SPIRE_AST_REP_003156

Title: Test Report for SPIRE FM SPT in He2

CI-No: 125 200

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Distribution: See Distribution List (last page)

| Issue | Date | Sheet | Description of Change | Release |
|---|---|---|---|---|
| 1 | 08.09.08 | All | Formal Issue | |

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# 1 Scope

This document reports on the SPIRE Special Performance Test (SPT) performed on the SPIRE FM Instrument to check correct operation in the frame of the HERSCHEL IST.

The test configuration was with the S/C mounted on the MPT in vertical position. The test was executed using the Herschel CCS & SPIRE I-EGSE.

The cooler recycling has been executed in this configuration (S/C filling level ~ 98%, 20° tilted around X - axis and Y - axis pointing downwards, as required for the SPT).

EMC testing (RS and CS) was performed during the night shifts (3 runs of 3 hour measurements).

The test has been performed in accordance with the IST Leading Procedure.

## 1.1 Objective

The objective of the SPT is to verify dedicated aspects of instrument performance integrated on the HERSCHEL S/C that have not been tested so far during the Integrated System Test (IST).

The test requires a specific S/C configuration which has been detailed in the AD1 test procedure.

## 1.2 Test Flow

The Test flow was roughly as follows:

1. Power ON and configure SPIRE I-EGSE for test
2. Power on NOMINAL SPIRE from OFF to Standby (REDY)
3. Perform SPT Day1 tests according to HP-2-ASED-TP-0204, chapter 7.5.3
4. Overnight EMC Testing (CS and RS)
5. Perform SPT Day2 tests according to HP-2-ASED-TP-0204, chapter 7.5.4 (not completely executed)
6. Overnight EMC Testing (CS and RS)
7. Perform SPT Day3 tests according to HP-2-ASED-TP-0204, chapter 7.5.5 (not completely executed)
8. Power OFF NOMINAL SPIRE from Standby (REDY) to OFF
9. Disconnect SPIRE I-EGSE

## 1.3 Procedure Execution Summary:

This test has been run with the HERSCHEL S/C in vertical position (X - axis tilted by 20°, Y - axis pointing downwards, precision ±0.5°).

| | |
|---|---|
| The cryo | L0 temperature (T107) was around 1.85 K, |
| | L1 temperature (T235) was around 4.27 K, |
| | L2 temperature (T254) was around 5.57 K, |
| | L3 temperature (T247) was around 4.29 K, |
| | Cryo Cover (T601, T602) was around ~230 K. |

The test could not be completely executed due to a significant loss of test time caused by:

- Unstable cryo conditions due to dewar exchange
- Cooler recycling more often than expected
- Wrong versions of scripts delivered
- Problems with I-EGSE start up
- Loss of data record on SPIRE I-EGSE
- Script execution longer than anticipated

The following protocols have been written documenting the SPIRE SPT Test status:

| | |
|---|---|
| SPIRE SPT TRR | 18.08.2008, HP-2-ASED-MN-1599 |
| SPIRE SPT HeII PTR | 23.08.2008, H-P-2-TAS-MN-10750 |

| | |
|---|---|
| Location: | ESTEC, Noordwijk, NL |
| Test Case: | SPIRE SPT in He2 |
| Test Session Name: | HP_2_ASED_TP_0204_iss1_ SPIRE_IST_SPT_END_001 |

Environment:
2008_08_19_18_25_hercdmu_hpws22_REALTIME_SPIRE_SPT

| | |
|---|---|
| OBSW: | CDMS 3.6.0.4, ACMS 3.8 |
| HPSDB: | H-P-2-ASP-LI-1441 issue 17 |
| HPCCS Release: | HPCCS_2.0-1317 |

Any procedure variations are recorded in the Procedure Variation Summary which is attached as the “As-Run” Log, in ANNEX 1.
All non-compliances are recorded in the Observation/NCR Summary below and detailed further in Section 3.

The following observations were made during the test:

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| 18:25 | Session Started | | | |
| | | | | |
| 20:15 | Start Test SPIRE SPT | | | |
| | Perform SC switch ON using TP0070 | | | |
| 20:20 | TLM Failure YM101946 TMTC DFE offline expected to be online | Rebooted TMTC FDE and repeat script, SCOE online now | | |
| | During PCDU Check the following Tms fail, as all sas channels are selected<br>WMT14565<br>WMT15565<br>WMT16565 | Due to set up configuration for this test. | | |
| 20:43 | Boot Report failure | Same as before<br>DUMPED CELA and repeated TM<br>D102159SCVT188_IST_DUMP_PKT_STORE.tcl | | **SPR673 Re-occurence** |
| | SC switch ON using TP0070 completed | | | |
| | Start SPIRE SPT TP-0204 | | | |
| | Perform PVS#1 for TP-0204 | | | **PVS#1-TP0204** |
| | Perform Gyro Calibration<br><br>AEGRA002 = -2.977074E-06<br>AEGRB002 = 4.411752E-05<br>AEGRC002 = 6.880729E-05<br>AEGRD002 = 2.314484E-05 | Updated SPIRE_UV | | **PVS#3-TP0204** |
| 04:20 | Perform time synchronization | | | **PVS#4-TP0204** |
| 04:34 | Shift handed over to early crew | | | |
| 04:34 | Time sync performed. | | | **SPR-698** |
| 04:43 | Connected to SPIRE IEGSE | | | |
| 04:45 | Lost connection to SPIRE IEGSE | | | |
| 04:53 | Reconnected to SPIRE IEGSE | | | |
| 04:54 | Connection lost again | SPIRE IEGSE will reboot completely before next attempt | | |
| 05:05 | Connection re-established | | | |
| 05:06 | ...and lost again | | | |
| 05:13 | Reconnected | | | |
| 05:15 | Connection seems ok, sent connection test => ok | Temp readings: T225 = -999 / T226= -999 / T227= 1.87 / T236= | | |

| Time (UTC ) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| | | 13.30 (going up slightly) / T254= 13.87 (going up slightly) | | |
| 05:27 | Go-ahead given by NS to start switch-on SPIRE to STBY(RDY)) | | | |
| 05:28 | Start ch. 7.5.2. SPIRE-PWR-ON-P | | | |
| 05:41 | Power on finished | | | |
| 05:43 | Execute SPIRE-IST-COLD-FUNC-SCU-07-P | | | |
| 05:53 | Interrupt test due temps too high to continue, so we wait for go-ahead from SPIRE/ NS(CRYO-CCU) | T225= 2.09 / T226=1.94 / T227= 999 / T236=999 / T254=000 | | |
| 07:20 | Execute SPIRE-IST-SPT-BSM-ON | This test can be run in the current temp conditions, done on request by SPIRE | | **PVS#5**<br>**TP0204** |
| 07:38 | Script SPIRE-IST-SPT-BSM-ON results in some NAK TC's, especially the define new HK report ==> sent define new HK report manually acc. to PVS#6 | New NCR : Nom HK does not restart when commanded at step 7.5.3.3.1 TP-0204 | | **PVS#6**<br>**TP0204**<br>**NCR-4458** |
| 07:44 | Execute SPIRE-IST-SPT-BSM-INIT | SPIRE now in BSM INIT mode rather then SDTBY | | |
| 07:50 | Run connection test DC810180 | | | |
| 07:53 | Execute SPIRE-IST-COLD-FUNC-BSM-01-P | New NCR Error: script fails with "Tcinfos count mismatch" (see printout) | | **NCR-4459** |
| 08:23 | Execute SPIRE-IST-COLD-FUNC-BSM-03-P | Note: the BSM-02-P script is missing (as in not delivered ?) ==> add to above NCR | | |
| 08:32 | Execute SPIRE-IST-BSM-CHOP-POS1 | Error: this script fails as well .... Due to "improper TC name sequence"; New NCR<br>Today is maybe not a good day to test SPIRE ...... | | **NCR-4460** |
| 09:11 | Execute PVS#7 | A check on XPND configuration outside the scope of the SPIRE TEST, authorised by the test conductor | | **PVS#7**<br>**TP0204** |
| 10:51 | Execute SPIRE-IST-SPT-BSM-OFF | BSM test failed, therefore switched off | | **PVS#8**<br>**TP0204** |
| 10:54 | In Cooler Recycling mode by executing SPIRE-IST-CRECm | Manual mode | | |
| 10:58 | Cooler Recycling stopped by continuing above script | Reason is Cryo operations | | **PVS#9**<br>**TP0204** |
| 13:01 | We have been given authority to proceed as | | | |

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| | temperatures are OK | | | |
| 16:00 | IFMGR crash after disconnection from IEGSE | Problem caused by abnormal termination of the IEGSE link (from IEGSE side). IFMGR restarted and connected re-established with different SCOEs. | | |
| | Problems with IEGSE configuration | NCR ?? | | **Possibly NCR** |
| 17:42 | Time sync problem – only the bus monitor machine was running the about time program. The CDMU DFE machine was not. The time difference was about 2 seconds. The about time program is restarted. | | | |
| 17:45 | Re-execute PVS 4 of TP 0204 – time sync | | | **PVS#4-TP0204** |
| 19:30 | Problem on IEGSE solved(xinitd services not enabled and firewall enabled) | | | |
| 19:50 | Test EMC SPOT script (dry run) | | | **PVS#11-TP0204** |
| 20:20 | Missing Scripts | | | **PVS#12 TP0204** |
| 20:30 | Preparing for EMC testing | | | |
| 20:26 | Run SPIRE-RALILT-DNS-PHOT | | | **PVS #12 TP0204** |
| 20:30 | Run SPIRE-IST-RESET-PHOT-OFFSETS | | | **PVS #12 TP0204** |
| 20:50 | Run SPIRE-IST-DNS-PHOT156.tcl | | | **PVS #13 TP0204** |
| 21:10 | SPIRE Prem From PHOT SBY to redy PVS 14 | | | **PVS #14 TP0204** |
| 21:14 | Switch OFF SPIRE | | | |
| 21:29 | Switch ON SPIRE to redy | | | |
| | Turn on the pump heat switch heater | | | |
| | Switch ON SPIRE redy to PHOT SBY | | | |
| | | | | |
| 21:52 | Lost Hk on APID 1282<br>Failed command SCR01500 | Repeat of above at time 07:38 | | **NCR 4458 Reoccurrence** |
| | Switching back to REDY | | | **PVS #14 TP0204** |
| | Repeat PVS#6 due as above | | | |
| 22:02 | Execute SPIRE-IST-SPT-BSM-INIT | SPIRE now in BSM INIT mode rather then SDTBY | | |

