-01-P	SMEC Encoder and LVDT check PRIME	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-04A-P	SMEC Open Loop Position check PRIME	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-09-P	SMEC Open Loop Scan check PRIME	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-04B-P	SMEC Close Loop Position check PRIME	IST-FT	YES	YES	Y vertical	Any	

Procedure	Description	Type	Hel	Hell	Orient	Cover	Notes
SPIRE-FM-FUNC-SMEC-07-P	SMEC Close Loop Scan check PRIME	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-SMEC-OFF-P	SMEC switch OFF	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-SMEC-02B-P	Latch the SMEC	IST-FT	YES	YES	Y vertical	Any	
SPIRE-FM-FUNC-DCU-02-P	DCU Nominal Sci. Contents Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-11-PHOT-P	Phot. BDAs Switch ON Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-13-PHOT-P	Phot. BDAs Integrity Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-14-PHOT-P	Phot. BDAs Noise Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-11-SPEC-P	Spec. BDAs Integrity Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-13-SPEC-P	Spec. BDAs Integrity Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-FUNC-DCU-14-SPEC-P	Spec. BDAs Noise Check PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-SDET-OFF-P	Spec. BDAs switch OFF	IST-FT	YES	YES	Any	Any	
SPIRE-FM-MCU-OFF-P	MCU switch OFF PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-SCU-OFF-P	SCU switch OFF PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-DRCU-OFF-P	DRCU power OFF PRIME	IST-FT	YES	YES	Any	Any	
SPIRE-FM-DPU-OFF-P	DPU power OFF PRIME	IST-FT	YES	YES	Any	Any	

SPT Procedures from HERE							
BSM Control Loop Setting		SPT	YES	YES	Any	Any	
Cooler recycle (manual)		SPT	NO	YES	Y +20 to 30	Any	Orientation is minimum - can also be done with Y horizontal
Cooler recycle (automatic)		SPT	NO	YES	Y +20 to 30	Any	Orientation is minimum - can also be done with Y horizontal
Photometer bias optimisation		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Photometer noise stability versus bias frequency		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Photometer thermal stability versus bias amplitude		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Photometer Ambient Background Verification		SPT	NO	YES	Y +20 to 30	Variable	Orientation is minimum - can also be done with Y horizontal
PTC Headroom Characterisation		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Photometer Thermal Control Verification		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
PCAL Photometer Characterisation		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Spectrometer bias optimisation		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Spectrometer noise stability versus bias frequency		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Spectrometer Ambient Background Verification		SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
PCAL Spectrometer Characterisation		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation requirement is only for cooler recycle - once completed can be any orientation
Photometer scan mode POF5		SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures

SPT Procedures from HERE							
Photometer chop/jiggle mode POF2		SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
SPEC high resolution mode SOF1		SPT	NO	YES	Y vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
Photometer Detector Microphonics Test		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
Spectometer Detector Microphonics Test		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is maximum - SMEC should be against end stop for this test
Spectrometer Mechanism Microvibration Test		SPT	NO	YES	Y vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
Spectrometer SCAL check		SPT	NO	YES	Y vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
EMC - Photometer most sensitive mode		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
EMC – Spectrometer most sensitive mode		SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y horizontal
EMC – SPIRE most Emissive mode		SPT	NO	YES	Y vertical	Any	Cryostat lid can be at any temperature
300mk Stage Decontamination		SPT	NO	YES	Y +20 to 30	Any	Cryostat lid can be at any temperature

7.5 Step by Step Procedure

Any text in **boldface** in the procedural steps generally indicates an action which has to be performed manually by the I-EGSE staff.
The last row in a procedure table should be used to record the overall Pass/Fail result of each test.

7.5.1 S/C Power ON & SPIRE I-EGSE Configuration/Connection

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE I-EGSE Configuration/Connection						
7.5.1.1	Confirm I-EGSE physically connected to HPCCS	OK					
7.5.1.2	If not already ON, switch ON HPCCS, SCOEs and Satellite/SVM and configure into basic test mode i.a.w. AD2 chapt. 7.1 to 7.5	OK					
7.5.1.3	Confirm that EGSE and Satellite are in correct configuration	OK					
7.5.1.4	From HPCCS power ON CCU A & CCU B by executing the test script: **K102999ECVT001_ASDGENCCU_ABPWRON**	OK					
7.5.1.5	From HPCCS enable monitoring mode 1 (512 sec cycle) for CCU A & B by executing test script: **K102999ECVT001_ASDGENCCU_MnEBOTH1**	OK					
7.5.1.6	From HPCCS Test Conductor console issue command to connect to CryoSCOE if connected to main temperature sensors in place of CCUA: **connect PFM_CRYO**	OK					
7.5.1.7	Confirm that from HPCCS that the Cryo SCOE connection has been established.	YZS11940= CONNECTED					

Enter Date / Time:			**Location:**		**Sign OFF:**	**TD:**	**PA:**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.1.8	Switch ON & configure SPIRE-IEGSE						
7.5.1.9	Confirm SPIRE I-EGSE is in correct configuration						
7.5.1.10	From HPCCS Test Conductor console issue command to connect to SPIRE I-EGSE: **connect HSPIREEGSE**	OK					
7.5.1.11	Confirm that from HPCCS and I-EGSE that the connection has been established.	YZS29940= CONNECTED					
7.5.1.11	Verify that I-EGSE is receiving CCU Cryo-Packets	OK					
7.5.1.12	On HPCCS start the following test script: **SPIRE_ALL_SubscribeParams.tcl**	OK					
7.5.1.13	Verify HPCCS-IEGSE connection by sending test command: **YC00X966** From the manual command stack (repeater value of “0”)	OK					
7.5.1.14	If required load Synoptics INSTRUMENTS on HPCCS to display SPIRE status overview						
	SPIRE I-EGSE connected and ready for start of SPT						

7.5.2 SPIRE PRIME OFF to Standby (REDY)

During Power ON of SPIRE a number of soft/hard OOLs are reported due to the sequential switch ON of the units. This is expected and will clear when SPIRE is in REDY mode. When in REDY mode one parameter remains OOL (soft), namely SMD2V505, which is also expected.

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Remarks	P	N
1.	On HPCCS start Packet History displays for the following APIDs:1280,1282	OK				
2.	From the HPCCS test conductor console start the test script to power on SPIRE Prime: **S102999SCVT027_ASDSPTSPIR_PWR_ON_P**	OK		AND: ZAD07999, ZAD14999 MIM: LCL_HERSCHEL		
3.	On HPCCS when prompted: `“SPIRE Switch ON for SPTs in Hel/Hell conditions ONLY - Select NO to abort TS if not correct”` **Select YES**	YES				
	The test script will go on to automatically power on all SPIRE warm units, force boot the DPU ASW and configure the instrument to Standby mode. Reply to prompts as indicated below.					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Remarks	P	N
4.	On HPCCS when prompted: `"Check Telemetry Updating Correctly and OBT is Consistent with CDMU - OK to continue"` Select OK	OK		**AND: SA_1_559**		
5.	If I-EGSE connected when prompted on HPCCS, perform check requested then select **OK**: `"Check IEGSE Time Consistent - OK to continue when RAL confirm"`	OK				
6.	On HPCCS when prompted: `"Check Telemetry No Longer Updating - OK to continue"` Check that parameters: THSK TM2N Select OK to continue	 Not refreshing Not incrementing OK				
7.	On HPCCS when prompted: `"Check Telemetry Updating Correctly - OK to continue"` Check that parameters:			**AND: SA_1_559**		

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Remarks	P	N
	THSK TM2N Select OK to continue	Refreshing @ 1Hz Incrementing by 1 @ 1Hz OK				
8.	On HPCCS when all autonomous actions have been completed by the power on script **S102999SCVT027_ASDSPTSPIR_PWR_ON_P** it will prompt: `“Set Bus Profile Back to Original Setting?”` Select NO	NO				
9.	At the prompt: `“Bus Profile left unchanged”` Select OK to continue	OK				
10.	Verify HK TM packets are being received on APIDs 1280 & 1282	OK				
	SPIRE DPU & DRCU powered and in REDY mode					

7.5.3 Integrated System Tests – SPIRE SPT Day 1

Test Preparation:

Get confirmation by cryo-operator that the cryostat is in correct configuration for SPIRE test continuation and that the lid temperature is < 15K.

7.5.3.1 Cooler Recycle (manual)

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	Prime DPU and DRCU ON						
	Initial Conditions: DPU-A & DRCU A ON						
7.5.3.1.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-SCU-07 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-SCU-07**						
7.5.3.1.2	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.2 Procedure: Cooler Recycle (manual)**						
	SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK						

7.5.3.2 Switch from REDY to Photometer STBY Mode

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK						
7.5.3.2.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.2 Procedure: REDY to PHOTSTBY mode**						
7.5.3.2.2	**Wait for stabilisation (confirmation to proceed with next test step will be given by SPIRE)**	T ≤ 300 mK					
	SPIRE in Photometer STBY						

7.5.3.3 BSM Control Loop Setting

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in REDY or PHOTSTBY						
7.5.3.3.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-BSM-01 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-BSM-01**						
7.5.3.3.2	**Check with SPIRE that the script SPIRE-IST-CPLD-FUNC-BSM-02 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-BSM-02**						

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.3.3.3	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-BSM-03 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-BSM-03**						
7.5.3.3.4	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.1 Procedure: BSM Control Loop Setting**						
	SPIRE in REDY or PHOTSTBY						

7.5.3.4 Photometer Bias Phase Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in REDY						
7.5.3.4.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						
7.5.3.4.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-FUNC-DCU-13P**						
7.5.3.4.3	**Check with SPIRE that the script SPIRE-IST-COLD-PHOT-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-PHOT-VSS**						

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.3.4.4	**Confirm that SPIRE is in PHOTSTBY mode**						
7.5.3.4.5	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.4 Procedure: Photometer Bias Phase Optimisation**						
	SPIRE in PHOTSTBY mode with bias set to ILT nominal values						

7.5.3.5 Photometer Noise Stability versus Bias Frequency

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.5.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.6 Procedure: Photometer Noise Stability versus Bias Frequency**						
	SPIRE in PHOTSTBY mode with bias set to nominal values						

7.5.3.6 Photometer Bias Noise Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.6.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						
7.5.3.6.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-FUNC-DCU-13P**						
7.5.3.6.3	**Check with SPIRE that the script SPIRE-IST-COLD-PHOT-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-PHOT-VSS**						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.3.6.4	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.5 Procedure: Photometer Bias Noise optimisation**						
	SPIRE in PHOTSTBY mode with bias set to ILT nominal values						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.3.7 Photometer Ambient Background Verification

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.7.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.8 Procedure: Ambient Background Verification**						
	SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values						

7.5.3.8 PTC Headroom Characterisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.8.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13P**						
7.5.3.8.2	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.9 Procedure: PTC Headroom Characterisation**						
	SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values – detector temperatures will drift downwards						

7.5.3.9 PCAL Photometer Characterisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.9.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-PCAL-01 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-PCAL-01**						
7.5.3.9.2	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.11 Procedure: PCAL Photometer Characterisation**						
	SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values						

End of SPIRE SPT Day 1

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.3.10 Overnight (Day 1 – Day 2) EMC CS Test - Photometer

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.3.10.1	For the execution of the RAL EMC procedure, SPIRE-RALPRC-003040 (ANNEX 3), the SPIRE instrument will be switched to the most sensitive Photometer mode by execution of the following test scripts on HPCCS in accordance to the ANNEX 2 of this procedure: **2.25 Procedure: Photometer most sensitive mode**						
7.5.3.10.2	Perform detailed step-by-step procedure according to SPIRE-RALPRC-003040, chapter 6.1.2 (ANNEX 3), for differential and common mode CS measurements						
7.5.3.10.3	Check that after exit of SPIRE script **SPIRE-IST-EMC-SPOT.tcl** the instrument is left in **PHOTSTBY** mode	Mode: **PHOTSTBY**					
	SPIRE is in PHOTSTBY						

7.5.4 Integrated System Tests – SPIRE SPT Day 2

Test Preparation:

Get confirmation by cryo-operator that the cryostat is in correct configuration for SPIRE test continuation and that the lid temperature is < 15K.

