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**			

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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		

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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***.**

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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**		

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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