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| 22:06 | Run SPIRE-IST-DNS-PHOT156.tcl | | | |
| 22:09 | Run SPIRE-IST-RESET-PHOT-OFFSETS | | | |
| 22:12 | Start EMC test photometer | | | |
| 23:25 | EMC in PHOT Mode part 1 completed | | | |
| 23:30 | Perform PVS#14 to go PHOTSTBY to Ready and then to SPECSTBY | | | |
| 23:46 | Run SPIRE-IST-DNS-SPEC240 | On PVS#14 | | |
| 00:08 | Start EMC test for spectrometer | | | |
| 00:50 | End EMC test for spectrometer | | | |
| 01:00 | SPIRE Switch OFF | | | |
| | | | | |
| 01:06 | SPIRE Switch ON to REDY | | | |
| 01:15 | Switch ON SPIRE redy to PHOT SBY | | | |
| 01:25 | Start EMC test part3 | | | |
| 02:10 | EMC test part3 completed | | | |
| 02:13 | Switch SPIRE to redy switch to SPECSTBY | | | |
| | Repeat PVS#6 | | | |
| | Run SPIRE-IST-DNS-SPEC240 | | | |
| 02:29 | Start EMC test for spectrometer | | | |
| | Completed | | | |
| 03:10 | Jump to Step 6.3.2 of SPIRE_RAL_PRC_003040 | | | |
| | EXEC SPIRE_ IST_START_TEST & IST_EMC_SPOT | | | |
| 04:19 | Completed | | | |
| 04:20 | EXEC SPIRE_ IST_END_TEST | | | |
| 04:22 | Shift handed over to early crew | | | |
| 04:24 | Going from Spectroscopy mode to ready mode by executing 4.5 of<br>SPIRE-RAL-PRC-2704 : SPIRE-IST-SPT-BSM-ON | Followed by execution of PVS#6 for new HK definition | | **PVS#6**<br>**TP0204** |
| 04:34 | Execute SPIRE-IST-SPT-PDET-ON - Photo STDBY mode | | | |
| 04:39 | Execute SPIRE-IST-DNS-PHOT156 | | | |
| 04:43 | Execute SPIRE-IST-START-TEST | | | |
| 04:44 | Execute SPIRE-IST-EMC-SPOT | Started a sweep ....... on Dougs Mark ! | | |
| 05:15 | Sweep 1 stopped by ending current step 1 in running script | Now waiting for go-ahead for step 2 | | |
| 05:26 | Start step 2 | Count down contest, Doug won, counting down from 5. On his | | |

| **Time (UTC )** | **Test Procedure / Step / Script / Command / Event / Anomaly** | **Remarks / Cause of anomaly / Corrective action** | **C/A type (T/P)** | **NCR ref. (P** |
|---|---|---|---|---|
| | | mark we started step 2 | | |
| 05:57 | Sweep 2 stopped, next step skipped by option “no” and then end script. | | | |
| 05:59 | EXEC SPIRE_ IST_END_TEST | | | |
| 06:00 | 4.3 of 704 SPIRE-IST-SPT-PDET-OFF | | | |
| 06:02 | Execute SPIRE-IST-SPT-BSM-OFF | SPIRE to REDY mode | | |
| | | | | |
| 06:05 | Cryo operations start now=> DEWAR exchange | For the FT this means babysitting and wait for the next two hours or so ..... | | |
| | | | | |
| | SPR701 issued for missing SPIRE scripts installation | | | **SPR#701** |
| | | | | |
| 08:20 | The dewar is exchanged and SPIRE [Tanja] requests to put SPIRE to STDBY | Start at step 7.5.3.2., then 7.5.3.2.1 and then continue with 7.5.3.4.4 (Skip DCU bits etc. since already done) | | **PVS#15.1 + .2 TP0204** |
| 08:27 | Execute SPIRE-IST-SPT-BSM-ON | Followed by execution of PVS#6 for new HK definition | | **PVS#6 TP0204** |
| 08:30 | Execute SPIRE-IST-SPT-BSM-INIT | | | |
| 08:32 | Execute SPIRE-IST-SPT-PDET-ON | SPIRE now in Phot STDBY mode | | |
| 08:46 | Execute SPIRE-IST-DSN-PHOT | Requested by SPIRE via PVS | | **PVS#15.3 TP0204** |
| 08:50 | Continue with step 1 annex 2.4:<br>Execute SPIRE-IST-PHASEUP-PHOT70 | Finished 09:16 | | |
| 09:16 | Next... step 2:<br>Execute SPIRE-IST-PHASEUP-PHOT100 | Finished 09:41 | | |
| | Info from SPIRE: Test is to be interrupted due to temps increasing;<br>SPIRE to be put to Standby and then Cooler Recycle to be run | | | |
| | | | | |
| 09:41 | Execute SPIRE-IST-SPT-PDET-OFF | | | **PVS#16 TP0204** |
| 09:44 | Execute SPIRE-IST-SPT-BSM-OFF | | | **„** |
| 09:48 | Execute SPIRE-IST-CRECa | Cooler Recycle mode in Auto mode | | **„** |
| 12:20 | Cooler script terminated automatically | | | |
| 12:40 | Manually send command SCD06505 with param A0C40DEB for Cooler Recycle | NCR on missing command in script SPIRE-IST-CRECa : | | **PVS#16.2 TP0204** |

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|---|---|---|---|---|
| | | SEND_DRCU_COMMAND to switch pump heater back on | | NCR-4462 |
| 13:39 | Switch ON SPIRE redy to PHOT STBY | PVS#16-3 was followed for this operation. | | |
| 13:46 | Continue with Step 3, of section 2.4 Bias Optimisation (PRC-2704) | | | |
| 14:19 | Alarm received “Packet Store Full” Cdmu BSW Event (5-4) | | | |
| 14:29 | Dumping the CEL A & B | | | PVS#17<br>TP0204 |
| | Olivier is pursuing Francois why TM5-1 is stored in the CEL<br>note – may be due to SSM is OFF. | Francois confirms when SSM is OFF, all TM's [5-x] go to CEL | | |
| | CCS has a threshold setting for max allowed time in the past 4 TM reception. When this threshold is surpassed, CCS uses the current time for the TM time stamp. | | | |
| 14:50 | We executed SetParameters_IFMGR_OBT_THRESHOLD 864000 (threshold for maximum allowed time of reception of packets received with time stamps in the past) | | | |
| 15:29 | The following scripts have been loaded on the CCS and patched to the on-line session:<br>SPIRE_IST_CPS_SPEC.tcl<br>SPIRE_IST_CPS_PHOT.tcl<br>SPIRE-IST-BSM-CHOP-POS1.tcl<br>SPIRE-IST-BSM-CHOP-POS2.tcl | This has been added to SPR701 | | |
| 16:00 | Proceed with 2.5 (Photometer bias noise optimisation) | PVS raised to cover additional steps needed for chapter 2.5 of RAL-PRC-2704, after step 2 | | PVS#18<br>TP0204 |
| 19:00 | Problem during execution of load curve, SPIRE-IST-LC-PHOT (see NCR entry at 07:53) | Due to “improper TC name sequence”<br>Add to NCR 4460 | | SPR-703 &<br>NCR 4460 |
| 19:15 | Start PCAL Photometer Characterisation (chapter 2.11 of SPIRE-RAL-PRC-2704 | | | PVS#19<br>TP0204 |
| 20:33 | Start Photmeter noise stabilisation versus bias frequency (chapter 2.6 of SPIRE-RAL-PRC-2704) | | | |
| 22:40 | Exchange of helium dewar<br>out of limits on:<br>EVAPHSTEMP<br>SCALTEMP | RAL are aware and agreed to continue. | | |

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| | SMECTEMP<br>EMCFILTEMP<br>SMECIFTEMP<br>BSMTEMP<br>OPTTEMP | | | **To be added to NCR4459** |
| 23:01 | Start BSM control loop setting (chapter 2.1 of SPIRE-RAL-PRC-2704) | Script error in SPIRE-IST-BSM-CHOP-POS1 delivered today 21/08/08 already a patched script, error is wait time is set to negative 1, remaining part of the Script will be executed manually. SPIRE-IST-BSM-CHOP-POS2 also has the same error both have been modified and patched onto the system. | | |
| 23:53 | HPWS21 has hung CLOSED DOWN AND RESTARTED | | | |
| 02:12 | Execute SPIRE-IST-DNS-PHOT | | | **PVS#19**<br>**TP0204** |
| 02:15 | Run SPIRE-IST-RESET-PHOT-OFFSETS | | | |
| | Perform section 2.9 of RAL – PRC- 2704 | SPIRE-IST-PTC-PWR not in the session performed a local patch of this file, was delivered today. | | |
| 02:42 | Run SPIRE-IST-PTC-PWR (chapter 2.9 of SPIRE-RAL-PRC-2704) | | | **PVS#19**<br>**TP0204** |
| 06:30 | Shift handed over to early crew at TCC | | | |
| 06:05 | SPIRE-IST-PTC-PWR finished as reported by SPIRE [Tanja] | Also reported that an updated Cooler Recycle script will be available within ~ 30 mins that can be used next | | |
| 06:52 | Execute SPIRE-IST-CP**S**-PHOT | Operator started by mistake SPIRE-IST-CP**C**-PHOT | | **PVS#20**<br>**TP0204** |
| 06:54 | Terminate SPITE-IST-CPC-PHOT and Execute SPIRE-IST-CPS-PHOT | | | **PVS#20**<br>**TP0204** |
| 06:58 | Execute SPIRE-IST-LC-PHOT | Finished 07:05 => when looking in script as-run logfile we observed that script failed early with another “improper TC name sequence” (same as earlier, last night at 19:00) | | |
| 07:15 | Execute SPIRE-IST-LC-PHOT again | Note: After checking the script found out that somehow we ran | | **SPR#0703** |

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|---|---|---|---|---|
| | | the old (previous) version; it was today updated via SPR#0703<br>Finished 07:42 | | |
| 07:42 | Execute SPIRE-IST-CPS-PHOT | Finished 07:45 | | **PVS#21**<br>**TP0204** |
| 07:50 | Execute SPIRE-IST-SPT-PDET-OFF | Finished 07:52 | | |
| 07:53 | Execute SPIRE-IST-SPT-BSM-OFF | Finished 07:54 | | |
| 07:54 | Execute SPIRE-IST-SPT-BSM-ON | Finished 07:55 | | |
| 07:56 | Run PVS#6 again for new HK definition | | | |
| 07:57 | Execute SPIRE-IST-SPT-BSM-INIT | Finished 07:57 | | |
| 07:58 | Execute SPIRE-IST-SPT-SDET-ON | Finished 08:00 | | |
| 08:02 | Execute SPIRE-IST-RESET-SPEC-OFFSETS | Finished 08:03 | | |
| 08:10 | Execute SPIRE-IST-PHASEUP-SPEC80 | Finished 08:32 | | |
| 08:33 | Execute SPIRE-IST-PHASEUP-SPEC160 | Finished 08:56 | | |
| 08:56 | Execute SPIRE-IST-PHASEUP-SPEC240 | Finished 09:19 | | |
| 09:26 | Execute PVS#22 | To put SPIRE from Spectroscope to REDY mode | | |
| 09:33 | Execute SPIRE-IST-CRECa | Start Cooler Recycle in Auto mode | | |
| 12:05 | Cooler Recycle auto terminated | SPIRE to be set to SPEC STDBY | | |
| 12:34 | PVS#6 was run manually | | | |
| 12:35 | Start of Spectrometer Bias Noise Optimisation, chapter 2.13 of SPIRE-RAL-PRC-2704) | | | |
| 14:29 | Started Spectrometer Noise Stability vs. Bias Frequency script. chapter 2.14 of SPIRE-RAL-PRC-2704) | | | |
| 15:46 | Load and online patch SPIRE-IST-CCS-LC-SPEC.tcl | | | **Added to SPR703** |
| 16:00 | Start ACMS for microvibration | | | **PVS#23**<br>**TP0204** |
| 16:06 | Start of Spectrometer Ambient Background Verification, chapter 2.15 of SPIRE-RAL-PRC-2704)<br><br>run SPIRE-IST-CPS-SPEC.tcl twice<br>run SPIRE-IST-CPS-PHOT.tcl because PCAL flash failed twice with previous script | | | **PVS#24**<br>**TP0204**<br><br>**To be added to NCR4459** |
| 16:30 | We run script SPIRE-IST-CPS-SPEC.tcl again | | | |
| 16:47 | Run script SPIR-IST-DNS-SPEC.tcl | | | |
| 17:11 | Run script SPIR-IST-CPS-SPEC.tcl | | | |
| 17:12 | Received alarm “Buffer Overflow” (data rate is too slow - 150Kbps) | | | |