7.5.4.1 PCAL Flash

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.1.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **Procedure: SPIRE-IST-SPT-PHOT-PCAL-FLASH**						
	SPIRE in PHOTSTBY mode with bias set to nominal values						

7.5.4.2 Photometer Thermal Stability versus Bias Amplitude

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.2.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						
7.5.4.2.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13P**						
7.5.4.2.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.7 Procedure: Photometer Thermal Stability versus Bias Amplitude**						
	SPIRE in PHOTSTBY mode with bias set to nominal values						

7.5.4.3 Change of LID temperature

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	Change of LID Temperature						
7.5.4.3.1	Inform Thermal Responsible that the LID temperature shall be changed to **70 K < T < 90 K**						
7.5.4.3.2	Confirmation by Thermal responsible that LID temperature range has been reached and note actual value	70 K < T < 90 K					
	LID temperature 70 K < T < 90 K						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.4.4 Photometer Thermal Control Verification

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.4.1	Check with test conductor that lid the temperature has been changed and is in the correct range	TBD	TBD				
7.5.4.4.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13P**						
7.5.4.4.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.10 Procedure: Photometer Thermal Control Verification**						
	SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal						

7.5.4.5 Photometer Bias Phase Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.5.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						
7.5.4.5.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13-P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-FUNC-DCU-13P**						
7.5.4.5.3	**Check with SPIRE that the script SPIRE-IST-COLD-PHOT-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST- COLD-PHOT-VSS**						

Enter Date / Time:			**Location:**		**Sign OFF:**	**TD:**	**PA:**

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.4.5.5	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.4 Procedure: Photometer Bias Phase Optimisation**						
	SPIRE in PHOTSTBY mode with bias set to ILT nominal values						

7.5.4.6 Photometer Ambient Background

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.6.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.8 Procedure: Photometer Ambient Background**						
	SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.4.7 Spectrometer Bias Phase Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.4.7.1	Switch **SPIRE from PHOTSTBY to REDY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.3 Procedure: PHOTSTBY to REDY mode**						
7.5.4.7.2	Switch **SPIRE from REDY to IST-SPECSTB mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.4 Procedure: REDY mode to IST-SPECSTBY**						
7.5.4.7.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.12 Procedure: Spectrometer Bias Phase Optimisation**						
	SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.4.8 Spectrometer Bias Noise Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.4.8.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04S**						
7.5.4.8.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13S**						
7.5.4.8.3	**Check with SPIRE that the script SPIRE-IST-COLD-SPEC-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD- SPEC-VSS**						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.4.8.4	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.13 Procedure: Spectrometer Bias Noise Optimisation**						
	SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values						

7.5.4.9 Spectrometer Noise Stability versus Bias Frequency

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.4.9.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04S**						
7.5.4.9.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13S**						
7.5.4.9.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.14 Procedure: Spectrometer Noise Stability versus Bias Frequency**						
	SPIRE in IST-SPECSTBY mode with bias set to nominal values						

7.5.4.10 Spectrometer Ambient Background Verification

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.4.10.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.15 Procedure: Spectrometer Ambient Background Verification**						
	SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal values						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.4.11 PCAL Spectrometer Characterisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.4.11.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-PCAL-01 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC- PCAL-01**						
7.5.4.11.2	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.17 Procedure: PCAL Spectrometer Characterisation**						
	SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal values						

End of SPIRE SPT Day 2

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.4.12 Overnight Hold on Test Activities

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.4.12.1	SPIRE stays in **Spectrometer Standby**						
	SPIRE in IST-SPECSTBY mode						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.5 Integrated System Tests – SPIRE SPT Day 3

Test Preparation:

Get confirmation by cryo-operator that the cryostat is in correct configuration for SPIRE test continuation and that the lid temperature is < 15K.

7.5.5.1 Change of LID temperature

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	Change of LID Temperature						
7.5.5.1.1	Inform Thermal Responsible that the LID temperature shall be changed to **T < 15 K**						
7.5.5.1.2	Confirmation by Thermal responsible that LID temperature range has been reached and note actual value	T < 15 K					
	LID temperature T < 15 K						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.5.2 Cooler Recycle (automatic)

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY						
7.5.5.2.1	Switch **SPIRE from IST-SPECSTBY to REDY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.5 Procedure: IST-SPECSTBY to REDY mode**						
7.5.5.2.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-SCU-07 has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-SCU-07**						
7.5.5.2.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.3 Procedure: Cooler Recycle (automatic)**						
	SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK						

7.5.5.3 Spectrometer Bias Phase Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in REDY						
7.5.5.3.1	**Check with SPIRE that stabilisation has reached**						
7.5.5.3.2	Switch **SPIRE from REDY to IST-SPECSTBY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.4 Procedure: REDY to IST-SPECSTBY mode**						
7.5.5.3.3	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04S**						
7.5.5.3.4	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13S**						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.3.5	**Check with SPIRE that the script SPIRE-IST-COLD-SPEC-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD- SPEC-VSS**						
7.5.5.3.6	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.12 Procedure: Spectrometer Bias Phase Optimisation**						
	SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values						

7.5.5.4 Spectrometer Bias Noise Optimisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY mode						
7.5.5.4.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04S**						
7.5.5.4.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13S**						

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.4.3	**Check with SPIRE that the script SPIRE-IST-COLD-SPEC-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-SPEC-VSS**						
7.5.5.4.4	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.13 Procedure: Spectrometer Bias Noise Optimisation**						
	SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.5.5 Spectrometer Noise Stability versus Bias Frequency

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY mode						
7.5.5.5.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04S**						
7.5.5.5.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13S has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13S**						
7.5.5.5.3	**Check with SPIRE that the script SPIRE-IST-COLD-SPEC-VSS has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-SPEC-VSS**						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.5.4	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.14 Procedure: Spectrometer Noise Stability versus Bias Frequency**						
	SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values						

7.5.5.6 SCAL Characterisation

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in SPECSTBY mode						
7.5.5.6.1	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **Procedure: SPIRE-IST-SPT-PHOT-SCAL-FLASH**						
	SPIRE in SPECSTBY mode with bias set to ILT nominal values						

7.5.5.7 Microphonics Pre-Test Configuration

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	ACMS Switch ON						
7.5.5.7.1	From Test Conductor Console, execute script: 'A102109SPVT003_ACMS_CONFIG25'	OK					
7.5.5.7.2	At the following main menu: HERSCHEL/PLANCK - MAIN MENU 1.0 - INIT PHASE == **1. Select/Load ACMS_CONFIG Input File** 2. Perform LAUNCH CONFIGURATION 3. On Board SW Updates 4. ACMS Power ON (in Pre-Sep configuration) 5. Modify ACC SGM/RM CONTENT (Enter sub-menu 1.1) 6. ACMS SCOE Configuration 77. JUMP to another Entry Point 88. Continue ACMS_CONFIG to menu 2.0 STBY/PRE-SEP 99. Terminate ACMS_CONFIG **select the point number 1** and press the relevant	Continue					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	button:“CONTINUE”.						
7.5.5.7.3	Sequence pops-up asking for the input file. Write SPIRE_UV and press OK	Write “SPIRE_UV” and press OK					
7.5.5.7.4	At sequence completion, the same main menu appears. *Select point number 6* **to switch on the ACMS SCOE then click OK, Continue**	Select Option 6 and click OK, Continue			ACMS SCOE is switched-on in ‘executing’ mode. Note: Until ACC is not fully powered-on, some WARNING ALARMS might come down in the On-Board Event History.		
7.5.5.7.5	On AND YA001939 ‘AMCS SCOE - AS_PSEUDO 1 of 1’ check that parameters: YMACT939 (ACMS SCOE state) YMASE939 (Simulator stata) YMAMS939 (MILFE state) YMAUS939 (UIFE state) Turned to: ‘executing’	Parameters set to ‘executing’					

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.7.6	At sequence completion, the same main menu appears. *Select point number 4* **to switch on the ACC then click OK, Continue**	Select Option 4 and click OK, Continue			Expected Out of Limit of AEYYY109 (synchronisation). ACC may become INVALID for a short time. SPR 245: Out of Limit of HKA_ANTHx_Data		
7.5.5.7.7	From a Packet History tool, select filter 'APID 512' and check that ACMS HK and ETM is correctly flowing down.	OK					
7.5.5.7.8	From On-Board Event History Display check that no 'NO-GO' are present.	OK					
7.5.5.7.9	From ACMS MASTER (ACMS_CONFIG25) sequence, move to Menu 3 (if not already there) with option 88. Click OK and then Confirm	OK					
7.5.5.7.10	From ACMS_CONFIG25, Menu 3, select option 1: 'Override Separation Flag' then Click button OK and then Confirm	Select 1, then OK and Continue			ACC goes in SAM Mode		

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.7.11	Sequence A102109SPVT034_ACMS_SAM_MON shall pop-up following the opening of separation straps, at prompt: 'Do you want to continue to monitor Sam Sun Pointing mode? Enter your choice: no Then click OK	no			ACMS SAM Point Coarse is reached		
7.5.5.7.12	From ACMS_CONFIG25 Master Sequence, Menu 4.0, select option 6 'Transition to OCM' **Click OK and then Confirm**	Select 6, then OK and Continue					
7.5.5.7.13	Sequence 'A102109SPVT036_ACMS_STR_ON' shall pop-up. At prompt: 'Do You want to change current Str in Use' check if STR already selected is the correct one and answer **'no'**	No			STR-1 is switched ON and put in ATFAD mode		
7.5.5.7.14	When scripts are completed, From ACMS synoptic check that ACC Mode is turned to: 'OCM pnt coarse'	OK					
	Synchronise CCS Time With ETS for Accelerometer Measurement Timing						
7.5.5.7.21	For correlation of test results, record time of ETS Accelerometer Test Equipment and at the same time record the CCS time:						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	ETS Time (Accelerometer Measurement T.E. Clock):						
	CCS Time:						
7.5.5.7.22	If not already active request ETS to start accelerometer acquisitions as per Appendix 4						

7.5.5.8 Reaction Wheel Operation for Spectrometer

This section should be performed in parallel with section 7.5.5.9 and takes approximately 40 mins to run.

Step	Reaction Wheel Activation	Nominal Value	Tolerance	Actual Value	Remark	P	N
7.5.5.8.1	From Test Conductor Console, execute script: ‘A102109SPVT208_ACMS_RWL_SPIRE_uVIB.tcl’	OK					
7.5.5.8.2	At the following prompt: ‘Positive Spin. Click OK’ Check from ACMS Synoptic that RWL 1-2-3-4 are ON. Then Click OK to start positive spinning	Click OK					
7.5.5.8.3	From a ‘TM Plotting Tool’ follow RWL spinning, monitoring parameters: AEWR1002 AEWR2002 AEWR3002 AEWR4002	OK					
7.5.5.8.4	At the following prompt: ‘Negative Spin. Click OK’ Click OK to start negative spinning	Click OK					
7.5.5.8.5	From ‘TM Plotting Tool’ (above step) follow RWL negative spinning	OK					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step	Reaction Wheel Activation	Nominal Value	Tolerance	Actual Value	Remark	P	N
7.5.5.8.6	At the following prompt: ‘Click OK to spin-down RWL to 0 [Nms]’ Click OK to bring RWLs to 0 [Nms]	Click OK					

7.5.5.9 Spectrometer Detector Microphonics Test

The previous section (7.5.5.8) must be performed in parallel with this section step 7.5.5.8.3, which is assumed to take around 40 mins to run. Make sure that for this micro-vibration test the accelerometer acquisition has been activated before continuing.

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY mode						
7.5.5.9.1	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						
7.5.5.9.2	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13P**						
7.5.5.9.3	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.22 Procedure: Spectrometer Detector Microphonics Test**						
	SPIRE in IST-SPECSTBY mode with bias set to nominal values						

Enter Date / Time:			**Location:**		**Sign OFF:**	**TD:**	**PA:**

7.5.5.10 Reaction Wheel Operation for Photometer

This section should be performed in parallel with section 7.5.5.11 and takes approximately 40 mins to run.

Step	Reaction Wheel Activation	Nominal Value	Tolerance	Actual Value	Remark	P	N
7.5.5.10.1	From Test Conductor Console, execute script: 'A102109SPVT208_ACMS_RWL_SPIRE_uVIB.tcl'	OK					
7.5.5.10.2	At the following prompt: 'Positive Spin. Click OK' Check from ACMS Synoptic that RWL 1-2-3-4 are ON. Then Click OK to start positive spinning	Click OK					
7.5.5.10.3	From a 'TM Plotting Tool' follow RWL spinning, monitoring parameters: AEWR1002 AEWR2002 AEWR3002 AEWR4002	OK					
7.5.5.10.4	At the following prompt: 'Negative Spin. Click OK' Click OK to start negative spinning	Click OK					
7.5.5.10.5	From 'TM Plotting Tool' (above step) follow RWL negative spinning	OK					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step	Reaction Wheel Activation	Nominal Value	Tolerance	Actual Value	Remark	P	N
7.5.5.10.6	At the following prompt: 'Click OK to spin-down RWL to 0 [Nms]' Click OK to bring RWLs to 0 [Nms]	Click OK					

7.5.5.11 Photometer Detector Microphonics Test

Make sure that for this micro-vibration test the accelerometer acquisition has been activated before continuing.

The previous section (7.5.5.10) must be performed in parallel with this section step 7.5.5.9.5, which is assumed to take around 40 mins to run.