| Time (UTC ) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| 17:18 | Change TM rate to 1.5Mbps | | | |
| 17:18 | Run script SPIR-IST-CPS-SPEC.tcl again, with 1.5Mbps data rate | | | |
| 17:30 | Running of script SPIR-IST-LC-SPEC.tcl failed, **run SPIRE-IST-CCS-LC-SPEC instead.** | PVS#24-2 details this script change. | | |
| 18:03 | Start of SCAL Photometric Verification, chapter 2.16 of SPIRE-RAL-PRC-2704) | | | |
| 18:09 | Run script SPIR-IST-DNS-SPEC.tcl | | | **PVS#25**<br>**TP0204**<br>**NCR4457** |
| 18:12 | Run script SPIR-IST-RESET-SPEC-OFFSETS.tcl | | | |
| 18:14 | Run script SPIR-IST-CPS-SPEC.tcl | | | |
| 20:17 | Run script SPIRE-IST-SCAL2-WARMUP.tcl<br>SPIRE indicates that the script is not performing the correct requirements (SCAL2 does not reach 25 deg) | Event seen (5,1): VM_CALLTABLE_FAULT<br>Printout for NCR obtained. | | |
| 20:41 | Cmd SPIRE from SPECSTBY to REDY MODE | | | |
| | Manual Cmd SPIRE | | | |
| | Cmd SPIRE from REDY MODE to SPECSTBY | | | |
| 21:38 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-CPS-SPEC.tcl was kept in an endless loop. Script terminated and restarted. | | | **Re-occurence of NCR4181** |
| 22:41 | Start of Spectrometer Detector Microphonics Test, chapter 2.22 of SPIRE-RAL-PRC-2704) | | | |
| 22:45 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-DNS-SPEC175.tcl was kept in an endless loop. Script terminated and restarted. Run time sync check script – time sync with IEGSE is OK (0.06s difference) | | | **Re-occurence of NCR4181** |
| 22:49 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-RESET-SPEC-OFFSETS.tcl was kept in an endless loop. Script terminated and restarted. Terminated and restarted SPIRE_ALL_subscribeParams | | | **Re-occurance of NCR4181** |
| 22:54 | Perform wheel spin up and down<br>- after 600 seconds the required speed was not reached. Wheels A and B showed a small decrease in speed (see graph). Speed not reached for spinning up an down. | CHECK with ACMS specialist! | | |
| 23:30 | Perform wheel spin up and down<br>- after 600 seconds the required speed was not | | | |

| Time (UTC ) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| | reached. Speed not reached for spinning up an down. | | | |
| 23:55 | Perform wheel spin up and down<br>- after 600 seconds the required speed was not reached. Speed not reached for spinning up an down. | | | |
| 00:40 | SPIRE request to perform PHOTOMETER THERM CONTROL VERIFICATION TEST | | | **PVS#27-TP204** |
| | | | | |
| | | | | |
| 00:42 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-SPT-PDET-ON.tcl was kept in an endless loop. Script terminated and restarted same problem again<br>Script terminated and restarted | 3rd attempt OK | | **Re-occurance of NCR4181** |
| 00:49 | SPIRE request modification to test script SPIRE-IST-PTC-VM-SUBKTEMP.tcl<br>Changes to params – set point, loop period, Kp, Ki, Kd, lpfgain, lpfcb1, lpfcb2. | Original Script printed, modified script printed.<br>Modified script locally Patched.<br>Ran script, however, no CMDs were sent. Looking at the script the cmds sent lines have been commented out. SPIRE request that the script be modified to allow cmd's to be sent. Modified and locally patched. | | **To be added to NCR4459**<br>**PVS#27-TP20** |
| | Re Run Script SPIRE-IST-PTC-VM-SUBKTEMP.tc<br>5-1 Event alarm VM COPYTABLE_FAULT | ABORT TEST | | |
| 01:31 | OOL BSM Interface | | | |
| 01:32 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-DNS-PHOT.tcl was kept in an endless loop. Script terminated and restarted. | | | **Re-occurance of NCR4181** |
| 01:44 | Spire request to Perform section 2.21of PRC-2704 Photometer Detector Microphonics Test | | | |
| 01:49 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-DNS-PHOT.tcl was kept in an endless loop. Script terminated and restarted. | | | **Re-occurance of NCR4181** |
| 02:16 | Several Temps OOL<br>Just been informed that the DEWAR is empty and | Have informed SPIRE. SPIRE are concerned with the increase in temp of SMK0K520. | | |

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| | switching over to pumping. | Have asked SPIRE if the test is to be stopped.<br>Spire request that the test is aborted due to the thermal variations. | | |
| 02:38 | Aborted Photometer Detector Microphonics Test | | | **PVS#29-TP0204** |
| 02:39 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-DNS-PHOT.tcl was kept in an endless loop. Script terminated and restarted. | | | **Re-occurance of NCR4181**<br>**PVS#29-TP0204** |
| 02:43 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-CPS-PHOT.tcl was kept in an endless loop. Script terminated and restarted. | | | **Re-occurance of NCR4181**<br>**PVS#29-TP0204** |
| 03:00 | Execute SPIRE-IST-CRECa | Start Cooler Recycle in Auto mode<br>Finished 05:42 | | |
| | | | | |
| 04:30 | Shift handed over to early crew | | | |
| 05:43 | Execute SPIRE-IST-SPT-BSM-ON | Finished 05:45 | | |
| 05:46 | Run PVS#6 again for new HK definition | | | |
| 05:48 | Execute SPIRE-IST-SPT-BSM-INIT | Finished 05:49 | | |
| 05:50 | Execute SPIRE-IST-SPT-PDET-ON | | | |
| 05:53 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-SPT-PDET was kept in an endless loop. Script terminated and restarted | Script hangs for param YM00A966; packet has arrived at 05:53:54, however during a fetch for the param the resulted fetch time states 05:53:44 | | **Re-occurance of NCR4181** |
| 05:56 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-SPT-PDET was kept in an endless loop. Script terminated and restarted | | | **Re-occurance of NCR4181** |
| 06:03 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-SPT-PDET was kept in an endless loop. Script terminated and restarted | ... now ok !! | | |

| **Time (UTC )** | **Test Procedure / Step / Script / Command / Event / Anomaly** | **Remarks / Cause of anomaly / Corrective action** | **C/A type (T/P)** | **NCR ref. (P** |
|---|---|---|---|---|
| 06:08 | Execute SPIRE-IST-RESET-PHOT-OFFSETS | On request of SPIRE [Tanja] Finished 06:09 | | **PVS#29**<br>**TP0204** |
| 06:16 | Execute SPIRE-IST-DNS-PHOT | Finished 06:18 | | **--,,--** |
| 06:19 | Execute SPIRE-IST-RESET-PHOT-OFFSETS | Finished 06:20 | | **--,,--** |
| 06:20 | Dewar exchange on the Cryo | | | |
| 07:41 | A short IFMG failure occurred for an unknown reason | TRB to decide if NCR is to be raised to cover this anomaly (might be difficult to resolve, remaining a mystery) | | **Potential NCR** |
| 07:46 | Then lost IFMGR completely, no TM anymore, lost all connections | Performed Operators note 16: Recovery after an IFMRG crash | | **--,,--** |
| 07:57 | Recovery completed, back in business..... | | | |
| | | Waiting for temperature stabilization before continue with test | | |
| | Start execution of PVS#30 | Decision reached on way forward up to end of this (part of the) test – SPIRE team | | |
| 09:15 | Execute ACMS_RWL_SPIRE_uVIB | This script will remain running for the duration of the next test | | |
| 09:18 | Execute SPIRE-DNS-PHOT126 | Problem with fetch during IEGSE-CCS communication. Script SPIRE-IST-DNS-PHOT126l was kept in an endless loop. Script terminated and restarted. | | **Re-occurance of NCR4181** |
| 09:19 | Execute SPIRE-DNS-PHOT126 | Finished 09:22 | | |
| 09:23 | Execute SPIRE-IST-START-TEST | Finished 09:24 | | |
| 09:24 | Spinning up the RWL's now (from the still running ACMS script) | | | |
| 09:46 | Spinning down the RWL's now (same as before) | | | |
| 09:50 | ACMS_RWL_SPIRE_uVIB finished | | | |
| 09:50 | Execute SPIRE-IST-TEST-END | Finished 09:50 | | |
| 09:51 | Execute SPIRE-IST-DNS-PHOT156 | Finished 09:53 | | |
| 09:54 | Execute SPIRE-IST-START-TEST | Finished 09:54 | | |
| 09:55 | Execute ACMS_RWL_SPIRE_uVIB | This script will remain running for the duration of the next test | | |
| 09:57 | Spinning up the RWL's now (from the still running ACMS script) | | | |
| 10:20 | Spinning down the RWL's now (same as before) | | | |
| 10:23 | ACMS_RWL_SPIRE_uVIB finished | | | |
| 10:24 | Execute SPIRE-IST-TEST-END | Finished 10:24 | | |

| Time (UTC) | Test Procedure / Step / Script / Command / Event / Anomaly | Remarks / Cause of anomaly / Corrective action | C/A type (T/P) | NCR ref. (P |
|---|---|---|---|---|
| 10:25 | Execute SPIRE-IST-DSN-PHOT | Finished 10:28 | | |
| 10:29 | In ACMS_CONFIG25 select 99 to switch off ACMS | | | |
| 10:32 | ACMS_event_buffer_dump suspended | " Wrong SCC error "<br>No need for NCR as this seems performance related (heavy load on system); anyway, Jeff made some necessary dumps for the record and analysis afterwards | | |
| 10:51 | ACMS switched off | | | |
| 11:01 | Start execution of PVS#31 | | | |
| 11:02 | Execute SPIRE-IST-CPS-PHOT | Finished 11:06 | | |
| 11:09 | Execute SPIRE-IST-LC-PHOT | Finished 11:36 | | |
| 11:36 | Execute SPIRE-IST-CPS-PHOT | Finished 11:40 | | |
| 11:42 | Execute SPIRE-IST-SPT-PDET-OFF | Finished 11:43 PHOTSTBY to REDY mode | | |
| 11:44 | Execute SPIRE-SIT-SPT-BSM-OFF | Finished 11:45 Now in REDY mode | | |
| 11:46 | Perform ch 7.5.6 from TP-0204 to switch SPIRE from Standby (REDY) to OFF | | | |
| 11:51 | SPIRE OFF | | | |
| 11:53 | A personal check by Stijn : Check time sync with HIFI IEGSE | Connected to IEGSE ==> Sync OK | | |
| 11:57 | Disconnect SPIRE IEGSE | | | |
| 12:14 | Start Power off S/c via POWER_OFF_HER_IST | | | |
| 12:22 | S/C powered off | | | |
| 12:33 | Power-off finished | Note: server seems very busy as every script/ process seems to run slow and take a lot of time to finish. Even saving the logbook takes much more then usual | | |
| | Session finished and closed. | . | | |
| | | | | |

Table 1: SPIRE SPT Test Summary

# 2 Documents/Drawings

## 2.1 Applicable Documents

| | | |
|---|---|---|
| AD1 | SPIRE IST Specific Performance Test | HP-2-ASED-TP-0204, Issue 1.2 |
| AD2 | Leading Procedure for Herschel Integrated Satellite Test | HP-2-ASED-TP-0134, Issue 5 |
| AD3 | Herschel Satellite IST – Instruments Commissioning – S/C Configuration | HP-2-ASED-TP-0237, Issue 1 |
| AD4 | Test Specification for HERSCHEL Instruments FM tests performed at satellite level | H-P-2-ASP-TS-1083, Issue 2 |

## 2.2 Reference Documents

None

## 2.3 Other Documents

None

## 2.4 Acronyms & Abbreviations

See “as-run” procedure.

# 3 Main Observations and Problems Identified.

The following NCR´s occurred during the test:

## 3.1 NCR-4457: SPIRE test script does not perform the correct operation

SPIRE test script does not perform the correct operation. During SPIRE SPT test the script SPIRE-IST-SCAL2-WARMUP.tcl was executed, a (5,1) event was received (VM_CALLTABLE_FAULT). This occurred at 20:17 UTC on the 22/08/08
→SPIRE to investigate

## 3.2 NCR-4458: SPIRE SPT He2: Nom HK does not restart when commanded

SPIRE-IST-SPT-BSM-ON (HK not re-enabled when commanded)
SPIRE_SPT_He2: Nom HK does not restart when commanded step 7.5.3.3.1, TP-0204.
– See PVS 6
This is probably a script timing issue (increase wait time). The script is to be updated for TV test.

## 3.3 NCR-4459: SPIRE SPT He2: Script fails with TC info's count mismatch

All scripts with problems (BSM01, BSM03, BSM_Chop_POS2) need to be updated for TV
Script problems due to CUS – script inconsistencies:

- SPIRE-IST-COLD-FUNC-BSM-01-P
- SPIRE-IST-COLD-FUNC-BSM-02-P - missing
- SPIRE-IST-COLD-FUNC-BSM-03-P
- SPIRE-IST-BSM-CHOP-POS2
- SPIRE-IST-LC-PHOT
- SPIRE-IST-LC-SPEC
- SPIRE-IST-CPS-SPEC
- SPIRE-IST-CPS-PHOT
- SPIRE-IST-PTC-VM-SUBKTEMP

## 3.4 NCR-4460: SPIRE SPT He2: Script fails with improper TC name sequence

SPIRE-IST-BSM-CHOP-POS1 script fails with improper TC name sequence
→ script to be corrected for TV

### 3.5 NCR-4462: TC missing in SPIRE IST script

TC missing in SPIRE IST script
SPIRE-IST-CRECa (Sorption cooler automatic recycle): Command to switch pump heater back cannot be executed
→ script / VM to be corrected for TV

### 3.6 NCR-4472: Problem with CDMU DFE during SPIRE SPT

A problem occurred with the CDMU DFE. The system was not time synchronized every minute with CCS server. The time program (that performs time sync) was not running.
See SPR-698.

### 3.7 NCR-4473: L1 temperature above Spec during SPIRE SPT

The L1 temperature was above specification (8K compared to IID-A 6.1K). This was agreed during the TRR to be able to run the Launch autonomy. This generated many out of limits on SPIRE temperatures.

### 3.8 NCR-4474: VC1 Overflow after RAL changed CUS parameters for SPIRE SPT

A VC1 Overflow was reported after RAL changed CUS parameters (after previous successful re-run of script SPIRE-IST-CPS-SPEC). The data-rate of 150kbps was not sufficient for some scripts (although SPIRE should have been compatible).
→ Switch to 1.5Mbps during the test = OK

### 3.9 NCR-4475: IFMGR crashes during SPIRE SPT

The IFMGR crash(es) may be related to the 2 existing NCR´s listed:

- 4008
- 3946

### 3.10 NCR´s which reoccurred during the SPT

**ASED-NCR-4423**: IEGSE QLA machine setup problems (day 1)
The SPIRE IEGSE did not archive the data for part of SPIRE commissioning which is the reoccurrence of a known problem which lead to the loss of 1 shift of testing. IEGSE needs to be checked.

**ASED-NCR-4181**: Problems with IEGSE-CCS communication occurred in SPIRE test (seen 9 times so far).
Note: a lot of TM plotting windows open on many workstations and need to be closed.

Additionally packets were out of order for the ACMS script.

### 3.11 Procedure Changes

Updates and clarifications in the procedure, as required during the test execution, were included by redlining. All necessary modifications have been reported in ANNEX 1, “AS-Run” Log.

# 4 Conclusion

The SPIRE SPT has been completed. All tests were executed, except the warm cover test which was assessed to priority 3 during the reshuffling of the sequence.
The board agreed that the performed test was successful, (all SPIRE parts are working well, similar behaviour of detectors in comparison to the ILT has been monitored), and that the instruments works nominally, pending detailed analysis.
The SPT objective has been reached.
The Cryo-conditions were not ideal, since the temperature on L1 was warmer than specified. Two hours of test time were lost at each daily dewar exchange. Hence the cover temperature was not fully stable the last day. The loss of test time is estimated to 25%.
The SPIRE Sorption cooler hold time for ground test is expected not to be larger than 20h (driver is the L0 evaporator strap conductance), and further tests will have to take this into account (most probably similar for PACS). Further analysis is needed (ASED+SPIRE).
The automatic cooler recycling script/parameters need to be modified for the SOVT. The command script is judged being far too complex and need to be more robust by proper selection of parameters. Further analysis by SPIRE is needed.
Many test scripts need to be reviewed & corrected by SPIRE for the TV test. An additional intermediate review will be necessary.
Instrument is validated to start the RMS, SOVT (if cryo-conditions can be guaranteed) but the scripts are to be reviewed for TV.

## 4.1 Open Issues

- Cooler recycle automatic to be re-run during RMS to measure the hold time for SOVT
- Scripts to be reviewed/corrected/time estimated for TV.
- Voice Communication problem between IEGSE & Checkout to be improved, or move I-EGSE to Checkout room.
- LPU test was not run (ACS-406). To be performed at the 1st forthcoming opportunity.

## 4.2 Requirements Verified

With the above test the requirement for the IST1 of what concerns the SPIRE instrument, according to chapter 4.7.3, (4.7.3.3 and 4.7.3.4), of “Test Specification for HERSCHEL Instruments FM tests performed at satellite level”, ref. H-P-2-ASP-TS-1083, has been verified.

# 5 Appendix 1: As-Run Log of SPIRE SPT

Procedure HP-2-ASED-TP-0204

19/08/08

FORMAL AS RUN

2008-08-19-18-25-hercdmm_hpws22_REALTIME_SPIRE_SPT
HP_2_ASED_TP_0204_ISS1_SPIRE_IST_SPT_END_001

Title: **SPIRE IST Specific Performance Test**

CI-No: 125200

A. Koppe

Prepared by: A. Koppe/S.Hamer Date: 13.08.2008

Checked by: for S. Idler 14.08.08

Checked by: J. Kroeker

Product Assurance: for R. Stritter 14/08/08

Configuration Control: W. Wietbrock

Project Management: Dr. W. Fricke

Approved by TAS-F: D. Montet

Distribution: See Distribution List (last page)

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

## Table of Content

## List of Tables

# 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,<br>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.

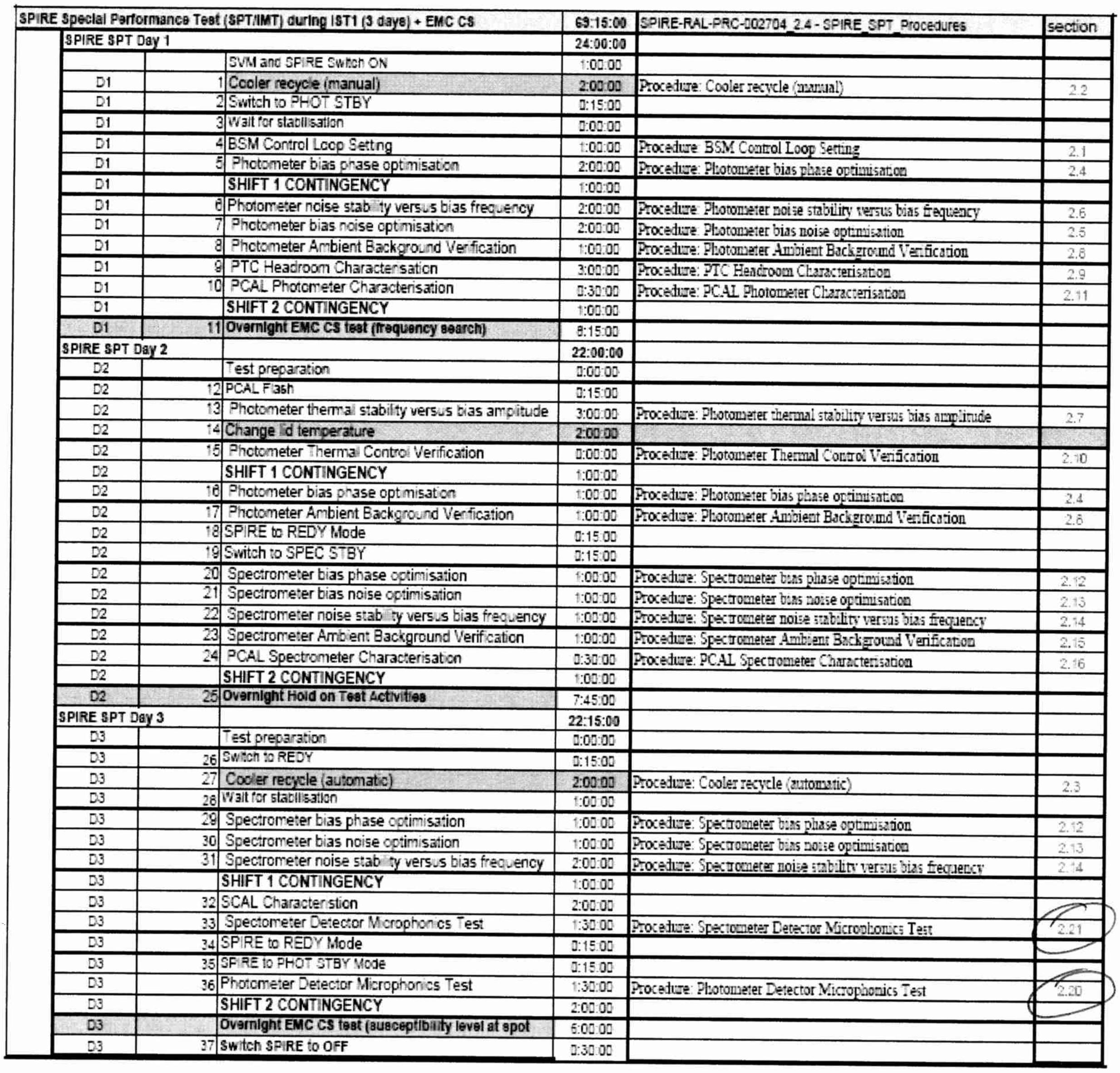
## 3.3 Set-up

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 | | |

Rvs #28

2.22

2.21

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 | B. Collandin / TASF |
| Test Conductor | N. Sonn / ASED |
| EGSE Operator | U. Klenke / ASED |
| PA Responsible | R. Goossens / TASF |
| Instrument Representative | T. Lim / RAL |
| Customer Representative | B. Collandin / TASF |
| ESA Representative | C. Scharmberg / ESA |