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in IST-SPECSTBY mode						
7.5.5.9.1	Switch **SPIRE from SPECSTBY to REDY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.5 Procedure: IST-SPECSTBY to REDY mode**						
7.5.5.9.2	Switch **SPIRE REDY to PHOTSTBY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.2 Procedure: REDY mode to PHOTSTBY**						
7.5.5.9.3	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-04P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-04P**						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.9.4	**Check with SPIRE that the script SPIRE-IST-COLD-FUNC-DCU-13P has been executed already and the results are known.** If answer is **YES**: proceed with next test step If answer is **NO**: On HPCCS execute the following test script: **SPIRE-IST-COLD-FUNC-DCU-13P**						
7.5.5.9.5	On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **2.21 Procedure: Photometer Detector Microphonics Test**						
	SPIRE in PHOTSTBY mode with bias set to ILT nominal values						

7.5.5.12 Microphonics Post-Test Configuration

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	ACMS Switch OFF						
7.5.5.12.1	Ensure RWLs have spun down before switching OFF						
7.5.5.12.2	From ACMS_CONFIG25 main menu: • **Select the point number 99** and confirm the selection pressing the relevant button "CONTINUE".	Continue					
7.5.5.12.3	The following menu will appear: HERSCHEL/PLANCK - MAIN MENU 9.0 - ACMS OFF PHASE == ***select the point number 1*** 'Switch Off ACMS' and confirm the selection pressing the relevant button "CONTINUE".	Continue					
7.5.5.12.4	Check the "ACMS_OFF" Test Sequence has been successfully ended.	OK					
7.5.5.12.5	By the same above menu, ***select the point number 99*** to end the ACMS_CONFIG25 Master Sequence". Click OK to Confirm	OK					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	Re-Synchronise Time With ETS for Accelerometer Measurement Timing						
7.5.5.12.6	For correlation of test results re-record time of ETS Accelerometer Test Equipment and at the same time record the CCS time:						
	ETS Time (Accelerometer Measurement T.E. Clock):						
	CCS Time:						
7.5.5.12.7	Notify ETS that accelerometer acquisitions can be stopped						

End of SPIRE SPT day 3

Enter Date / Time:			**Location:**			**Sign OFF:**	**TD:**	**PA:**

7.5.5.13 Overnight (Day 3 – Day 4) EMC CS Test - Spectrometer

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
	SPIRE in PHOTSTBY						
7.5.5.13.1	Switch **SPIRE from PHOTSTBY to REDY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.3 Procedure: IST-PHOTSTBY to REDY mode**	Mode: **REDY**					
7.5.5.13.2	Switch **SPIRE REDY to SPECSTBY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.4 Procedure: REDY mode to SPECSTBY**	Mode: **SPECSTBY**					
7.5.5.13.3	For the execution of the RAL EMC procedure, SPIRE-RALPRC-003040 (ANNEX 3), the SPIRE instrument will be switched to the most sensitive Spectrometer mode by execution of the following test scripts on HPCCS in accordance to the ANNEX 2 of this procedure: **2.27 Procedure: Spectrometer most sensitive mode**						
7.5.5.13.4	Perform detailed step-by-step procedure according to SPIRE-RALPRC-003040, chapter 6.1.2 (ANNEX 3), for differential and common mode CS measurements						
7.5.5.13.5	Check that after exit of SPIRE script **SPIRE-IST-EMC-SPOT.tcl** the instrument is left in **SPECSTBY** mode	Mode: **SPECSTBY**					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value	Remarks	P	N
7.5.5.13.6	Switch **SPIRE from SPECSTBY to REDY mode** On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure: **4.5 Procedure: SPECSTBY to REDY mode**	Mode: **REDY**					
	SPIRE in SPECSTBY mode						

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

7.5.6 SPIRE Prime Standby (REDY) to OFF

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Remarks	P	N
7.5.6.1.	From the HPCCS test conductor console start the test script to power OFF SPIRE Prime: **S102999SCVT028_ASDSPTSPIR_PWR_OFF_P**	OK				
7.5.6.2.	On HPCCS when prompted: "SPIRE Switch OFF for SPTs in HeI/HeII conditions ONLY - Select NO to abort TS if not correct" **Select YES**	YES				
	If **YES** is selected the test script will go on to automatically power off all SPIRE warm units.					
	During Switch OFF of SPIRE the following (5,2) and (5,4) event messages on APID 1280 may be expected and do not indicate a problem: EVID 1313 No_MCU_Response_Error EVID 21773 ALARM_LSMCU_DEAD					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Remarks	P	N
7.5.6.3.	On HPCCS when prompted: "Check Telemetry No Longer Updating - OK to continue" Check that parameters: THSK TM2N	 Not refreshing Not incrementing		**AND: SA_1_559**		
7.5.6.4.	Select OK to continue	OK				
7.5.6.5.	On HPCCS when all autonomous actions have been completed by the power on script **S102999SCVT028_ASDSPTSPIR_PWR_OFF_P** it will prompt: “Bus profile left as SPIRE PRIME, change manually after if required - OK to continue”					
7.5.6.6.	Select OK to continue	OK				
7.5.6.7.	On HPCCS stop Packet History displays for the following APIDs:1280,1282	OK				
	SPIRE PRIME OFF					

7.5.7 SPIRE I-EGSE Disconnection & S/C Power OFF

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value		P	N
	Satellite & EGSE Switch Off						
	Initial Conditions: Nominal & Redundant SPIRE warm units OFF						
7.5.7.1	From HPCCS Test Conductor console issue command to disconnect from SPIRE I-EGSE **disconnect HSPIREEGSE**	OK					
7.5.7.2	On HPCSS terminate **SPIRE_ALL_SubscribeParams.tcl** test script.	OK					
7.5.7.3	Confirm from HPCSS and SPIRE I-EGSE that the disconnection was successful	**YZS29940= DISCONNECTED**					
7.5.7.4	Perform SPIRE I-EGSE switch OFF according to procedure 7.2.6 of AD8 as attached.	OK					
7.5.7.5	If connected, from HPCCS Test Conductor console issue command to disconnect from the CryoSCOE. **disconnect PFM_CRYO**	OK					
7.5.7.6	Confirm that from HPCCS that the Cryo SCOE is disconnected.	YZS11940= DISCONNECTED					
7.5.7.7	From HPCCS disable Monitoring Mode 1 (512 sec cycle) for CCU A & B by executing test script: **K102999ECVT001_ASDGENCCU_MnDBOTH1**	OK					
7.5.7.8	From HPCCS power OFF CCU A & CCU B by executing test script: **K102999ECVT001_ASDGENCCU_ABPWROFF**	OK					

Enter Date / Time:			Location:		Sign OFF:	TD:	PA:

Step-No.	Test-Step-Description	Nominal Value	Tolerance	Actual Value		P	N
7.5.7.9	If applicable, stop monitoring CryoSCOE data on the CCS by selecting Stop Record & Exit from the following script: **K102999ECVT035_ASDGEN_SCOE_CCU_LOG**	OK					
7.5.7.10	Switch OFF Satellite/SVM, HPCCS and SCOEs i.a.w. procedure AD 2 Sections 7.7 to 7.11 if required	OK					
7.5.7.11	Confirm both Satellite and EGSE powered down, if applicable	OK					
	End Conditions: Satellite and EGSE OFF						
	END OF TEST						

8 Summary Sheets

8.1 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 8.1-1: Procedure Variation Sheet

8.2 Non Conformance Report (NCR) Summary

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

Table 8.2-1: Non-Conformance Record Sheet

8.3 Sign-off Sheet

	Date	Signature
Test Director		
Test Conductor		
Operator		
PA Responsible		
ESA Representative		

APPENDIX 1

Actual SCOE cable connection (to be confirmed by AIT)

SCOE CABLES CONNECTION to HERSCHEL S/C					
SKIN-01	PWR Panel (PCDU)				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
	BS Nom Power	SK01BJ09	PCDU	BS SCOE Cable Plugged	
	BS Red Power	SK01BJ10	PCDU	BS SCOE Cable Plugged	
	BDR1 AIT	SK01BJ11	PCDU	LPS SCOE Cable Plugged	
	BDR2 AIT	SK01BJ12	PCDU	LPS SCOE Cable Plugged	
	SA Nom Power	SK01AJ01	PCDU	POWER SCOE Cable Plugged	
	SA Nom Power	SK01AJ02	PCDU	POWER SCOE Cable Plugged	
	SA Nom Power	SK01AJ03	PCDU	POWER SCOE Cable Plugged	
	SA Nom Power	SK01AJ04	Battery	EMC Dust Cap	
	SA Red Power	SK01AJ05	PCDU	POWER SCOE Cable Plugged	
	SA Red Power	SK01AJ06	PCDU	POWER SCOE Cable Plugged	
	SA Red Power	SK01AJ07	PCDU	POWER SCOE Cable Plugged	
SKIN-02	PWR Panel (ACC, CDMU, RCS, 1553 & Thruster)				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
SKIN-02	DMS 1553 Bus_A	J01	CDMU	Bus Monitor Cable Plugged	
SKIN-02	DMS 1553 Bus_B	J02	CDMU	Bus Monitor Cable Plugged	
SKIN-02	ACMS 1553 Bus_A	J03	ACC	ACMS SCOE Cable Plugged	
SKIN-02	ACMS 1553 Bus_B	J04	ACC	ACMS SCOE Cable Plugged	
SKIN-02	LV1/FCV 20N CMD S/A M	J05	ACC/RCS	ACMS SCOE	

				Cable Plugged	
SKIN-02	LV2/FCV 20N CMD S/A R	J06	ACC/RCS	ACMS SCOE Cable Plugged	
SKIN-02	RCS Press/Tank Temp/PT Pwr	J07	ACC/PT&TH		Flight Plug SK02P07 Plugged
SKIN-02	Thruster Temp M/LV1 Sts	J08	ACC/RCS	ACMS SCOE Cable Plugged	
SKIN-02	CDMU and ACC EEPROM reprogramming input	J09	ACC/CDMU		Flight Plug SK02P09 Plugged
SKIN-02	CDMU and ACC EEPROM reprogramming input	J10	ACC/CDMU		Flight Plug SK02P10 Plugged
SKIN-02	Thruster Temp R/LV2 Sts	J11	ACC/RCS	ACMS SCOE Cable Plugged	
SKIN-02	Thruster C/B Heaters M	J12	ACC/CBH	ACMS SCOE Cable Plugged	
SKIN-02	Thruster C/B Heaters R	J13	ACC/CBH	ACMS SCOE Cable Plugged	
SKIN-02	Str1/2 On/Off Cmd M/Str1 Sts	J14	ACC/STR-1		ACMS Flight Plug SK02P14 Plugged
SKIN-02	Str1/2 On/Off Cmd R/Str2 Sts	J15	ACC/STR-2		ACMS Flight Plug SK02P15 Plugged
SKIN-02	Gyro A On/Off Cmd	J16	ACC/GYRO-E1		ACMS Flight Plug SK02P16 Plugged
SKIN-02	Gyro B On/Off Cmd	J17	ACC/GYRO-E2		ACMS Flight Plug SK02P17 Plugged
SKIN-03	TTC Panel				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
SKIN-03	Test point TC + protection jumper EPC1	SK03J01	XPND1/EPC1		Flight cap
SKIN-03	Test point TC + protection jumper EPC2	SK03J02	XPND2/EPC2		Flight cap
	RF LINK				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
	RF link for antenna LGA1	N/A	LGA1	RF SCOE LGA1 Plugged	LGA1 Anechoic Cap
	RF link for antenna LGA2	N/A	LGA2	RF SCOE LGA2 Plugged	LGA2 Anechoic Cap
	RF link for antenna MGA	N/A	MGA	RF SCOE MGA Plugged	MGA Anechoic Cap
SKIN-04	ACMS Panel (RWE)				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
SKIN-04	RWL1 Sgn	J01	ACC/RWL-1		ACMS Flight Plug SK04P01 Plugged
SKIN-04	RWL2 Sgn	J02	ACC/RWL-2		ACMS Flight Plug

					SK04P02 Plugged
SKIN-04	RWL3 Sgn	J03	ACC/RWL-3		ACMS Flight Plug SK04P03 Plugged
SKIN-04	RWL4 Sgn	J04	ACC/RWL-4		ACMS Flight Plug SK04P04 Plugged
SKIN-05	GYR/QRS Panel				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
SKIN-05	CRS1 AOCS Sgn	J01	CRS-1/ACC		ACMS Flight Plug
SKIN-05	CRS2 AOCS Sgn	J02	CRS-2/ACC		ACMS Flight Plug
SKIN-05	GYRO RS422 / Test	J03	GYRO	ACMS SCOE Cable Plugged	
SKIN-05	CRS 1/2 Stimuli	J04	CRS-1,2	ACMS SCOE Cable Plugged	
SKIN-05	AAD Sgn M	J05	AAD/ACC	ACMS SCOE Cable Plugged	
SKIN-05	SAS1/2 Sgn M	J06	SAS/ACC	ACMS SCOE Cable Plugged	
SKIN-05	SAS1/2 Sgn R	J07	SAS/ACC	ACMS SCOE Cable Plugged	
SKIN-05	AAD Sgn R	J08	AAD/ACC	ACMS SCOE Cable Plugged	
SKIN-06	STR Panel				
	Connector Function	Skin Connector	S/C unit	SCOE CABLE	Flight Connector
SKIN-06	STR1 Stimuli	J01	STR1	ACMS SCOE Cable Plugged	
SKIN-06	STR2 Stimuli	J02	STR2	ACMS SCOE Cable Plugged	
	UMBILICAL				
	Connector Function	Connector	S/C unit	SCOE CABLE	
	Power/Data	HU1J01	SYSTEM	SCOEs cable Plugged	
	Power/Data	HU2J01	SYSTEM	SCOEs cable Plugged	

APPENDIX 2

SPIRE CFT Procedure ref. SPIRE-RAL-PRC-002704, issue 3.4

1. INTRODUCTION

This document sets out the procedures to be used during the SPIRE Specific Performance Test which will be carried out at system level as part of the Integrated System Test. The format of the document is identical to that used for the Warm Functional Test Procedures (RD01). In this document only the individual procedures are detailed; neither the timing nor the sequencing of the tests are given or should be implied from the order given in the document. The actual test sequence and duration is specified in a spreadsheet (RD03) and implemented in AD02. The sequencing of the EMC and thermal tests will be detailed in separate documents.

1.1 Change Record

Draft 0.1, 17th July 2006	Draft 0.1
Issue 1.0 15th Aug 2006	Issue 1.0 Included detailed procedure for BSM tuning operation Several updates for procedure naming Spectrometer SCAL check rearranged
Issue 2.0 20th July 2007	Extensive additions to incorporate lessons learned from ILT
Issue 2.1 28th August 2007	Minor typos; bias phase and noise optimisation split and addition of constraints table
Issue 2.2 18th September 2007	Split spectrometer bias test into two as per photometer – other minor corrections – this version issued to TAS/Astrium/Project for review
Issue 2.3 19th October 2007	Added procedure for photometric verification of SCAL to replace spectral measurement
Issue 2.4 14th November 2007	Added cryostat interface temperature constraints – removed extraneous switch on procedures where not required
Issue 2.5 8th January 2008	Changes to the micro-vibration test procedures to make compatible with JPL suggestions and SMEC operating constraints
Issue 2.6 14th January 2008	Changed introduction to clarify where sequence of tests is defined – added spreadsheet as R03 Added SMEC uVibe to just do one speed with ramp of reaction wheels rotation – other speeds won't really affect result Change BSM Tuning to start from either REDY or PHOTSTBY *Note add mode transitions into EMC tests overnight in spreadsheet – add comments in specification - done*
Issue 3.0	Added switch on and mode transition procedures to appendix Added standalone reset offsets procedure into appendix Deleted tests that cannot be carried out – SMEC operations Changed SPECSTBY to IST-SPECSTBY to account for no SMEC operation
Issue 3.1 1st April 2008	Reinstated heading/procedure numbering correctly – missing heading from section 2.1 Added section 4.7 for PCAL flash for photometer and section 4.8 for PCAL flash for spectrometer Changed section 2.2 and 2.3 cooler recycle to have consistent pre-requisites Changed microphonics tests to fit into 2.5 hours each

Issue 3.2 19th June 2008	Correction to 2.28 Spectrometer EMC Vss test mode preconditions Correction to naming of procedures and description for 2.26 and 2.28 Vss tests to be carried at during EMC tests
Issue 3.3 6th Aug 2008	Procedures updated to show actual sequence of test scripts to be executed. Additional SPT scripts listed in the Appendix 2. These will be run as required. Updated versions of applicable documents.
Issue 3.4 12th Aug 2008	Automated the BSM PID tuning procedure. Extended its duration from 1 hour to 2.5 hours.