## 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 | 100 000 |
| Temperature | 22°C ± 3°C | 20°C |
| Rel. Humidity | 40 % - 60 % | 52% |
| Pressure | Ambient | 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 | 1.85 k | | |
| SPIRE L1 | T < 6.2 K | 4.3 < T <4.5 | T235, T236 | 4.27k | | |
| SPIRE L2 | T < 12 K | T < 6.0 | T254, T256, T258 | 5.57k<br>5.18k | | |
| SPIRE L3 | T < 15 K | 10 < T <15 *) | T246, T247 | 4.29 k | | |

*) may be adjusted for JFET switch ON only

CryoCover | T < 20k | T601, T602 | ~230k @ 04:25 UTC

## 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**

| Procedure | Description | Type | Hel | Hell | 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

PVS#1 →
PVS#3 →

| 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 | | | PVS#1<br>PVS#3 | ✓<br>✓ | |
| 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 | | | | ✓ | |

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PVS#2

| Step-No. | Test-Step-Description | Nominal Value | Tolerance | Actual Value | Remarks | P | N |
|---|---|---|---|---|---|---|---|
| 7.5.1.8 | Switch ON & configure SPIRE-IEGSE | | | confirmed | | ✓ | |
| 7.5.1.9 | Confirm SPIRE I-EGSE is in correct configuration | | | confirmed | I-EGSE time syncr. | ✓ | |
| 7.5.1.10 | From HPCCS Test Conductor console issue command to connect to SPIRE I-EGSE:<br>**connect HSPIREEGSE** | OK | | OK | | ✓ | |
| 7.5.1.11 | Confirm that from HPCCS and I-EGSE that the connection has been established. | YZS29940= CONNECTED | | OK | | ✓ | |
| 7.5.1.11 | Verify that I-EGSE is receiving CCU Cryo-Packets | OK | | OK | | ✓ | |
| 7.5.1.12 | On HPCCS start the following test script:<br>**SPIRE_ALL_SubscribeParams.tcl** | OK | | OK | | ✓ | |
| 7.5.1.13 | Verify HPCCS-IEGSE connection by sending test command:<br>**YC00X966**<br>From the manual command stack (repeater value of "0") | OK | | 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** | | | | | | |

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### 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:<br>**S102999SCVT027_ASDSPTSPIR_PWR_ON_P** | OK | OK | AND: ZAD07999, ZAD14999<br>MIM: LCL_HERSCHEL | ✓ | |
| 3. | On HPCCS when prompted:<br>`"SPIRE Switch ON for SPTs in Hel/Hell conditions ONLY - Select NO to abort TS if not correct"`<br>**Select YES** | 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. | | | | ✓ | |

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

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

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-SCU-07** – P | | | OK | | ✓ | |
| 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:<br>**2.2 Procedure: Cooler Recycle (manual)** | | | | | | |
| | **SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK** | | | | | | |

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PVS 5-1

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### 7.5.3.2 Switch from REDY to Photometer STBY Mode

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| 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:<br>**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** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-BSM-01** – P. | | | | | ✓ | |
| 7.5.3.3.2 | **Check with SPIRE that the script SPIRE-IST-COLD-FUNC-BSM-02 has been executed already and the results are known.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-BSM-02** — P | | | | | | |

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| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-BSM-03** – P | | | | | ✓ | |
| 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:<br>**2.1 Procedure: BSM Control Loop Setting** | | | | | | |
| | **SPIRE in REDY or PHOTSTBY** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST- COLD-PHOT-VSS** |  |  |  |  | ✓ |  |

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| 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** | | | PHOTSTBY | | ✓ | |
| 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:<br>**2.4 Procedure: Photometer Bias Phase Optimisation** | OK | | OK | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to ILT nominal values** | | | | | | |

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### 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:<br>**2.6 Procedure: Photometer Noise Stability versus Bias Frequency** | | | | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to nominal values** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST- COLD-PHOT-VSS** | | | | | ✓ | |

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| 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:<br>**2.5 Procedure: Photometer Bias Noise optimisation** | | | | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to ILT nominal values** | | | | | | |

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### 7.5.3.7 Photometer Ambient Background Verification

Repeat on 22/08.

| 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:<br>**2.8 Procedure: Ambient Background Verification** | | | ok | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values** | | | | | | |

PVS #21 to be run from here. ok. ✓

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13P** | | | Not Performed | | N/A | |
| 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:<br>**2.9 Procedure: PTC Headroom Characterisation** | | | OK | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values – detector temperatures will drift downwards** | | | | | | |

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### 7.5.3.9 PCAL Photometer Characterisation

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| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-PCAL-01** | | | Not Performed. | | N/A | |
| 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:<br>**2.11 Procedure: PCAL Photometer Characterisation** | | | OK | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values** | | | | | | |

## End of SPIRE SPT Day 1

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

PVS 14 ↗

| 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:<br>**2.25 Procedure: Photometer most sensitive mode** | | | | See PVS 14 for details. | ✓ | |
| 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<br>**SPIRE-IST-EMC-SPOT.tcl**<br>the instrument is left in **PHOTSTBY** mode | Mode:<br>**PHOTSTBY** | | | 〃 | ✓ | |
| | **SPIRE is in PHOTSTBY** | | | | | | |

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### 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:<br>**Procedure: SPIRE-IST-SPT-PHOT-PCAL-FLASH** | | | | | | |
| | **SPIRE in PHOTSTBY mode with bias set to nominal values** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04P** | | | N/A | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13P** | | | N/A | | N/A | |
| 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:<br>**2.7 Procedure: Photometer Thermal Stability versus Bias Amplitude** | | | NOT PERFORMED SEE PTR MINUTES | | | |
| | **SPIRE in PHOTSTBY mode with bias set to nominal values** | | | | | | |

RVS27

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### 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** | | | | | | |

NOT PERFORMED
SEE PTR MINUTES

### 7.5.4.4 Photometer Thermal Control Verification

PV827

| 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 | Not Performed | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13P** | | | N/A | | N/A | |
| 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:<br>**2.10 Procedure: Photometer Thermal Control Verification** | | | ✓ | | NOK | |
| | **SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal** | | | | | | |

– ABORTED
NCR-4459

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST- COLD-PHOT-VSS** | | | | | | |

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PVS15
PVS16
PVS19

| 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:<br>**2.4 Procedure: Photometer Bias Phase Optimisation** | | | ✓ | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to ILT nominal values** | | | | | | |

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### 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:<br>**2.8 Procedure: Photometer Ambient Background** | | | | | | ✓ |
| | **SPIRE in PHOTSTBY mode with bias set to IST Ground Nominal values** | | | | | | |

NCR 4460

PVS 19

| | | | | | | | |
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### 7.5.4.7 Spectrometer Bias Phase Optimisation

See Section 7.5.5.3 for As Run

| 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.3 Procedure: PHOTSTBY to REDY mode** | | | N/A | | N/A | |
| 7.5.4.7.2 | Switch **SPIRE from REDY to IST-SPECSTB mode**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.4 Procedure: REDY mode to IST-SPECSTBY** | | | N/A | | N/A | |
| 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:<br>**2.12 Procedure: Spectrometer Bias Phase Optimisation** | | | ✓ | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04S** | | | N/A | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13S** | | | N/A | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD- SPEC-VSS** | | | N/A | | N/A | |

| | | | | | | | |
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| 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:<br>**2.13 Procedure: Spectrometer Bias Noise Optimisation** | | | ✓ | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

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### 7.5.4.9 Spectrometer Noise Stability versus Bias Frequency

PVS23

| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04S** | | | N/A | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13S** | | | N/A | | N/A | |
| 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:<br>**2.14 Procedure: Spectrometer Noise Stability versus Bias Frequency** | | | ✓ | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to nominal values** | | | | | | |

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### 7.5.4.10 Spectrometer Ambient Background Verification

PVS24
PVS25

| 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:<br>**2.15 Procedure: Spectrometer Ambient Background Verification** | | | ✓ | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal values** | | | | | | |

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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:<br>**2.17 Procedure: PCAL Spectrometer Characterisation** | | | | | | |
| | **SPIRE in IST-SPECSTBY mode with bias set to IST Ground Nominal values** | | | | | | |

(NOT PERFORMED)
See PTR MoM

**End of SPIRE SPT Day 2**

### 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** | | | | | | |

NOT REQUIRED

### 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** | | | | | | |

NOT PERFORMED

SEE PTR. MoM.

### 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.5 Procedure: IST-SPECSTBY to REDY mode** | OK | | OK | | ✓ | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-SCU-07** | N/A | | N/A | | ✓ | |
| 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:<br>**2.3 Procedure: Cooler Recycle (automatic)** | OK | | OK | | ✓ | |
| | **SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK** | | | | | | |

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### 7.5.5.3 Spectrometer Bias Phase Optimisation

RVS21.

| 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.4 Procedure: REDY to IST-SPECSTBY mode** | | | SPECSTBY | | ✓ | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04S** | | | Not Performed | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13S** | | | Not Performed | | N/A | |

| | | | | | | |
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| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD- SPEC-VSS** | | | Not Performed | | N/A | |
| 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:<br>**2.12 Procedure: Spectrometer Bias Phase Optimisation** | | | OK | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

PVS #22

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### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13S** | | | | | | |

Performed once only

See Section 7.5.4.8

| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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:<br>**2.13 Procedure: Spectrometer Bias Noise Optimisation** | | | | | | |
| | **SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

See Section 7.5.4.8.

### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04S** | | | | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13S** | | | | | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-SPEC-VSS** | | | | | N/A | |

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| 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:<br>**2.14 Procedure: Spectrometer Noise Stability versus Bias Frequency** | | | OK | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

| | | | | | |
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### 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:<br>**Procedure: SPIRE-IST-SPT-PHOT-SCAL-FLASH** | | | | | | |
| | **SPIRE in SPECSTBY mode with bias set to ILT nominal values** | | | | | | |

See SPIRE-RAL-PRC-2204

chapter 2.16

PUS: 25

### 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:<br>'A102109SPVT003_ACMS_CONFIG25' | OK | | | | ✓ | |
| 7.5.5.7.2 | At the following main menu:<br>HERSCHEL/PLANCK - MAIN MENU 1.0 - INIT PHASE<br>==================================================<br>**1. Select/Load ACMS_CONFIG Input File**<br>2. Perform LAUNCH CONFIGURATION<br>3. On Board SW Updates<br>4. ACMS Power ON (in Pre-Sep configuration)<br>5. Modify ACC SGM/RM CONTENT (Enter sub-menu 1.1)<br>6. ACMS SCOE Configuration<br>77. JUMP to another Entry Point<br>88. Continue ACMS_CONFIG to menu 2.0 STBY/PRE-SEP<br>99. Terminate ACMS_CONFIG<br>**select the point number 1** and press the relevant | Continue | | | | ✓ | |

22/8

15:53

15:54

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| 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.<br>*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.<br>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:<br>YMACT939 (ACMS SCOE state)<br>YMASE939 (Simulator stata)<br>YMAMS939 (MILFE state)<br>YMAUS939 (UIFE state)<br>Turned to: 'executing' | Parameters set to 'executing' | | | | ✓ | |

15:55

15:56

16:04

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| 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.<br>*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).<br>ACC may become INVALID for a short time.<br>SPR 245: Out of Limit of HKA_ANTHx_Data | ✓ | | 16:08 |
| 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 | | ok | | ✓ | | 16:12 |
| 7.5.5.7.8 | From On-Board Event History Display check that no 'NO-GO' are present. | OK | | ok | | ✓ | | 16:14 |
| 7.5.5.7.9 | From ACMS MASTER (ACMS_CONFIG25) sequence, move to Menu 3 (if not already there) with option 88.<br>Click OK and then Confirm | OK | | ok | | ✓ | | 16:18 |
| 7.5.5.7.10 | From ACMS_CONFIG25, Menu 3, select option 1:<br>'Override Separation Flag'<br>then<br>Click button OK and then Confirm | Select 1, then OK and Continue | | 1, ok | ACC goes in SAM Mode | ✓ | | 16:18 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Enter Date / Time:** | 22/08/08 | 16:19 | **Location:** | ESTEC | **Sign OFF:** | TD: | PA: D. Lamouby |

|  | 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:<br>'Do you want to continue to monitor Sam Sun Pointing mode?<br>Enter your choice: no<br>Then click OK | no |  | no | ACMS SAM Point Coarse is reached | ✓ |  | 16:27 |
|  | 7.5.5.7.12 | From ACMS_CONFIG25 Master Sequence, Menu 4.0, select option 6 'Transition to OCM'<br>**Click OK and then Confirm** | Select 6, then OK and Continue | 6, OK |  |  | ✓ |  | 16:40 |
|  | 7.5.5.7.13 | Sequence 'A102109SPVT036_ACMS_STR_ON' shall pop-up. At prompt:<br>'Do You want to change current Str in Use' check if STR already selected is the correct one and answer<br>**'no'** | No | no |  | STR-1 is switched ON and put in ATFAD mode | ✓ |  | 16:42 |
| AUS 23 → | 7.5.5.7.14 | When scripts are completed, From ACMS synoptic check that ACC Mode is turned to: 'OCM pnt ~~coarse~~ fine' | OK |  |  |  |  |  |  |
|  |  | Synchronise CCS Time With ETS for Accelerometer Measurement Timing |  |  | N/A |  |  |  |  |
|  | 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: |  |  | N/A |  |  |  |  |

**Enter Date / Time:** 22/10/08 16:58 **Location:** ESTEC **Sign OFF:** **TD:** **PA:** D. Lamarb

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

| **Enter Date / Time:** | 22/08/08 | 16:58 | **Location:** | ESTEC | **Sign OFF:** | **TD:** | **PA:** D. Lamonby |
|---|---|---|---|---|---|---|---|

### 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:<br>'A102109SPVT~~208~~ 213_ACMS_RWL_SPIRE_uVIB.tcl' | OK | | | | ✓ | | 22/08<br>17:05 |
| 7.5.5.8.2 | At the following prompt:<br>'Positive Spin. Click OK'<br>Check from ACMS Synoptic that RWL 1-2-3-4 are ON. Then Click OK to start positive spinning | Click OK | | | | ✓ | | 23:00 |
| 7.5.5.8.3 | From a 'TM Plotting Tool' follow RWL spinning, monitoring parameters:<br>AEWR1002<br>AEWR2002<br>AEWR3002<br>AEWR4002 | OK | | | | ✓ | | |
| 7.5.5.8.4 | At the following prompt:<br>'Negative Spin. Click OK'<br>Click OK to start negative spinning | Click OK | | | | ✓ | | 23.08 |
| 7.5.5.8.5 | From 'TM Plotting Tool' (above step) follow RWL negative spinning | OK | | | | ✓ | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Enter Date / Time: | 22/08/08 | 23:0 | Location: | ESTEC | Sign OFF: | TD: | PA: R. Goossens |

| Step | Reaction Wheel Activation | Nominal Value | Tolerance | Actual Value | Remark | P | N |
|---|---|---|---|---|---|---|---|
| 7.5.5.8.6 | At the following prompt:<br>'Click OK to spin-down RWL to 0 [Nms]'<br>Click OK to bring RWLs to 0 [Nms] | Click OK | | | | ✓ | |

23:18

**Enter Date / Time:** 22/08/08 23:20 **Location:** ESTEC **Sign OFF:** **TD:** **PA:** R. Goossens

### 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**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:<br>**2.22 Procedure: Spectrometer Detector Microphonics Test** | | | | | ✓ | |
| | **SPIRE in IST-SPECSTBY mode with bias set to nominal values** | | | | | | |

**Enter Date / Time:** 22/08/08 23:20 **Location:** ESTEC **Sign OFF:** **TD:** **PA:** R Goossens

### 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:<br>13<br>'A102109SPVT2082_ACMS_RWL_SPIRE_uVIB.tcl' | OK | | | | ✓ | |
| 7.5.5.10.2 | At the following prompt:<br>'Positive Spin. Click OK'<br>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:<br>AEWR1002<br>AEWR2002<br>AEWR3002<br>AEWR4002 | OK | | | | ✓ | |
| 7.5.5.10.4 | At the following prompt:<br>'Negative Spin. Click OK'<br>Click OK to start negative spinning | Click OK | | | | ✓ | |
| 7.5.5.10.5 | From 'TM Plotting Tool' (above step) follow RWL negative spinning | OK | | | | ✓ | |

22/08 23:29
23/08 01:55

22/08 23:30
23/08 01:56

23/08 02:35
TEST ABORTED

22/08 23:42

| Enter Date / Time: | 22/08 | 23:48 | Location: | ESTEC | Sign OFF: | TD: | PA: R. Goossens |
|---|---|---|---|---|---|---|---|
| | 23/08 | 01:50 | | ESTEC | | | |

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

22/58

23:53

| Enter Date / Time: | 22/08/08 | 23:53 | Location: | ESTEC | Sign OFF: | TD: | PA: R. Grosser |
|---|---|---|---|---|---|---|---|

### 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.5 Procedure: IST-SPECSTBY to REDY mode** | | | | N/A | | |
| 7.5.5.9.2 | Switch **SPIRE REDY to PHOTSTBY mode**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.2 Procedure: REDY mode to PHOTSTBY** | | | | N/A | | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04P** | | | | N/A | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Enter Date / Time:** | 22/06 | 23:53 | **Location:** | ESTEC | **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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13P** | | | | N/A | | |
| 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:<br>**2.21 Procedure: Photometer Detector Microphonics Test** | | | | | ✓ | |
| | **SPIRE in PHOTSTBY mode with bias set to ILT nominal values** | | | | | | |

| Enter Date / Time: | 22/08 | 23:54 | Location: | ESTEC | Sign OFF: | TD: | PA: R. Goossens |
|---|---|---|---|---|---|---|---|

## PVS#27 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:<br>• **Select the point number 99**<br>and confirm the selection pressing the relevant button "CONTINUE". | Continue | | 99, OK<br>Continue. | | ✓ | |
| 7.5.5.12.3 | The following menu will appear:<br>HERSCHEL/PLANCK - MAIN MENU 9.0 - ACMS OFF PHASE<br>===============================================<br>***select the point number 1*** 'Switch Off ACMS' and confirm the selection pressing the relevant button "CONTINUE". | Continue | | 1, OK<br>Continue | | ✓ | |
| 7.5.5.12.4 | Check the "ACMS_OFF" Test Sequence has been successfully ended. | OK | | OK | Different manifestation of NC4181. | ✓ | |
| 7.5.5.12.5 | By the same above menu,<br>***select the point number 99*** to end the ACMS_CONFIG25 Master Sequence". Click OK to Confirm | OK | | OK | | ✓ | |

| Enter Date / Time: | 23/08/08 | 10:51. | Location: ESTEC/HYDRA | Sign OFF: | TD: | PA: R. Goossens |
|---|---|---|---|---|---|---|

| 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: | | | NA | | N/A | |
| | **ETS Time (Accelerometer Measurement T.E. Clock):** | | | NA | | N/A | |
| | **CCS Time:** | | | N/A | | N/A | |
| 7.5.5.12.7 | Notify ETS that accelerometer acquisitions can be stopped | | | N/A | | N/A | |

**End of SPIRE SPT day 3**

| | | | | | |
|---|---|---|---|---|---|
| **Enter Date / Time:** 23/08/08 | **Location:** ESTEC/HYDRA | **Sign OFF:** | **TD:** | **PA:** R. Goossens | |

### 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.3 Procedure: IST-PHOTSTBY to REDY mode** | Mode:<br>**REDY** | | | | | |
| 7.5.5.13.2 | Switch **SPIRE REDY to SPECSTBY mode**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.4 Procedure: REDY mode to SPECSTBY** | Mode:<br>**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:<br>**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<br>**SPIRE-IST-EMC-SPOT.tcl**<br>the instrument is left in **SPECSTBY** mode | Mode:<br>**SPECSTBY** | | | | | |

NOT PERFORMED

DAY 1-2 SUFFICIENT

| 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.5 Procedure: SPECSTBY to REDY mode** | Mode:<br>**REDY** | | | | | |
| | **SPIRE in SPECSTBY mode** | | | | | | |