1.2 Applicable Documents

AD01 SPIRE System Level Test Plan SPIRE-RAL-002726 iss1.1
AD02 Herschel Instruments FM IST Test Specification H-P-2-ASP-TS-1083 v2.0

1.3 Applicable Documents

RD01 SPIRE IST Warm Functional Test Procedures SPIRE-RAL-PRC-002422, Issue 2.4, 16th Oct 2007
RD02 SPIRE Instrument User Manual, Issue 1.3, SPIRE-RAL-PRJ-002395, 9th Nov 2007
RD03 Spreadsheet "*IST_SPT_Proc_requirements and schedule_THREEDAY*" supplied as input to AD02

1.4 General instructions for executing test procedures

- Before executing any of the procedures please always check with the I-EGSE staff
- Any text in **boldface** in the procedural steps generally indicates an action which has to be performed manually by the I-EGSE staff.
- The last row in a procedure table should be used to record the overall Pass/Fail result of each test.

1.5 Assumptions

- The CCS is only required to check changes in instrument configuration related HK parameters.
- For each test the instrument will be in a pre-defined mode as listed in the IUM (**RD02**).
- For the SPIRE spectrometer mechanism (SMECm) tests it is assumed that the Herschel cryostat will be tilted such that the plane of the Herschel Optical Bench (HOB) is vertical and the SPIRE Optical Bench (SOB) is horizontal.

- For the SPIRE Cooler recycle it is assumed that the Herschel cryostat will be tilted such that the plane of the SOB is at, at least, 30 degrees from the vertical with the +Y Spacecraft axis downwards
- These procedures should be suitable for operation of both the Prime and Redundant side of the instrument (TBD).
- Several manual procedures are present in this document for which TCL scripts are used for command sequence generation. These procedures require minimal action from the CCS operator and will be cleary explained within this document.
- **The converted TM parameter values are extracted from the MIB in use for PFM ILT. These values are subject to change for both prime and redundant operations.**

1.6 Open Issues

- The ability to operate the PTC control loop is not yet confirmed – some extra interactive testing may is required to allow this to happen
- The sequencing of the tests and under which phase of the test plan they are to be done is not implied by the order of the procedures in this note.

1.7 Duration

The estimated duration for executing the entire sequence of procedures, including switch off of the SPIRE instrument afterwards is estimated to be about **5 days**

The actual duration available is 3 days and a test sequence has been provided for inclusion in AD02, see RD03.

2. TEST PROCEDURES

The following test procedures are detailed in this document

2.1 Procedure: BSM Control Loop Setting
2.2 Procedure: Cooler recycle (manual)
2.3 Procedure: Cooler recycle (automatic)
2.4 Procedure: Photometer bias phase optimisation
2.5 Procedure: Photometer bias noise optimisation
2.6 Procedure: Photometer noise stability versus bias frequency
2.7 Procedure: Photometer thermal stability versus bias amplitude
2.8 Procedure: Photometer Ambient Background Verification
2.9 Procedure: PTC Headroom Characterisation
2.10 Procedure: Photometer Thermal Control Verification
2.11 Procedure: PCAL Photometer Characterisation
2.12 Procedure: Spectrometer bias phase optimisation
2.13 Procedure: Spectrometer bias noise optimisation
2.14 Procedure: Spectrometer noise stability versus bias frequency
2.15 Procedure: Spectrometer Ambient Background Verification
2.16 Procedure: SCAL Photometric Verification
2.17 Procedure: PCAL Spectrometer Characterisation
2.18 Procedure: Photometer scan mode POF5
2.19 Procedure: Photometer chop/jiggle mode POF2
2.20 Procedure: SPEC high resolution mode SOF1
2.21 Procedure: Photometer Detector Microphonics Test
2.22 Procedure: Spectrometer Detector Microphonics Test
2.23 Procedure: Spectrometer Mechanism Spot Frequency Microvibration Test
2.24 Procedure: Spectrometer Mechanism Variable Frequency Microvibration Test
2.25 Procedure: EMC - Photometer most sensitive mode
2.26 Procedure: EMC – Photometer JFET VSS Test
2.27 Procedure: EMC – Spectrometer most sensitive mode
2.28 Procedure: EMC – Spectrometer JFET VSS Test
2.29 Procedure: 300mk Stage Decontamination

4.1 Switch on to REDY mode
4.2 REDY to PHOTSTBY mode
4.3 PHOTSTBY to REDY mode
4.4 REDY to SPECSTBY mode
4.5 SPECSTBY to REDY mode
4.6 REDY to OFF
4.7 PCAL Flash (PHOT)
4.8 PCAL Flash (SPEC)

2.1 Procedure: BSM Control Loop Setting

Version: 2.1
Date: 12th August 2008
Purpose: To optimize the PID control loop for BSM best dynamic behaviour
V1-V2 – Changed to have two separate scripts for different chop throws.
V2.0-V2.1 – Automated the script to tune the Chop PID parameters. Increased the duratiion

Duration: 2.5 hours (1.25 hours per script)

Preconditions:

- Functional tests SPIRE-IST-COLD-FUNC-BSM-01,02,03 have been carried out successfully
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Level 0 temperature: <2 K – not critical
- Level 1 temperature: < 5 K – not critical
- Level 2 temperature: No constraint

Initial Configuration:

- SPIRE is in either REDY or PHOTSTBY mode

Procedure Steps:

Step#	Action	Comments
1	If in REDY mode execute SPIRE-IST-BSM-ON.tcl template and SPIRE-IST-BSM-INIT.tcl	This switches ON the BSM magneto resistive sensors
2	Start chopping the BSM to first chop position by executing SPIRE-IST-BSM-CHOP-POS1.tcl Chop On/Off positions 0xb600/0x6a28 (46592/27176) Jiggle On/Off positions 0x9a60/0x9a60 (39520/39520)	
3	Test will naturally stop when chopping stops – wait for I-ESGE staff to confirm end of test	
4	Start chopping the BSM to second chop position by executing SPIRE-IST-BSM-CHOP-POS2.tcl Chop On/Off positions 0xdbc4/0x4414 (56260/17428) Jiggle On/Off positions 0x9a60/0x9a60 (39520/39520)	
5	Test will naturally stop when chopping stops – wait for I-ESGE staff to confirm end of test	
6	Test will naturally stop when chopping stops – wait for I-ESGE staff to confirm end of test	

7	If initial condition was REDY then
	Switch OFF BSM mechanism
	Execute SPIRE-IST-BSM-OFF.tcl
	else
	End of test	

Final Configuration: SPIRE in REDY or PHOTSTBY

2.2 Procedure: Cooler recycle (manual)

Version: 1.3
Date: 31st July 2008
v1-v2 Change heater power to 400 mW from 300 mW
v1.2-v1.3 – Added start and end test scripts. EVHSV changed to SPHSV in step 2

Purpose:
Recycle the cooler to provide the correct operating temperature for the detectors.
This procedure is carried out with operator intervention to ensure the correct conditions are obtained during the recycle and to properly calibration the duration of each phase of the recycle. Once the calibration is obtained an automatic procedure will be used that does not require operator intervention (see section 2.3)

Duration:
About 2 hours

Preconditions:
- Functional test SPIRE-IST-COLD-FUNC-SCU-07 has been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Herschel tilted such that SOB is tilted at least 20 degrees from vertical towards +Y direction
- Level 0 temperature: <1.7 K – critical that this is maintained throughout recycle to ensure efficient condensation
- Level 1 temperature: < 5 K – not critical
- Level 2 temperature: No constraint

Initial Configuration:
SPIRE in REDY mode

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-CRECm.tcl • **Click on OK button to turn off Pump Heat Switch (whether it is on or off)** **Apply 1.4 mA to the Evaporator Heat Switch**	STEP *Time (UT)* SPHSV PUMPHSTEMP EVAPHSTEMP	1 TBC TBC TBC		
3	**Wait for PUMPHSTEMP to go just below 12 K and then click on OK to apply 400 mW power to Pump Heater**	STEP *Time (UT)* *ΔTime (minutes)* SPHTRV	2 TBC		
4	**Wait for PUMPHTRTEMP to increase to 45 K and then click on OK to reduce power to Pump Heater to 40mW**	STEP *Time (UT)* *ΔTime (minutes)* SPHTRV PUMPHTRTEMP	3 TBC TBC		
5	**Wait for SUBKTEMP to fall below 2 K and then click on OK to switch off power to the** **Pump Heater and Evaporator Heat Switch.** **IMPORTANT: This step should be executed even if SUBKTEMP is above 2 K but more than an hour has elapsed since the start of the recycle procedure.**	STEP *Time (UT)* *ΔTime (minutes)* EVHSV SPHTRV PUMPHSTEMP EVAPHSTEMP	4 TBC TBC TBC TBC		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
6	**Wait for EVAPHSTEMP to fall below ~ 16 K and then click on OK to switch on power to the Pump Heat Switch** *The TCL script ends after execution of this step*	STEP *Time (UT)* *ΔTime (minutes)* SPHSV SUBKTEMP PUMPHSTEMP	5 TBC TBC TBC		
7	**Monitor SUBKTEMP and PUMPHSTEMP.** *Cooler recycle procedure completes when SUBKTEMP reaches ~ 0.285 K and PUMPHSTEMP reaches ~TBC K.*	*Time (UT)* *ΔTime (minutes)* SUBKTEMP PUMPHSTEMP	 < 300mK TBC		
8	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID for the test	N/A	N/A	N/A	

Final Configuration:
SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK

2.3 Procedure: Cooler recycle (automatic)

Version: 1.0
Date: 24th July 2006
Purpose:
Recycle the cooler without operator intervention

Duration:
Approximately 2 hours

Preconditions:

- Functional test SPIRE-IST-COLD-FUNC-SCU-07 has been carried out successfully.
- Manual recycle carried out under nominal temperature and cryostat operational conditions
- **The calibration table CoolerRecycling.txt has been updated in the CUS following the manual cooler recycle**
- **Mission configuration changed on the I-EGSE (if the CUS scripts or Calibration tables have been updated)**
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Herschel tilted such that SOB is tilted at least 20 degrees from vertical towards +Y direction
- Level 0 temperature: <1.7 K – critical that this is maintained throughout recycle to ensure efficient condensation
- Level 1 temperature: < 5 K – not critical
- Level 2 temperature: No constraint

Initial Configuration:
SPIRE in REDY mode

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CRECa.tcl	SUBKTEMP	AFTER RECYCLE <		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
			300mK		
Test Result (Pass/Fail):					
Duration of SPIRE Cooler Recycle Procedure:					

Final Configuration:
SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK

2.4 Procedure: Photometer bias phase optimisation

Version: 1.4
Date: 31st July 2008
1.0-1.1 Split previous detector bias optimisation into two following Tanya's recommendation
1.2-1.3 Set bias freq, amplitudes and phase range
1.3-1.4 Test sequence and script names defined

Purpose:
Find the optimum bias phase versus frequency for operating the photometer under IST ground nominal conditions

Duration:
Approximately 4 hours

Preconditions:
- Functional tests SPIRE-IST-COLD-FUNC-DCU-04P,13P and SPIRE-IST-COLD-PHOT-VSS have been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- The establishment of the correct Vss settings (SPIRE-IST-COLD-PHOT-VSS)
- Level 0 temperature: <1.8 K drift < 0.05 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

OPEN ISSUE – do we want the PTC operating during this test – No
Bias amplitudes 15, 30, 50 mV
Bias frequencies 70, 100, 130, 190 Hz
Phase Range – PFM5 central phase +/-11.2 degrees in steps of 2.8 degrees

Initial Configuration:
SPIRE in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-PHASEUP-PHOT70.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels at 70Hz bias frequency • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-PHASEUP-PHOT100.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels at 100Hz bias frequency • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
3	Execute TCL script SPIRE-IST-PHASEUP-PHOT130.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels at 130Hz bias frequency • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
4	Execute TCL script SPIRE-IST-PHASEUP-PHOT190.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels at 190Hz bias frequency • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
5	If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-PHOT.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
6	Analyse data in real time to determine IST ground nominal operating parameters and compare to ILT results – confirm ILT table entries.				

Test Result (Pass/Fail):

Approximate optimum phase settings for each detector:

Bias Level	Frequency	PSW Phase	PMW Phase	PLW Phase
15	70			
30	70			
50	70			
.				
.				