NOT PERFORMED

| **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:<br>**S102999SCVT028_ASDSPTSPIR_PWR_OFF_P** | OK | OK | | ✓ | |
| 7.5.6.2. | On HPCCS when prompted:<br>`“SPIRE Switch OFF for SPTs in HeI/HeII conditions ONLY - Select NO to abort TS if not correct”`<br>**Select YES** | 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:<br>EVID 1313 No_MCU_Response_Error<br>EVID 21773 ALARM_LSMCU_DEAD | | | | | |

| Enter Date / Time: | 23/08/2008 11:48 | Location: | ESTEC | Sign OFF: | TD: Uwe Vrenky | PA: R. Goossens |
|---|---|---|---|---|---|---|

| Step-No. | Test-Step-Description | Nominal Value | Actual Value | Remarks | P | N |
|---|---|---|---|---|---|---|
| 7.5.6.3. | On HPCCS when prompted:<br>`"Check Telemetry No Longer Updating - OK to continue"`<br>Check that parameters:<br>THSK<br>TM2N | <br><br><br>Not refreshing<br>Not incrementing | | AND: SA_1_559 | ✓ | |
| 7.5.6.4. | Select OK to continue | OK | 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:<br>`"Bus profile left as SPIRE PRIME, change manually after if required - OK to continue"` | | | | ✓ | |
| 7.5.6.6. | Select OK to continue | OK | OK | | ✓ | |
| 7.5.6.7. | On HPCCS stop Packet History displays for the following APIDs:1280,1282 | OK | | | ✓ | |
| | **SPIRE PRIME OFF** | | | | ✓ | |

| Enter Date / Time: | 23/08/2008 | 11:52 | Location: | ESTEC | Sign OFF: | TD: Uwe Klenke | PA: R. Gossen |
|---|---|---|---|---|---|---|---|

## 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<br>**disconnect HSPIREEGSE** | OK | | OK | | ✓ | |
| 7.5.7.2 | On HPCSS terminate **SPIRE_ALL_SubscribeParams.tcl** test script. | OK | | OK | | ✓ | |
| 7.5.7.3 | Confirm from HPCSS and SPIRE I-EGSE that the disconnection was successful | **YZS29940=**<br>**DISCONNECTED** | | OK | | ✓ | |
| 7.5.7.4 | Perform SPIRE I-EGSE switch OFF according to procedure 7.2.6 of AD8 as attached. | OK | | | Performed by SPIRE team | | |
| 7.5.7.5 | If connected, from HPCCS Test Conductor console issue command to disconnect from the CryoSCOE.<br>**disconnect PFM_CRYO** | OK | | OK | | ✓ | |
| 7.5.7.6 | Confirm that from HPCCS that the Cryo SCOE is disconnected. | YZS11940=<br>DISCONNECTED | | Yes | | ✓ | |
| 7.5.7.7 | From HPCCS disable Monitoring Mode 1 (512 sec cycle) for CCU A & B by executing test script:<br>**K102999ECVT001_ASDGENCCU_MnDBOTH1** | OK | | OK | | ✓ | |
| 7.5.7.8 | From HPCCS power OFF CCU A & CCU B by executing test script:<br>**K102999ECVT001_ASDGENCCU_ABPWROFF** | OK | | OK | | ✓ | 12:06 |

| | | | | | |
|---|---|---|---|---|---|
| **Enter Date / Time:** | 23/8/2008 | 12:11 | **Location:** ESTEC | **Sign OFF:** | **TD:** Uwe Klenk | **PA:** R. Goossens |

| 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 | | N/A | | | |
| 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 | | Ok | Performed sections 7.7 and 7.11 only | ✓ | |
| 7.5.7.11 | Confirm both Satellite and EGSE powered down, if applicable | OK | | OK | EGSE still powered | ✓ | |
| | End Conditions: Satellite and EGSE OFF | | | | | | |
| | **END OF TEST** | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Enter Date / Time:** | 23/08/2008 | 12:37 | **Location:** | ESTEC | **Sign OFF:** | **TD:** | **PA:** R. Goossens |

# 8 Summary Sheets

## 8.1 Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | | Curr. No.:<br>Date<br>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<br>Closed | PA sig. |
|---|---|---|---|---|
| | | | | |

Table 8.2-1: Non-Conformance Record Sheet

## 8.3 Sign-off Sheet

| | Date | Signature |
|---|---|---|
| **Test Director** | 7/9/08 | |
| **Test Conductor** | 7/9/08 | |
| **Operator** | 23/08/08 | |
| **PA Responsible** | D.LAMONBY 24-08-08 | D Lamonby |
| **ESA Representative** | 8/9/08 | |

# 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 ✓ | |

checked 19.8.2008

| | | | | | |
|---|---|---|---|---|---|
| | | | | Cable Plugged ✓ | |
| SKIN-02 | LV2/FCV 20N CMD S/A R | J06 | ACC/RCS | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-02 | RCS Press/Tank Temp/PT Pwr | J07 | ACC/PT&TH | | Flight Plug<br>SK02P07 Plugged ✓ |
| SKIN-02 | Thruster Temp M/LV1 Sts | J08 | ACC/RCS | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-02 | CDMU and ACC EEPROM reprogramming input | J09 | ACC/CDMU | | Flight Plug<br>SK02P09 Plugged ✓ |
| SKIN-02 | CDMU and ACC EEPROM reprogramming input | J10 | ACC/CDMU | | Flight Plug<br>SK02P10 Plugged ✓ |
| SKIN-02 | Thruster Temp R/LV2 Sts | J11 | ACC/RCS | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-02 | Thruster C/B Heaters M | J12 | ACC/CBH | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-02 | Thruster C/B Heaters R | J13 | ACC/CBH | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-02 | Str1/2 On/Off Cmd M/Str1 Sts | J14 | ACC/STR-1 | | ACMS Flight Plug<br>SK02P14 Plugged ✓ |
| SKIN-02 | Str1/2 On/Off Cmd R/Str2 Sts | J15 | ACC/STR-2 | | ACMS Flight Plug<br>SK02P15 Plugged ✓ |
| SKIN-02 | Gyro A On/Off Cmd | J16 | ACC/GYRO-E1 | | ACMS Flight Plug<br>SK02P16 Plugged ✓ |
| SKIN-02 | Gyro B On/Off Cmd | J17 | ACC/GYRO-E2 | | ACMS Flight Plug<br>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<br>LGA1 Plugged ✓ | LGA1 Anechoic Cap ✓ |
| | RF link for antenna LGA2 | N/A | LGA2 | RF SCOE<br>LGA2 Plugged ✓ | LGA2 Anechoic Cap ✓ |
| | RF link for antenna MGA | N/A | MGA | RF SCOE<br>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<br>SK04P01 Plugged ✓ |
| SKIN-04 | RWL2 Sgn | J02 | ACC/RWL-2 | | ACMS Flight Plug ✓ |

checked 19.8.08

| | | | | | |
|---|---|---|---|---|---|
| | | | | | SK04P02 Plugged ✓ |
| SKIN-04 | RWL3 Sgn | J03 | ACC/RWL-3 | | ACMS Flight Plug<br>SK04P03 Plugged ✓ |
| SKIN-04 | RWL4 Sgn | J04 | ACC/RWL-4 | | ACMS Flight Plug<br>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<br>Cable Plugged ✓ | |
| SKIN-05 | CRS 1/2 Stimuli | J04 | CRS-1,2 | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-05 | AAD Sgn M | J05 | AAD/ACC | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-05 | SAS1/2 Sgn M | J06 | SAS/ACC | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-05 | SAS1/2 Sgn R | J07 | SAS/ACC | ACMS SCOE<br>Cable Plugged ✓ | |
| SKIN-05 | AAD Sgn R | J08 | AAD/ACC | ACMS SCOE<br>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<br>Cable Plugged ✓ | |
| SKIN-06 | STR2 Stimuli | J02 | STR2 | ACMS SCOE<br>Cable Plugged ✓ | |
| | **UMBILICAL** | | | | |
| | Connector Function | Connector | S/C unit | SCOE CABLE | |
| | Power/Data | HU1J01 | SYSTEM | SCOEs cable<br>Plugged ✓ | |
| | Power/Data | HU2J01 | SYSTEM | SCOEs cable<br>Plugged ✓ | |

checked 19.8.08

Setup checked by R. Langenstein
19.8.08

# CryoSCOE harness setup for ACS/PR/TP No.: HP-2-ASED-TP-0204

## SPIRE IST Specific Performance Test

**315 100** on top of

| Connector Function | Connector | S/C unit | SCOE | CryoSCOE connected | CCU Flight connected |
|---|---|---|---|---|---|
| Temperature Sensors | 315100-J01 | T117, T118, T207, T211, T238, T239, T249,T251, T253, T255, T423, T443, T463, T851, T852, T853, T861 | Cryo SCOE J07 & J15 | X ✓ | no flight |
| Temperature & pressure Sensors | 315100-J03 | T702, T872, P101, T103, T115, T116, T704, T802, T803, T805, T806, T871 | Cryo SCOE J01 & J17 | X ✓ | no flight |
| Temperature Sensors | 315100-J05 | T331, T333, T335, T337, T339, T341 (Telescope) | Cryo SCOE J14 | | X ✓ |
| Temperature Sensors | 315100-J06 | T332, T334, T336, T338, T340, T342 (Telescope) | Cryo SCOE J10 | | X ✓ |

**316 100** on top of

| Connector Function | Connector | S/C unit | SCOE | CryoSCOE connected | CCU Flight connected |
|---|---|---|---|---|---|
| Valve Sensor | 316100-J01 | VS501, VS504 | | | X ✓ |
| Valve Sensor | 316100-J02 | VS503, VS505 | | | X ✓ |

**321 100** on top of

| Connector Function | Connector | S/C unit | SCOE | CryoSCOE connected | CCU Flight connected |
|---|---|---|---|---|---|
| | 321100-J01 | L701, H701 | Cryo SCOE J11 | | Cover ✓ |
| | 321100-J02 | LL702, H702 | Cryo SCOE J03 | | Cover ✓ |
| | 321100-J03 | H502, H503 | Cryo SCOE J06 | ~~Cover~~ | ~~no flight~~ Cover ✓ R. |
| | 321100-J04 | P501 | Cryo SCOE J01 | X ✓ | no flight |
| | 321100-J05 | H103, H701, L102, VT102, VT103, VT105, VT701, VH102, VH103, VH105, VH701, VS102, VS105, VS701 | Cryo SCOE J11 | X ✓ | no flight |
| | 321100-J06 | H104, H702, L101, VT104, VT106, VT702, VH104, VH106, VH702, VS104, VS702 | Cryo SCOE J03 | ✓ X | no flight |
| | 321100-J07 | H501 | Cryo SCOE J06 | | Cover ✓ |
| | 321100-J08 | T502 | Cryo SCOE J01 | | Cover ✓ |

19.8.08

| **321 200** | on top of | | | | | |
|---|---|---|---|---|---|---|
| | Connector Function | Connector | S/C unit | SCOE | CryoSCOE connected | CCU Flight connected |
| | | 321200-J01 | T202, T212, T221, T223, T227, T228, T232, T234, T236, T242, T244, T246, T250, T254, T258, T424, T464 | Cryo SCOE J08 | X ✓ | no flight |
| | | 321200-J02 | T102, T105, T106, T111, PR_P701, T421, T442, T461, H101 | Cryo SCOE J04 | X ✓ | no flight |
| | | 321200-J03 | T321, T323, T501, T505, T651, T901, T903, T907, T911 | Cryo SCOE J09 | | X ✓ |
| | | 321200-J04 | T312, T314, T316, T905, T909, T931, T933, T935 | Cryo SCOE J09 | | X ✓ |
| | | 321200-J05 | VS103, H102 | Cryo SCOE J04 | | X ✓ |