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
Create a new calibration table Phot_Noise_Settings.txt: **Bias F, Samp F, PSW bias, PMW bias, PLW bias, PSW phase, PMW phase, PLW phase** **70** **100** **130** **190**					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to ILT nominal values

2.5 Procedure: Photometer bias noise optimisation

Version: 1.2
Date: 31st July 2008
1.0-1.1 Split previous detector bias optimisation into two following Tanya's recommendation
1.1-1.2 Test sequence and script names defined

Purpose:
Find the optimum bias level and frequency for operating the photometer under IST ground nominal conditions

Duration:
Approximately 2.5 hours

Preconditions:

- Functional tests SPIRE-IST-COLD-FUNC-DCU-04P,13P and SPIRE-IST-COLD-PHOT-VSS have been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- The establishment of the correct Vss settings (SPIRE-IST-COLD-PHOT-VSS)
- The establishment of the correct bias phase versus frequency and amplitude done during test 2.4
- **The input PSW, PMW and PLW phases to the CUS scripts SPIRE_IST_DNA_PHOT_AMP15/30/50 have been updated following phase-ups**
- **Mission configuration changed on the I-EGSE (if the CUS scripts or Calibration tables have been updated)**
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Bias and phases to use as per 2.4

Initial Configuration:
SPIRE in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-DNA-PHOT-AMP15.tcl • Set bias amplitude to 15mV • Set frequency to 70 Hz and predetermined phase – observe signal and measure noise • Set frequency to 100 Hz and predetermined phase – observe signal and measure noise • Set frequency to 130 Hz and predetermined phase – observe signal and measure noise • Set frequency to 190 Hz and predetermined phase – observe signal and measure noise If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-PHOT.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-DNA-PHOT-AMP30.tcl • Set bias amplitude to 30mV • Set frequency to 70 Hz and predetermined phase – observe signal and measure noise • Set frequency to 100 Hz and predetermined phase – observe signal and measure noise • Set frequency to 130 Hz and predetermined phase – observe signal and measure noise • Set frequency to 190 Hz and predetermined phase – observe signal and measure noise If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-PHOT.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
3	Execute TCL script SPIRE-IST-DNA-PHOT-AMP50.tcl • Set bias amplitude to 50mV • Set frequency to 70 Hz and predetermined phase – observe signal and measure noise • Set frequency to 100 Hz and predetermined phase – observe signal and measure noise • Set frequency to 130 Hz and predetermined phase – observe signal and measure noise • Set frequency to 190 Hz and predetermined phase – observe signal and measure noise If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-PHOT.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
4	Analyse data in real time to determine IST ground nominal operating parameters	N/A	N/A	N/A	
5	If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-PHOT.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	

Test Result (Pass/Fail):

Approximate optimum bias settings each detector: Note that the bias frequency has to be the same for all three arrays.

Bias Frequency:

	Bias Level	Phase
PSW		
PMW		
PLW		

.
.

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to ILT nominal values

2.6 Procedure: Photometer noise stability versus bias frequency

Version: 1.2
Date: 31st July 2008
Changes to prerequisites following Tanya's recommendation
1.1-1.2 Test sequence and script names defined

Purpose:
Determine the detailed noise spectrum versus frequency when operating the photometer under IST ground nominal conditions

Duration:
Approximately 2 hours

Preconditions:

- Functional tests SPIRE-IST-COLD-FUNC-DCU-04P,13P have been carried out successfully.
- Procedure for setting optimum photometer bias conditions versus frequency has been carried out and a table of phase versus frequency and amplitude is available.
- Correct VSS setting is established
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Phase versus bias amplitude and frequency has been established by test 2.4
- **The input PSW, PMW and PLW biases and phases to the CUS script SPIRE_IST_DNA_PHOT_FRQ have been updated following tests 2.4 and 2.5**
- **Mission configuration changed on the I-EGSE (if the CUS scripts or Calibration tables have been updated)**
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

OPEN ISSUE – do we want the PTC operating during this test? - Included as an option. But requires that procedure PTC Thermal Control Verification has been successfully carried out.

Initial Configuration:
SPIRE in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	OPTIONAL: Execute one of these TCL scripts: SPIRE-IST-PTC-VM-SUBKTEMP.tcl, SPIRE-IST-PTC-VM-PSWT1.tcl or SPIRE-IST-PTC-VM-TC2.tcl • Starts VM with parameters for PTC control determined during PTC optimisation procedure				
2	Execute TCL script SPIRE-IST-DNA-PHOT-FRQ.tcl • Set frequency to 70 Hz and phase to predetermined level • Measure noise for 30 minutes (nominal – can be longer) • Repeat for the following default settings • 100 Hz • 130 Hz • 190 Hz • Set to detectors nominal values	N/A	N/A	N/A	
3	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings **(The input values to the CUS script may need updating by the I-EGSE)**	N/A	N/A	N/A	
Test Result (Pass/Fail):					
Detailed analysis of data required by off line processing					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to nominal values

2.7 Procedure: Photometer thermal stability versus bias amplitude

Version: 1.1
Date: 31st July 2008
Purpose: Determine thermal response of the detectors to a step change bias looking for long term thermal drift in the bolometers
1.0-1.1 Test sequence and script names defined

Duration:
Approximately 3 hours

Preconditions:

- Functional tests SPIRE-IST-COLD-FUNC-DCU-04P,13P have been carried out successfully.
- Procedure for setting optimum photometer bias conditions versus frequency has been carried out and a table of phase versus frequency is available.
- **The input bias settings (phases, bias amplitudes and frequency) in the CUS script SPIRE_IST_DNA_PHOT_STAB have been updated for IST**
- **The mission configuration updated on the I-EGSE.**
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible.
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint
- 300 mK stage drift <0.1 mK/hour

OPEN ISSUE – do we want the PTC operating during this test? - Included as an option. But requires that procedure PTC Thermal Control Verification has been successfully carried out.

Initial Configuration:
SPIRE in PHOTSTBY with bias set to IST ground nominal settings

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	OPTIONAL: Execute one of these TCL scripts: SPIRE-IST-PTC-VM-SUBKTEMP.tcl, SPIRE-IST-PTC-VM-PSWT1.tcl or SPIRE-IST-PTC-VM-TC2.tcl • Starts VM with parameters for PTC control determined during PTC optimisation procedure				
2	Execute TCL script SPIRE-IST-DNA–PHOT-STAB.tcl • Measure signal for 30 minutes at nominal bias amplitude of ~30mV • Step bias to ½ nominal amplitude, appropriate phases and reset offsets • Measure signal for 1 hour • Step bias to nominal amplitude (30mV) and reset offsets • Measure signal for 1 hour	N/A	N/A	N/A	
3	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings				
Test Result (Pass/Fail):					
Detailed analysis of data required by off line processing					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to nominal values

2.8 Procedure: Photometer Ambient Background Verification

Version: 1.2
Date: 31st July 2008
Purpose: Determine the optical power load onto the photometer detectors using a detector "loadcurve" at fixed frequency and phase to measure the detector temperature.
1.1-1.2 Test sequence and script names defined

Duration:
Approximately 1 hour

Preconditions:

- Photometer IST Ground Nominal bias settings have been determined by procedures 2.4 to 2.7
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- **If the IST optimum phases are significantly different from the ILT values then the input phases in CUS script SPIRE_IST_LC_PHOT will need to be modified and the Mission Configuration updated on the I-EGSE.**
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is set to PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CPS-PHOT.tcl • Standard PCAL flash for photometer	N/A	Detector signal N+/-dN mV		
2	Execute TCL script SPIRE-IST-LC-PHOT.tcl • Standard Load Curve	N/A	N/A		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
3	Execute TCL script SPIRE-IST-CPS-PHOT.tcl • Standard PCAL flash for photometer	N/A	Detector signal N+/-dN mV		
4	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal

2.9 Procedure: PTC Headroom Characterisation

Version: 1.2
Date: 31st July 2008
1.0-1.1 Changed to three hours to fit with schedule
1.1-1.2 Test sequence and script names defined

Purpose: Determine the required PTC power setting required to enable stable operation of the photometer detectors under Ground Nominal conditions.
Duration: Approximately 3 hours
Preconditions:

- Functional test SPIRE-IST-COLD-FUNC-DCU-13P has been carried out successfully
- Photometer IST Ground Nominal bias settings have been determined by procedures 2.4 to 2.7
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.05 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is set to PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-PTC-PWR.tcl Start by resetting photometer offsets and collecting detector data for 5 minutes with PTC off	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	• Set PTC to first level and reset offsets • Collect detector data for 20 minutes – observe PTC thermistor and detector signals • *Loop n-times* • Set PTC heater power to nth level +1 Switch PTC off, reset photometer offsets and collect detector data for 20 minutes – observe PTC thermistor and detector signals				
2	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					
PTC power level required to stabilise typical thermal drift					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal – detector temperatures will be drifting downwards

2.10 Procedure: Photometer Thermal Control Verification

Version: 2.1
Date: 31st July 2008
1.0-2.0 Changed to add in ability to vary tuning parameters for control algorithm – three iterations of the test are expected
2.0-2.1- Test sequence and script names defined

Purpose:
To test detector thermal stability whilst under PTC control – this can be carried out at any point

Duration:
Indeterminate - see RD03

Preconditions:
- Functional test SPIRE-IST-COLD-FUNC-DCU-13P has been carried out successfully
- Photometer IST Ground Nominal bias settings have been determined by procedures 2.4 to 2.7
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- The “PTC Headroom” procedure has been carried out and the optimum PTC power setting has been established
- Level 0 temperature: <1.8 K drift < 0.05 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
2	Execute one of the following stand alone TCL scripts to switch PTC on and put it in VM control mode. The script to be run will be specified by the I-EGSE 1. SPIRE-IST-PTC-VM-PSWT1.tcl 2. SPIRE-IST-PTC-VM-SUBKTEMP.tcl 3. SPIRE-IST-PTC-VM-TC2.tcl	N/A	N/A	N/A	
3	Stop VM using pop up button when advised by I-EGSE staff • It may be necessary to edit one or more of command parameters in these scripts and rerun the script. • It may also be necessary to set the PTC heater power by sending the SEND_DRCU_COMMAND(0xA0C6xxxx,0), where xxxx will be specified by the I-EGSE.				
4	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID for the test	N/A	N/A	N/A	
5	Repeat above steps as requested by I-EGSE staff. Three repeats are expected but may require more.				
6	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration:

SPIRE is in PHOTSTBY with detector temperature under PTC control (TBC).

2.11 Procedure: PCAL Photometer Characterisation

Version: 1.2
Date: 31st July 2008
1.1-1.2 *Test sequence and script names defined. Added test script for PCAL flash characterisation*

Purpose: Determine the response of the photometer detectors to variable PCAL power setting required to confirm the operating conditions for PCAL for the photometer detectors under Ground Nominal conditions.
Duration: Approximately 0.75 hours
Preconditions:

- Functional test SPIRE-IST-COLD-FUNC-PCAL-01 has been carried out successfully
- Photometer IST Ground Nominal bias settings have been determined by procedure "Photometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.1 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is set to PHOTSTBY with ground nominal detector bias settings

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CPC-PHOT.tcl • Set PCAL bias to 0.35 mA • Wait for 10 seconds • Set PCAL to 0 mA • Wait for 10 seconds • Repeat for PCAL bias values going between 0 and 0.7, 1.05, 1.4,	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	1.75, 2.1, 2.45, 2.8, 3.15, 3.5, 3.85, 4.2, 4.55, 4.9, 5.25, 5.6, 5.95, 6.3, 6.65, 7.0 • Switch off PCAL				
2	Execute TCL script SPIRE-IST-CPT-PHOT.tcl This test runs the PCAL flash VM for 15 flash cycles, flash period 4 seconds. The flashes are between PCAL bias currents of 0.0/0.35, 0.0/0.7, 0.0/1.05, 0.0/1.4, 0.0/1.75, 0.0/2.1, 0.0/2.45, 0.0/2.8, 0.0/3.15, 0.0/3.5, 0.0/3.85, 0.0/4.2, 0.0/4.55, 0.0/4.9, 0.0/5.25, 0.0/5.6, 0.0/5.95, 0.0/6.3, 0.0/6.65, 0.0/7.0 PCAL is switched off at the end by the script.	N/A	N/A	N/A	
3	If requested by the I-EGSE, execute the TCL script SPIRE-IST-DNS-PHOT.tcl to set the IST nominal detector settings				
Test Result (Pass/Fail):					
PCAL standard flash power settings confirmed					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal

2.12 Procedure: Spectrometer bias phase optimisation

Version: 1.1
Date: 31st July 2008
Split previous detector bias optimisation into two following Tanya's recommendation
1.0-1.1 Test sequence and script names defined.

.

Purpose:
Find the optimum bias phase versus frequency for operating the spectrometer under IST ground nominal conditions

Duration:
Approximately 4 hours

Preconditions:

- Functional tests SPIRE-IST-FUNC-DCU-04S,13S and SPIRE-IST-COLD-SPEC-VSS have been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- The establishment of the correct Vss settings (SPIRE-IST-COLD-SPEC-VSS)
- Level 0 temperature: <1.8 K drift < 0.05 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Bias amplitudes 15, 30, 50 mV
Bias frequencies 80, 160, 240 Hz
Phase Range – PFM5 central phase +/-11.2 degrees in steps of 2.8 degrees

Initial Configuration:
SPIRE in IST-SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-PHASEUP-SPEC80.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-PHASEUP-SPEC160.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
3	Execute TCL script SPIRE-IST-PHASEUP-SPEC240.tcl • Observe signal levels and determine optimum phase setting for ILT bias levels • 3 bias amplitudes, with each phase up taking ~20 minutes each	N/A	N/A	N/A	
4	If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-SPEC.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
4	Analyse data in real time to determine IST ground nominal operating parameters and compare to ILT results – confirm ILT table entries.				

Test Result (Pass/Fail):

Approximate optimum phase settings for each detector:

Bias Level	Frequency	SSW Phase	SLW Phase
15	80		
30	80		
50	80		

.

.

Final Configuration:

SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values

2.13 Procedure: Spectrometer bias noise optimisation

Version: 2.2
Date: 31st July 2008
V1.0 to 1,1 – changed to "Set bias amplitude" and phase up per frequency setting – referred to setting "Frequency" before – didn't make sense.
V1.1 to V2.0 – split into two following Tanya's recommendation
V2.1 – text changed – incorrect description – removed switch and start from IST-SPECSTBY
V2.1-V2.2 - Test sequence and script names defined

Purpose:
Find the optimum bias level and frequency for operating the spectrometer under IST ground nominal conditions

Duration:
Approximately 4 hours

Preconditions:
- Functional tests SPIRE-IST-FUNC-DCU-04S,13S have been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- JFET Vss set correctly for optimum noise (SPIRE-IST-COLD-SPEC-VSS)
- Phase for each bias setting has been determined using test 2.12
- **The input SSW and SLW phases to the CUS scripts SPIRE_IST_DNA_SPEC_AMP15/30/50 have been updated following phase-ups**
- **Mission configuration changed on the I-EGSE (if the CUS scripts or Calibration tables have been updated)**
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in IST-SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-DNA-SPEC-AMP15.tcl • Set frequency to 80 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise • Set frequency to 160 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise • Set frequency to 240 Hz and ILT nominal setting If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-SPEC.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-DNA-SPEC-AMP30.tcl • Set frequency to 80 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise • Set frequency to 160 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise • Set frequency to 240 Hz and ILT nominal setting If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-SPEC.tcl to apply the ILT nominal bias settings	N/A	N/A	N/A	
3	Execute TCL script SPIRE-IST-DNA-SPEC-AMP50.tcl • Set frequency to 80 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise • Set frequency to 160 Hz and ILT nominal setting • Set bias amplitude to each predetermined level and phase - observe	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	signal at each level and measure noise • Set frequency to 240 Hz and ILT nominal setting If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-SPEC.tcl to apply the ILT nominal bias settings				
4	Analyse data in real time to determine IST ground nominal operating parameters	N/A	N/A	N/A	

Test Result (Pass/Fail):

Approximate optimum bias settings each detector: Note that the bias frequency has to be the same for both arrays.

Nominal Bias Frequency:

	Bias Level	Phase
SSW		
SLW		

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values

2.14 Procedure: Spectrometer noise stability versus bias frequency

Version: 1.1
Date: 31st July 2008
Purpose:
Determine the detailed noise spectrum versus frequency when operating the spectrometer under IST ground nominal conditions
*V1.0-V1.1 Test sequence and script names defined***.**

Duration:
Approximately 1.5 hours

Preconditions:
- Functional tests SPIRE-IST-FUNC-DCU-04S,13S have been carried out successfully.
- Procedure for setting optimum spectrometer bias conditions versus frequency has been carried out and a table of phase versus frequency is available.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Phase for each bias setting has been determined using test 2.12
- **The input SSW and SLW biases and phases to the CUS script SPIRE_IST_DNA_SPEC_FRQ have been updated following tests 2.12 and 2.13.**
- **Mission configuration changed on the I-EGSE (if the CUS scripts or Calibration tables have been updated)**
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in IST-SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-DNA-SPEC-FRQ.tcl	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	• Set frequency to 80 Hz and phase to predetermined level • Measure noise for 30 minutes • Repeat for the following default settings • 160 Hz • 240 Hz • Set to detectors nominal values				
2	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-SPEC.tcl to apply the IST nominal bias settings **(The input values to the CUS script may need updating by the I-EGSE)**	N/A	N/A	N/A	
Test Result (Pass/Fail):					
Detailed analysis of data required by off line processing					

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to nominal values

2.15 Procedure: Spectrometer Ambient Background Verification

Version: 1.2
Date: 31st July 2008
Purpose: Determine the optical power load onto the photometer detectors using a detector "loadcurve" at fixed frequency and phase to measure the detector temperature.
*V1.1-V1.2 Test sequence and script names defined***.**

Duration:
Approximately 45 minutes

Preconditions:

- Spectrometer IST Ground Nominal bias setting have been determined by procedure "Spectrometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- **If the IST optimum phases are significantly different from the ILT values then the input phases in CUS script SPIRE_IST_LC_SPEC will need to be modified and the Mission Configuration updated on the I-EGSE.**
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is set to PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CPS-SPEC.tcl • Standard PCAL flash for spectrometer	N/A	Detector signal N+/-dN mV		
2	Execute TCL script SPIRE-IST-LC-SPEC.tcl •	N/A	N/A		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
3	Execute TCL script SPIRE-IST-CPS-SPEC.tcl • Standard PCAL flash for spectrometer	N/A	Detector signal N+/-dN mV		
4	If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-SPEC.tcl to apply the IST nominal bias settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal

2.16 Procedure: SCAL Photometric Verification

Version: 1.1
Date: 31st July 2008
Invented to allow SCAL characterisation with the cryostat in the vertical position and SMEC inoperable.
Note we will only be able to do one of the calibration sources – suggest SCAL2
V1.0-v1.1 Test sequence and script names defined. Scripts also available for SCAL4

Purpose:
Determine the optical power load onto the spectrometer detectors from the calibration source using a detector "loadcurve" at fixed frequency and phase to measure the detector temperature.

Duration:
Approximately 120 minutes

Preconditions:

- Spectrometer IST Ground Nominal bias settings have been determined by procedures 2.12 to 2.15
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible

Initial Configuration:
SPIRE is set to IST-SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CPS-SPEC.tcl • Standard PCAL flash for spectrometer	N/A	Detector signal N+/-dN mV		
2	Set SCAL2 to 25K Execute standalone script SPIRE-IST-SCAL2-WARMUP.tcl Wait for SCAL2 to reach 25K	SCAL2 temperature	SCAL2TEMP T +/- dT K		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	Initially SCAL2 will be set to 25K.				
3	Execute TCL script SPIRE-IST-CPS-SPEC.tcl Standard PCAL flash for spectrometer	N/A	Detector signal N+/-dN mV		
4	Execute TCL script SPIRE-IST-LC-SPEC.tcl	N/A	N/A		
5	Execute TCL script SPIRE-IST-CPS-SPEC.tcl • Standard PCAL flash for spectrometer	N/A	Detector signal N+/-dN mV		
6	Execute SPIRE-IST-SCAL2-COOLDOWN.tcl 1. Press ok to Switch off SCAL2				
7	**If SCAL2 is to be set to a different temperature then the CUS script StartSCAL2VM will first need to be modified and the Mission Configuration updated by the I-EGSE staff.**	N/A	N/A		
8	**Corresponding TCL scripts are also available for SCAL4, i.e. SPIRE-IST-SCAL4-WARMUP.tcl and SPIRE-IST-SCAL4-COOLDOWN.tcl.** **It may be necessary to run these if advised by the I-EGSE staff.**	N/A	N/A		
9	If requested by the I-EGSE staff, execute TCL script SPIRE-IST-RESET-SPEC-OFFSETS.tcl	N/A	N/A		
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal and SCAL2 cooling to base temperature
The offsets will need resetting once base temperature is reached (~1 hour later)

2.17 Procedure: PCAL Spectrometer Characterisation

Version: 1.1
Date: 31st July 2008
*V1.0-V1.1 Test sequence and script names defined***.** *Added test script for PCAL flash characterisation*

Purpose: Determine the response of spectrometer detectors to variable PCAL power setting required to confirm the operating conditions for PCAL for the spectrometer detectors under Ground Nominal conditions.

Duration: Approximately 30 minutes
Preconditions:

- Functional test SPIRE-IST-COLD-FUNC-PCAL-01 has been carried out successfully
- Spectrometer IST Ground Nominal bias settings have been determined by procedures 2.12 to 2.15
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.1 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is set to IST-SPECSTBY with nominal bias settings

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-CPC-SPEC.tcl • Set PCAL bias to 0.35 mA • Wait for 10 seconds	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	• Set PCAL to 0 mA • Wait for 10 seconds • Repeat for PCAL bias values going between 0 and 0.7, 1.05, 1.4, 1.75, 2.1, 2.45, 2.8, 3.15, 3.5, 3.85, 4.2, 4.55, 4.9, 5.25, 5.6, 5.95, 6.3, 6.65, 7.0 • Switch off PCAL				
2	Execute TCL script SPIRE-IST-CPT-SPEC.tcl This test runs the PCAL flash VM for 15 flash cycles, flash period 4 seconds. The flashes are between PCAL bias currents of 0.0/0.35, 0.0/0.7, 0.0/1.05, 0.0/1.4, 0.0/1.75, 0.0/2.1, 0.0/2.45, 0.0/2.8, 0.0/3.15, 0.0/3.5, 0.0/3.85, 0.0/4.2, 0.0/4.55, 0.0/4.9, 0.0/5.25, 0.0/5.6, 0.0/5.95, 0.0/6.3, 0.0/6.65, 0.0/7.0 PCAL is switched off at the end by the script.	N/A	N/A	N/A	
3	If requested by the I-EGSE, execute the TCL script SPIRE-IST-DNS-SPEC.tcl to set the IST nominal detector settings				
Test Result (Pass/Fail):					
PCAL standard flash power settings confirmed					

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal

2.18 Procedure: Photometer scan mode POF5

Version: 1.0
Date: 24th July 2006
Purpose: To exercise the photometer POF5 AOT – also sets photometer mode for thermal tests etc
Duration: Indeterminate – depends on master procedure
Preconditions:

- Photometer IST Ground Nominal bias setting have been determined by procedure “Photometer bias optimisation”
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- “PTC Headroom” procedure has been carried out and power setting has been determined
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-PHOTO-LARGE-SCAN.tcl *Open issue do we use PTC Control Procedure here - YES*	N/A	N/A		
Test Result (Pass/Fail):					

Final Configuration:

SPIRE in PHOTSTBY

2.19 Procedure: Photometer chop/jiggle mode POF2

Version: 1.0
Date: 24th July 2006
Purpose:
To exercise the photometer POF2 AOT – also sets photometer mode for thermal tests etc

Duration:
Indeterminate – depends on master procedure

Preconditions:

- Photometer IST Ground Nominal bias setting have been determined by procedure “Photometer bias optimisation”
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- “PTC Headroom” procedure has been carried out and power setting has been determined
- Level 0 temperature: <1.8 K drift < 0.05 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in PHOTSTBY

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-AOT-PHOTO-POINT-JIGGLE.tcl	N/A	N/A		
Test Result (Pass/Fail):					

Final Configuration:

SPIRE in PHOTSTBY

2.20 Procedure: SPEC high resolution mode SOF1

Version: 1.0
Date: 24th July 2006
Purpose:
To exercise the photometer SOF1 AOT – also sets photometer mode for thermal tests etc

NOTE THIS NEEDS TO BE DONE AS OPEN LOOP SCANS.

Duration:
Indeterminate – depends on master procedure

Preconditions:
- Spectrometer IST Ground Nominal bias setting have been determined by procedure "Spectrometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Herschel tilted such that SOB is horizontal
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in IST-SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-AOT-SPECTRO-SCAN-POINT.tcl	N/A	N/A		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in IST-SPECSTBY

2.21 Procedure: Photometer Detector Microphonics Test

Version: 1.4
Date: 31st July 2008
V1.0-V1.1 Changed bias frequencies to those suggested by JPL
V1.1-V1.2 change to make into four separate scripts
V1.2- V1.3 Changed to shorten taking into account 40 minutes required for wheel operation – quiescent stage done once and dumped 70 Hz setting
*V1.3-V1.4 Test sequence and script names defined***.**

Purpose:
Determine the detailed photometer detector noise spectrum versus frequency when operating the spacecraft reaction wheels

Duration:
Approximately 2 ½ hours

Preconditions:
- Functional tests SPIRE-IST-FUNC-DCU-04P,13P have been carried out successfully.
- Procedure for setting optimum photometer bias conditions versus frequency has been carried out and a table of phase versus frequency is available.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- **The input phase and bias settings have been modified in the CUS scripts SPIRE_IST_DNS_PHOT126, SPIRE_IST_DNS_PHOT156 and SPIRE_IST_DNS_PHOT171 for the IST nominal settings.**
- **The Mission Configuration has been updated on the I-EGSE.**
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in PHOTSTBY- PTC control is off

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-DNS- PHOT126.tcl • Set frequency to 126 Hz and phase to predetermined IST level	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
3	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**	N/A	N/A	N/A	
4	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
5	Execute TCL script SPIRE-IST-DNS- PHOT156.tcl • Set frequency to 156 Hz and phase to predetermined IST level	N/A	N/A	N/A	
6	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
7	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**				
8	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
9	Execute TCL script SPIRE-IST-DNS- PHOT171.tcl • Set frequency to 171 Hz and phase to predetermined IST level	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
10	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
11	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**				
12	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
13	Execute TCL script SPIRE-IST-DNS-PHOT.tcl Resets SPIRE photometer bias and readout parameters to the nominal settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					
Detailed analysis of data required by off line processing					

Final Configuration:
SPIRE in PHOTSTBY mode with bias set to nominal values

2.22 Procedure: Spectrometer Detector Microphonics Test

Version: 1.4
Date: 31st July 2008
V1.0-V1.1 Changed bias frequencies to those suggested by JPL
V1.1-V1.2 change into three separate scripts one for each frequency
V1.2- V1.3 Changed to shorten taking into account 40 minutes required for wheel operation – quiescent stage done once
*V1.3-V1.4 Test sequence and script names defined***.**

Purpose:
Determine the detailed spectrometer detector noise spectrum versus frequency when operating the spacecraft reaction wheels

Duration:
Approximately 2 ½ hours

Preconditions:

- Functional tests SPIRE-IST-FUNC-DCU-04P,13P have been carried out successfully.
- Procedure for setting optimum photometer bias conditions versus frequency has been carried out and a table of phase versus frequency is available.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- **The input phase and bias settings have been modified in the CUS scripts SPIRE_IST_DNS_SPEC175, SPIRE_IST_DNS_SPEC240 and SPIRE_IST_DNS_SPEC279 for the IST nominal settings.**
- **The Mission Configuration has been updated on the I-EGSE.**
- Cryostat vertical with SMEC resting at end stop – this prevents confusion between SMEC vibrations and detector microphonic response
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE in IST-SPECSTBY- SMEC not initialised

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST-DNS- SPEC175.tcl • Set frequency to 175 Hz and phase to predetermined IST level	N/A	N/A	N/A	
2	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
3	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**	N/A	N/A	N/A	
4	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
5	Execute TCL script SPIRE-IST-DNS- SPEC240.tcl Set frequency to 240 Hz and phase to predetermined IST level	N/A	N/A	N/A	
6	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
7	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**	N/A	N/A	N/A	
8	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
9	Execute TCL script SPIRE-IST-DNS- SPEC279.tcl Set frequency to 279 Hz and phase to predetermined IST level	N/A	N/A	N/A	
10	Execute TCL script SPIRE-IST-START-TEST.tcl	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	This sets the OBSID for the test				
11	Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl • **Confirm GO to S/C operators** • S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary • **S/C operators confirm reaction wheel sweep complete**	N/A	N/A	N/A	
12	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
13	Execute TCL script SPIRE-IST-DNS-SPEC.tcl Resets SPIRE spectrometer bias and readout parameters to the nominal settings	N/A	N/A	N/A	
Test Result (Pass/Fail):					
Detailed analysis of data required by off line processing					

Final Configuration:
SPIRE in IST-SPECSTBY mode with bias set to nominal values

2.23 Procedure: Spectrometer Mechanism Spot Frequency Microvibration Test

Version: 2.1
Date: 8th January 2008
V1.0-V2.0 SPIRE cooler cannot be recycled with cryostat horizontal – test changed to only be a test of the motion control rather than signal response

Purpose:
Evaluate the influence of space craft systems on the performance of the SPIRE spectrometer mechanism

Duration:
Approximately 2 hours

Preconditions:
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Herschel tilted such that SOB is horizontal
- Initially S/C reaction wheels are stationary
- Acoustic and vibrational environment is as quiet as possible – night time operation?
- Level 0 temperature: <10 K no drift constraint
- Level 1 temperature: < 10 K no drift constraint
- Level 2 temperature: < 15 K no drift constraint
- SMEC functional tests have been carried out and operating parameters have been determined
- This test can only be carried out at the end of the SMEC cold functional tests

Initial Configuration:
Continuation from SMEC cold functional tests
SPIRE in REDY plus MCU on, SMEC initialised and ready for operation

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
2	Execute SPIRE-IST-SMEC-SPOT-MICROVIBRATION.tcl Generate high rate data – we are looking for fluctuations in SMEC velocity Scan SMEC at 0.1 mm/s over full range for four scans Scan SMEC at 0.2 mm/s over full range for four scans Scan SMEC at 0.3 mm/s over full range for four scans Scan SMEC at 0.5 mm/s over full range for four scans	N/A	N/A	N/A	
3	Switch on S/C reaction wheels at TBD Hz	N/A	N/A	N/A	
4	Repeat scan procedure	N/A	N/A	N/A	
5	Switch reaction wheels to TBD Hz	N/A	N/A	N/A	
6	Repeat scan procedure	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in REDY Mode with MCU on, SMEC initialised and in closed loop mode, Continue with CFT test

2.24 Procedure: Spectrometer Mechanism Variable Frequency Microvibration Test

Version: 1.0
Date: 14th January 2008

Purpose:
Evaluate the influence of space craft systems on the performance of the SPIRE spectrometer mechanism

Duration:
Approximately 2 hours

Preconditions:
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Herschel tilted such that SOB is horizontal
- Initially S/C reaction wheels are stationary
- Acoustic and vibrational environment is as quiet as possible – night time operation?
- Level 0 temperature: <10 K no drift constraint
- Level 1 temperature: < 10 K no drift constraint
- Level 2 temperature: < 15 K no drift constraint
- SMEC functional tests have been carried out and operating parameters have been determined
- This test can only be carried out at the end of the SMEC cold functional tests

Initial Configuration:
SPIRE in REDY plus MCU on, SMEC initialised and ready for operation

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute stand alone script SPIRE-IST-SMEC-RAMP-				

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	MICROVIBRATION.tcl Generate high rate MCU engineering data – we are looking for fluctuations in SMEC velocity Set SMEC continuously scanning at 0.5 mm/s (TBC) over full range Number of scans set to make this a 1 hour test	N/A	N/A	N/A	
2	Wait for o.k. from I-EGSE staff Switch on S/C reaction wheels at TBD Hz	N/A	N/A	N/A	
3	Ramp S/C reaction wheels over full range of operational speed this should be completed within 1 hour of start of test **An ABORT TEST pop up should visible on the operator screen – only press if advised by I-EGSE staff.**	N/A	N/A	N/A	
4	Test complete once all SMEC scans are finished.				
Test Result (Pass/Fail):					

Final Configuration:
SPIRE in REDY Mode with MCU on, SMEC initialised and in closed loop mode, Continue with CFT test

2.25 Procedure: EMC - Photometer most sensitive mode

Version: 1.1
Date: 31st July 2008
*V1.0-V1.1 Test sequence and script names defined***.**

Purpose: Sets SPIRE into the mode used for EMC susceptibility testing for photometer. This is the mode used for all RS and CS testing during system level testing.

Duration:
Indeterminate see EMC test procedure

Preconditions:
- Photometer IST Ground Nominal bias setting have been determined by procedure “Photometer bias optimisation”
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	If requested by the I-EGSE staff execute TCL script SPIRE-IST-DNS-PHOT.tcl Resets SPIRE photometer bias and readout parameters to the IST nominal	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	settings (The intention is to set photometer bias frequency to highest compatible with low noise with corresponding phase set and detector sampling to as fast as practicable)				
2	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
3	Execute standalone script SPIRE-IST-EMC-SPOT.tcl and follow instructions given by the EMC experts.	N/A	N/A	N/A	
4	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration: SPIRE is in PHOT OBSV with high data rate.

2.26 Procedure: EMC – Photometer JFET VSS Test

Version: 1.1
Date: 31st July 2008
V1.0-V1.1 Test sequence and script names defined. Script from the SPIRE CFTs are to be used here.

Purpose:
Test to check the effect of JFET bias on the performance of the EMI rejection of SPIRE

Duration:
Indeterminate see EMC test procedure

Preconditions:
- Photometer IST Ground Nominal bias setting have been determined by procedure "Photometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is in PHOTSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute CFT script SPIRE-IST-COLD-PHOT-VSS-P.tcl *This sets the PHOT JFET Vss to values between 1.2-2.8V in steps of 0.1V dwelling for 2 minutes at each whilst collecting detector data at the highest*	N/A	N/A	N/A	

Step	**Description**	**Parameters**	**Expected Values**	**Actual Values**	**Success/ Failure**
	possible rate.				
Test Result (Pass/Fail):					

Final Configuration:
SPIRE is in PHOT OBSV with high data rate.

2.27 Procedure: EMC – Spectrometer most sensitive mode

Version: 1.1
Date: 31st July 2008
*V1.0-V1.1 Test sequence and script names defined***.**

Purpose: Sets SPIRE into the mode used for EMC susceptibility testing for spectrometer

Duration: Indeterminate see EMC test procedure

Preconditions:

- Spectrometer IST Ground Nominal bias setting have been determined by procedure "Spectrometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is in IST-SPECSTBY
Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	If requested by the I-EGSE staff execute TCL script SPIRE-IST-DNS-SPEC.tcl Resets SPIRE spectrometer bias and readout parameters to the IST nominal settings	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	(The intention is to set spectrometer bias frequency to highest compatible with low noise with corresponding phase set and detector sampling to as fast as practicable)				
2	Execute TCL script SPIRE-IST-START-TEST.tcl This sets the OBSID for the test	N/A	N/A	N/A	
3	Execute standalone script SPIRE-IST-EMC-SPOT.tcl and follow instructions given by the EMC experts.	N/A	N/A	N/A	
4	Execute TCL script SPIRE-IST-END-TEST.tcl This resets the OBSID after the test	N/A	N/A	N/A	
Test Result (Pass/Fail):					

Final Configuration: SPIRE is in SPEC OBSV with detector sampling at high rate. Further commands are used to set the OBSID and/or step number to delineate the data during different test configurations.

2.28 Procedure: EMC – Spectrometer JFET VSS Test

Version: 1.1
Date: 31st July 2008
V1.0-V1.1 Test sequence and script names defined. **.** *Script from the SPIRE CFTs are to be used here.*

Purpose:
Test to check the effect of JFET bias on the performance of the EMI rejection of SPIRE

Duration:
Indeterminate see EMC test procedure

Preconditions:
- Spectrometer IST Ground Nominal bias setting have been determined by procedure "Spectrometer bias optimisation"
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- The cooler is recycled, the detectors are at <300 mK and the detector temperatures are as stable as possible
- Level 0 temperature: <1.8 K drift < 0.025 K/hr
- Level 1 temperature: < 5 K drift <0.25 K/hr
- Level 2 temperature: < 15 K no drift constraint

Initial Configuration:
SPIRE is in SPECSTBY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute CFT script SPIRE-IST-COLD-SPEC-VSS-P.tcl *This sets the PHOT JFET Vss to values between 1.2-2.8V in steps of 0.1V dwelling for 2 minutes at each whilst collecting detector data at the highest possible rate.*	N/A	N/A	N/A	

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
Test Result (Pass/Fail):					

Final Configuration:
SPIRE is in SPEC OBSV with high data rate. Further commands are used to set the OBSID and/or step number to delineate the data during different test configurations.

2.29 Procedure: 300mk Stage Decontamination

Version: 1.1
Date: 31st July 2008
V1.0-V1.1 Test sequence and script names defined. **Only to be run once all the SPTs have been completed.**

Purpose:
To remove any traces of Helium deposited over the 300mK stage during the SPT testing

Duration:
2hr- 4hr

Preconditions:
- Functional test SPIRE-IST-FUNC-SCU-07 has been carried out successfully.
- SPIRE is at ground nominal operating temperature and temperatures are as stable as possible
- Cryostat flow rates are at ground nominal
- Herschel tilted such that SOB is tilted at least 30 degrees from vertical towards +Y direction
- Level 0 temperature: <1.7 K no drift constraint
- Level 1 temperature: < 5 K no drift constraint
- Level 2 temperature: < 15 K no drift constraint
- **All SPIRE SPTs have been completed.**
- **THIS SHOULD BE LAST TEST TO BE RUN BEFORE THE END OF SPT**

Initial Configuration: SPIRE is in REDY

Procedure Steps:

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute standalone TCL script SPIRE-IST-DECONTAMINATE.tcl	MODE	REDY		

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
Test Result (Pass/Fail):					

Final Configuration:
SPIRE is mode we started from – REDY

3. Operational Constraints for Procedures

The table given here lists the requirements for the operational conditions that must be met in order to carry out the SPT procedures listed in this document.

Colour coding

No restriction

Some Restriction

Very Restricted

Procedure	Type	HeI	HeII	Orientation	Cover	Notes
BSM Control Loop Setting	SPT	YES	YES	Any	Any	
Cooler recycle (manual)	SPT	NO	YES	Y +20 to 30	Any	Orientation is minimum - can also be done with Y vertical
Cooler recycle (automatic)	SPT	NO	YES	Y +20 to 30	Any	Orientation is minimum - can also be done with Y vertical
Photometer bias phase optimisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Photometer bias noise optimisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Photometer noise stability versus bias frequency	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Photometer thermal stability versus bias amplitude	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Photometer Ambient Background Verification	SPT	NO	YES	Y +20 to 30	Variable	Orientation is minimum - can also be done with Y vertical
PTC Headroom Characterisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Photometer Thermal Control Verification	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
PCAL Photometer Characterisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Spectrometer bias phase optimisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Spectrometer bias noise optimisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical

Procedure	Type	HeI	HeII	Orientation	Cover	Notes
Spectrometer noise stability versus bias frequency	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Spectrometer Ambient Background Verification	SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
PCAL Spectrometer Characterisation	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation requirement is only for cooler recycle - once completed can be any orientation
Photometer scan mode POF5	SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
Photometer chop/jiggle mode POF2	SPT	NO	YES	Y +20 to 30	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
SPEC high resolution mode SOF1	SPT	NO	YES	Y Vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
Photometer Detector Microphonics Test	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
Spectometer Detector Microphonics Test	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is maximum - SMEC should be against end stop for this test
Spectrometer Mechanism Microvibration Test	SPT	NO	YES	Y Vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
Spectrometer SCAL check	SPT	NO	YES	Y Vertical	Variable	Cryostat lid can be at any temperature during procedure but some tests will require various and stable lid temperatures
EMC - Photometer most sensitive mode	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
EMC – Spectrometer most sensitive mode	SPT	NO	YES	Y +20 to 30	Cold <15K	Orientation is minimum - can also be done with Y vertical
EMC – SPIRE most Emissive mode	SPT	NO	YES	Y Vertical	Any	Cryostat lid can be at any temperature
300mk Stage Decontamination	SPT	NO	YES	Y +20 to 30	Any	Cryostat lid can be at any temperature

4. Appendix 1: Switch-On/Off Sequence And Mode Transitions For SPT

4.1 Switch on to REDY mode

Test Script	**Action** / *Description*	Parameters on AND SA_7_559: SFT PARAMETERS AND -	Expected Values Before/After	Actual Values Before/After
CCS script	• **Execute procedure to switch ON the 28V power supply to the SPIRE DPU PRIME** • **Wait for the BSW to produce at least 2 TM(5,1) event packets** *These TM(5,1) event packets are generated at 10 second interval with the following parameters:* • *Event ID: 0x8008* • *SID: 0x0003* • *Last three parameters before packet checksum: 0xABAB, 0xCDCD, 0xAAAA* *These indicate that the BSW is ready to accept TCs.*			

Test Script	**Action** / *Description*	Parameters on AND SA_7_559: SFT PARAMETERS AND -	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-DPU-START.tcl	*The BSW copies the OBS from the requested EEPROM partition into PM, jumps to the start location of the OBS in the PM, and the OBS starts running*	MODE	SPIRE nominal and critical HK report generation starts at 1Hz and 0.5Hz respectively DPU_ON	
SPIRE-IST-SPT-DRCU-START-STEP1.tcl	*Stops SPIRE HK generation prior to DRCU switch on*	None	SPIRE HK generation stops	
CCS script	**Execute procedure to switch ON the 28V power supply to the SPIRE DRCU PRIME**			
SPIRE-IST-SPT-DRCU-STEP2-P/R.tcl	*Starts SPIRE HK generation after DRCU switch on and configures the DRCU*	MODE	DPU_ON/DRCU_ON	
SPIRE-IST-SPT-SCU-ON.tcl	*Switches on SCU DC and AC thermometry*	MODE SCUTEMPSTAT SUBKSTAT	DRCU_ON/SCU_ON 0x0000/0xFFFF 0x0/0x1	
SPIRE-IST-SPT-MCU-BOOT.tcl	*Boots the MCU*	MODE	SCU_ON/REDY	

4.2 REDY to PHOTSTBY mode

Test Script	Description	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-BSM-ON.tcl	Switches on the BSM	CHOPSENSPWR JIGGSENSPWR MODE	0/1 0/1 REDY/BSM_ON	
SPIRE-IST-SPT-BSM-INIT.tcl	Initialises the BSM	CHOPLOOPMODE JIGGLOOPMODE MODE	0/1 0/1 BSM_ON/BSM_INIT	
SPIRE-IST-SPT-PDET-ON.tcl	Switches on the Photometer arrays	MODE	BSM_INIT/PHOTSTBY	

4.3 PHOTSTBY to REDY mode

Test Script	Description	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-PDET-OFF.tcl	Switches off the Photometer arrays	MODE	PHOTSTBY/PDET_OFF	
SPIRE-IST-SPT-BSM-OFF.tcl	Switches off the BSM	CHOPSENSPWR JIGGSENSPWR MODE	1/0 1/0 PDET_OFF/REDY	

4.4 REDY to SPECSTBY mode

Test Script	Description	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-BSM-ON.tcl	Switches on the BSM	CHOPSENSPWR JIGGSENSPWR MODE	0/1 0/1 REDY/BSM_ON	
SPIRE-IST-SPT-BSM-INIT.tcl	Initialises the BSM	CHOPLOOPMODE JIGGLOOPMODE MODE	0/1 0/1 BSM_ON/BSM_INIT	
SPIRE-IST-SPT-SDET-ON.tcl	Switches on the Spectrometer arrays	MODE	BSM_INIT/SPECSTBY	

4.5 SPECSTBY to REDY mode

Test Script	Description	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-SDET-OFF.tcl	Switches off the Spectrometer arrays	MODE	SPECSTBY/SDET_OFF	
SPIRE-IST-SPT-BSM-OFF.tcl	Switches off the BSM	CHOPSENSPWR JIGGSENSPWR MODE	1/0 1/0 SDET_OFF/REDY	

4.6 REDY to OFF

Test Script	**Action** / *Description*	Parameters on AND SA_7_559: SFT PARAMETERS AND -	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-SPT-MCU-OFF.tcl	*Switches off the MCU*	MODE	REDY/SCU_ON	
SPIRE-IST-SPT-SCU-OFF.tcl	*Switches off the SCU*	SCUTEMPSTAT SUBKSTAT MODE	0xFFFF/0x0000 0x1/0x0 SCU_ON/DRCU_ON	
SPIRE-IST-SPT-DRCU-OFF.tcl	*Stops SPIRE HK generation prior to DRCU switch on*		HK generation stops	

Test Script	**Action** / *Description*	Parameters on AND SA_7_559: SFT PARAMETERS AND -	Expected Values Before/After	Actual Values Before/After
		MODE	DRCU_ON/DPU_ON	
CCS script	**Execute procedure to switch OFF the 28V power supply to the SPIRE DRCU PRIME**			
CCS script	**Execute procedure to switch OFF the 28V power supply to the SPIRE DPU PRIME**			

4.7 PCAL Flash (PHOT)

Test Script	**Action** / *Description*	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-CPS-PHOT.tcl	**Execute procedure to switch PCAL current between A and B N times/**Standard PCAL flash for photo	TBC	N/A	N/A

4.8 PCAL Flash (SPEC)

Test Script	**Action** / *Description*	Parameters	Expected Values Before/After	Actual Values Before/After
SPIRE-IST-CPS-SPEC.tcl	**Execute procedure to switch PCAL current between A and B N times/**Standard PCAL flash for spectro	TBC	N/A	N/A

5. APPENDIX 2 – ADDITIONAL SCRIPTS TO BE RUN AS REQUIRED DURING SPT

The following set of scripts will need to be executed during the SPT as and when required by the I-EGSE staff.

Test Script	Description
SPIRE-IST-RESET-PHOT-OFFSETS.tcl	Resets Photometer offsets
SPIRE-IST-RESET-SPEC-OFFSETS.tcl	Resets Spectrometer offsets
SPIRE-IST-START-PHOT-DATA.tcl	Starts Photometer data
SPIRE-IST-START-SPEC-DATA.tcl	Start Spectrometer data
SPIRE-IST-STOP-DCU-DATA.tcl	Stops DCU data (Photometer or Spectrometer)
SPIRE-IST-GOTOREDY.tcl	Standalone script which just sets the HK rate for REDY mode
SPIRE-IST-START-TEST.tcl	Starts a manual test and sets the OBSID (e.g. EMC tests, Manual Cooler Recycle, PTC tests)
SPIRE-IST-END-TEST.tcl	Ends a manual test and resets the OBSID for a manual test
SPIRE-IST-CPS-PHOT.tcl	Performs a standard PCAL flash for the Photometer
SPIRE-IST-CPS-SPEC.tcl	Performs a standard PCAL flash for the Spectrometer
SPIRE-IST-CRECm.tcl	Manual Cooler Recycle
SPIRE-IST-CRECa.tcl	Automatic Cooler Recycle

APPENDIX 3

SPIRE CS Test Procedure, ref. SPIRE-RAL-PRC-003040, issue 1.0

APPENDIX 4

Accelerometer Measurement & ACMS Reaction Wheel Profile for Microphonics Test

During reaction wheel activation the accelerometers on OBA and reaction wheel panel according to the Table A4-1 below shall be read.

ZONE	CHANNELS ID	DESCRIPTION
OPTICAL BENCH	PACRYO201X	OBA
	PACRYO202Y	OBA
	PACRYO203Z	OBA
	PACRYO204X	OBA
	PACRYO205Z	OBA
	PACRYO206Y	OBA
-Y +Z PANEL	381X	RWL#4 to bracket I/F
	381Y	RWL#4 to bracket I/F
	381Z	RWL#4 to bracket I/F
	382X	RWL#4/RWL#2 to bracket I/F
	382Y	RWL#4/RWL#2 to bracket I/F
	382Z	RWL#4/RWL#2 to bracket I/F
	386X	RWL#3 to bracket I/F
	386Y	RWL#3 to bracket I/F
	386Z	RWL#3 to bracket I/F
	384X	RWL#1 to bracket I/F
	384Y	RWL#1 to bracket I/F
	384Z	RWL#1 to bracket I/F
	383X	RWL#2 to bracket I/F
	383Y	RWL#2 to bracket I/F
	383Z	RWL#2 to bracket I/F

Table A4--1: Measurement Channels for Micro-vibration Test (RD8)

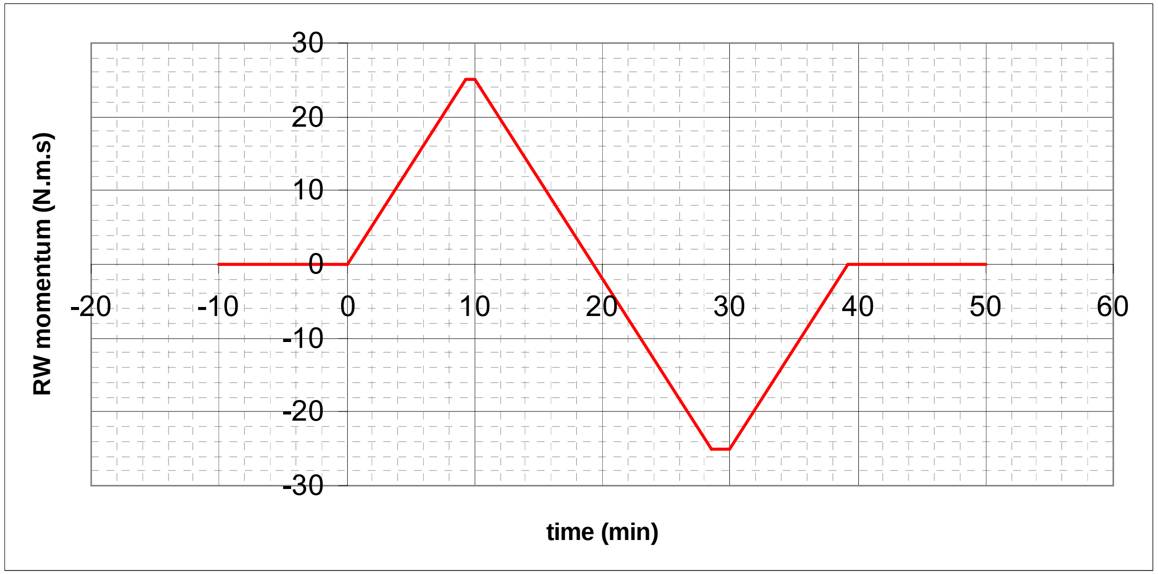
Table A4-2: Reaction Wheel Profile

It should be noted that the test configuration, as required in chapter 4.1 of RD8, can not be achieved and the test has to be performed under the conditions of this procedure.

Hmax	25	N.m.s
Tmax	0,05	N.m
Friction	0,005	N.m
DT	10	Min

time (min)	H (N.m.s)
-10	0
0	0
9,25925926	25
10	25
28,5185185	-25
30	-25
39,2592593	0
50	0

Figure A4-1: Reaction Wheel Profile Graphically


30
20
10
0
-10
-20
-30
-20
-10
0
10
20
30
40
50
60
RW momentum (N.m.s)
time (min)

END OF DOCUMENT

	Name	Dep./Comp.		Name	Dep./Comp.
	Baldock Richard	FAE12		Schweickert Gunn	ASG23
	Barlage Bernhard	AED13	X	Sonn Nico	ASG51
	Bayer Thomas	ASA42		Steininger Eric	AED321
	Brune Holger	ASA45	X	Stritter Rene	AED11
	Chen Bing	HE Space		Suess Rudi	OTN/ASA44
	Davis William	Captec		Theunissen Martijn	DSSA
	Edelhoff Dirk	AED21		Vascotto Riccardo	HE Space
	Fehringer Alexander	ASG15		Wagner Klaus	ASG23
X	Fricke Wolfgang Dr.	AED 65	X	Wietbrock Walter	AET12
	Geiger Hermann	ASA42		Wöhler Hans	ASG23
	Grasl Andreas	OTN/ASA44		Wössner Ulrich	ASE252
X	Grasshoff Brigitte	AET12		Zumstein Armin	AED15
X	Hamer Simon	Terma			
	Hanka, Erhard	FI522			
	Hendrikse Jeffrey	HE Space			
X	Hendry David	Terma			
	Hengstler Reinhold	ASA42			
	Hinger Jürgen	ASG23			
X	Hohn Rüdiger	AED65			
X	Hopfgarten Michael	AET32			
	Huber Johann	ASA42			
	Hund Walter	ASE252			
X	Idler Siegmund	AED312			
	Ivády von András	FAE12			
	Jahn Gerd Dr.	ASG23			
	Jolk Matthias	AET1	X	ESA/ESTEC	ESA
	Klenke Uwe	ASG72	X	Thales Alenia Space Cannes	TAS-F
X	Kölle Markus	ASA43		Thales Alenia Space Torino	TAS-I
X	König Werner	AET32			
X	Koppe Axel	AED312			
X	Kroeker Jürgen	AED65		**Instruments:**	
	La Gioia Valentina	Terma		MPE (PACS)	MPE
	Lang Jürgen	ASE252	X	RAL (SPIRE)	RAL
	Langenstein Rolf	AED15		SRON (HIFI)	SRON
X	Langfermann Michael	ASA41			
	Leitermann Stefan	AET12		**Subcontractors:**	
	Liberatore Danilo	Rhea		Austrian Aerospace	AAE
	Martin Olivier	Altec		Austrian Aerospace	AAEM
X	Maukisch Jan	ASA43		BOC Edwards	BOCE
X	Much Christoph	ASA43		Dutch Space Solar Arrays	DSSA
X	Müller Martin	ASA43		EADS Astrium Sub-Subsyst. & Equipment	ASSE
	Pietroboni Karin	AED65		EADS CASA Espacio	CASA
	Reichle Konrad	ASA42		EADS CASA Espacio	ECAS
	Runge Axel	OTN/ASA44		European Test Services	ETS
	Saal Christoph	External		Patria New Technologies Oy	PANT
	Schink Dietmar	AED321		SENER Ingenieria SA	SEN
	Schmidt Thomas	AED15		Thales Alenia Space, Antwerp	TAS-ETCA