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| **321 300** | on top of | | | | | |
|---|---|---|---|---|---|---|
| | Connector Function | Skin Connector | S/C unit | SCOE | SCOE Cable connected | Flight Cap connected |
| | | 321300-J01 | T208, T213, T222, T224, T225, T226, T231, T233, T235, T237, T247, T248, T252, T256, T862, T444 | Cryo SCOE J02 | | X ✓ |
| | | 321300-J02 | T101, T104, T107, T112, T703, T422, T441, T462, T701, H102 | Cryo SCOE J04 | | X ✓ |
| | | 321300-J03 | P502,T322, T324, T504, T506, T507, T652, T902, T908, T912 | Cryo SCOE J18 | | X ✓ |
| | | 321300-J04 | T311, T313, T315, T904, T906, T910, T932, T934 | Cryo SCOE J14 | | X ✓ |
| | | 321300-J05 | VS106, H102 | Cryo SCOE J04 | | X ✓ |
| **CVSE I/F** | on top of | | | | | |
| | Connector Function | Skin Connector | S/C unit | SCOE | SCOE Cable connected | Flight Cap connected |
| | | | | Cryo SCOE J18 | X ✓ | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| to be approved & released before start of ACS/PR/TP by Floor-Manager | Date: 19.8.98 | | Sign: | | | |

additional:

| **314 200** | Connector Function | Skin Connector | S/C unit | SCOE | SCOE Cable connected | Flight Cap connected |
|---|---|---|---|---|---|---|
| | Cryo-Cover | 314200-J01 | T601 | Cryo SCOE J05 | X ✓ | no flight |
| | Cryo-Cover | 314200-J02 | T602 | Cryo SCOE J05 | X ✓ | no flight |
| to be approved & released before start of ACS/PR/TP by Floor-Manager | Date: 19.8.96 | | Sign: | | | |

| **312300** | Connector Function | SVM Connector | S/C unit | PLM SIH | SVM SIH Cable connected | Flight / Non-Flight Configuration |
|---|---|---|---|---|---|---|
| | SPIRE | 312300-P01 | | Launch-latch | | Flight ✓ |
| | SPIRE | 312300-P02 | | Launch-latch | | Flight ✓ |
| to be approved & released before start of ACS/PR/TP by Floor-Manager | Date: 19.8.96 | | Sign: | | | |

# APPENDIX 2

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

# 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)

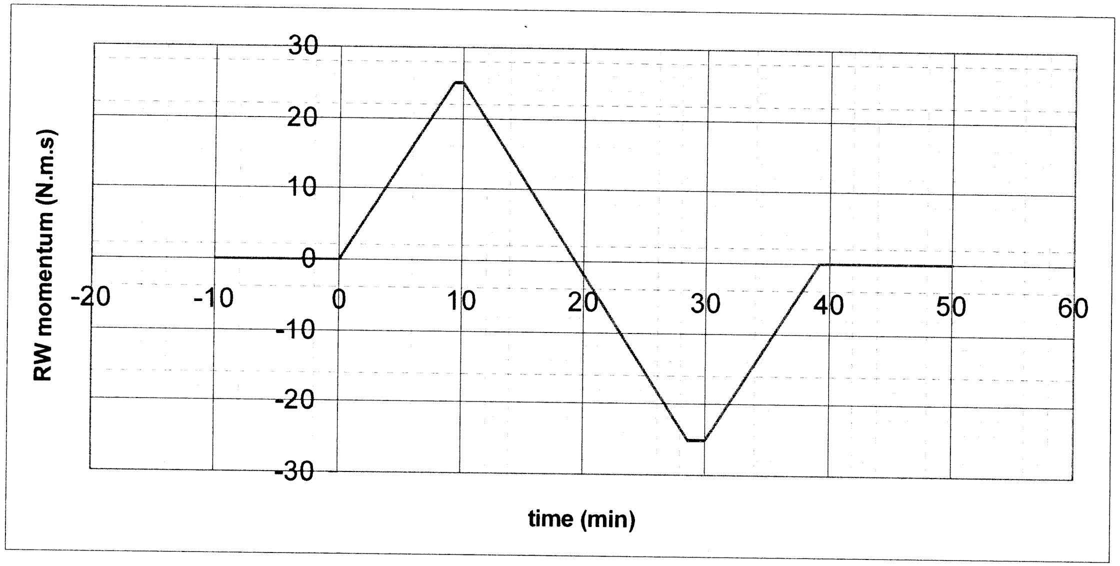
Table A4-2: Reaction Wheel Profile

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 |
| | Fricke Wolfgang Dr. | AED 65 | | 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 | | | |
| | 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 | | | |
| | 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 |
| | Maukisch Jan | ASA43 | | BOC Edwards | BOCE |
| X | Much Christoph | ASA43 | | Dutch Space Solar Arrays | DSSA |
| | 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 |

# 6 Appendix 2: As-Run Log of RAL SPT Procedure

Procedure SPIRE-RAL-PRC-002704

**Spire Procedure**

SPIRE IST Specific Performance Test Procedures
Prepared by B.M.Swinyard & S D Sidher

**Ref:** SPIRE-RAL-PRC-2704
**Issue:** 3.4
**Date:** 12th August 2008
**Page:** 1 of 81

# 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<br>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.<br>Additional SPT scripts listed in the Appendix 2. These will be run as required.<br>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:**

PVS8

| 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<br>Chop On/Off positions 0xb600/0x6a28 (46592/27176)<br>Jiggle On/Off positions 0x9a60/0x9a60 (39520/39520) | → retry 21/08 23:00 (failed, recovered from script error) |
| 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<br>Chop On/Off positions 0xdbc4/0x4414 (56260/17428)<br>Jiggle On/Off positions 0x9a60/0x9a60 (39520/39520) | → 21/08 00.27 |
| 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<br>Switch OFF BSM mechanism<br>Execute SPIRE-IST-BSM-OFF.tcl<br>else<br>End of test | |

ok already in BSM_INIT.

NCR.-

**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<br>This sets the OBSID for the test | N/A | N/A | N/A | | |
| 2 | Execute TCL script SPIRE-IST-CRECm.tcl<br>- **Click on OK button to turn off Pump Heat Switch (whether it is on or off)**<br>**Apply 1.4 mA to the Evaporator Heat Switch** | STEP<br>*Time (UT)*<br>SPHSV<br>PUMPHSTEMP<br>EVAPHSTEMP | 1<br>TBC<br>TBC<br>TBC | OK<br>OK | | 10:56. |
| 3 | **Wait for PUMPHSTEMP to go just below 12 K and then click on OK to apply 400 mW power to Pump Heater** | STEP<br>*Time (UT)*<br>*ΔTime (minutes)*<br>SPHTRV | 2<br>TBC | OK | | 10:56 |
| 4 | **Wait for PUMPHTRTEMP to increase to 45 K and then click on OK to reduce power to Pump Heater to 40mW** | STEP<br>*Time (UT)*<br>*ΔTime (minutes)*<br>SPHTRV<br>PUMPHTRTEMP | 3<br>TBC<br>TBC | Ok | | 11:27 |
| 5 | **Wait for SUBKTEMP to fall below 2 K and then click on OK to switch off power to the**<br>**Pump Heater and Evaporator Heat Switch.**<br>**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<br>*Time (UT)*<br>*ΔTime (minutes)*<br>EVHSV<br>SPHTRV<br>PUMPHSTEMP<br>EVAPHSTEMP | 4<br>TBC<br>TBC<br>TBC<br>TBC | OK | | 11:58 |

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| 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**<br>*The TCL script ends after execution of this step* | STEP<br>*Time (UT)*<br>*ΔTime (minutes)*<br>SPHSV<br>SUBKTEMP<br>PUMPHSTEMP | 5<br><br><br>TBC<br>TBC<br>TBC | OK. | | 11:58 |
| 7 | **Monitor SUBKTEMP and PUMPHSTEMP.**<br>*Cooler recycle procedure completes when SUBKTEMP reaches ~ 0.285 K and PUMPHSTEMP reaches ~TBC K.* | *Time (UT)*<br>*ΔTime (minutes)*<br>SUBKTEMP<br>PUMPHSTEMP | <br><br>< 300mK<br>TBC | OK | | 12:39 |
| 8 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID for the test | N/A | N/A | ~~N/A~~ OK | | 12:40 |

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

20. 8. 2008 Uwe Klenke

## 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:** 21/08/08 08:46

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| PVS15 -3 →<br>1<br>08:50 → | Execute TCL script SPIRE-IST-PHASEUP-PHOT70.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels at 70Hz bias frequency<br>• 3 bias amplitudes, with each phase up taking ~20 minutes each | N/A | N/A | N/A | ✓ |
| 2<br>09:17<br>PVS16 → | Execute TCL script SPIRE-IST-PHASEUP-PHOT100.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels at 100Hz bias frequency<br>• 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<br>• Observe signal levels and determine optimum phase setting for ILT bias levels at 130Hz bias frequency<br>• 3 bias amplitudes, with each phase up taking ~20 minutes each | N/A | N/A | N/A | ✓ |
| 4<br>PVS17 → | Execute TCL script SPIRE-IST-PHASEUP-PHOT190.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels at 190Hz bias frequency<br>• 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 | ~~N/A~~ ✓ 16:01 |
| 6 | Analyse data in real time to determine IST ground nominal operating parameters and compare to ILT results – confirm ILT table entries. | | | | N/A |

**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 | | | |
| . | | | | |
| . | | | | |

See Instrument AS-RUN

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| | **Create a new calibration table Phot_Noise_Settings.txt:**<br>**Bias F, Samp F, PSW bias, PMW bias, PLW bias, PSW phase, PMW phase, PLW phase**<br>**70**<br>**100**<br>**130**<br>**190** | | | See Instrument As-run | |
| | | | | | |

**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<br>• Set bias amplitude to 15mV<br>• Set frequency to 70 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 100 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 130 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 190 Hz and predetermined phase – observe signal and measure noise<br>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<br>• Set bias amplitude to 30mV<br>• Set frequency to 70 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 100 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 130 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 190 Hz and predetermined phase – observe signal and measure noise<br>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 | ✓ |

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16:04
16:52
16:54

PVS
18 →

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 3 | Execute TCL script SPIRE-IST-DNA-PHOT-AMP50.tcl<br>• Set bias amplitude to 50mV<br>• Set frequency to 70 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 100 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 130 Hz and predetermined phase – observe signal and measure noise<br>• Set frequency to 190 Hz and predetermined phase – observe signal and measure noise<br>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 | 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 | N/A |

21/8
17:43

21/08
13:32

**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:**

21/08 20:33

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 1 | OPTIONAL:<br>~~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~~<br>~~• Starts VM with parameters for PTC control determined during PTC optimisation procedure~~ | | | N/A | |
| 2 | Execute TCL script SPIRE-IST-DNA-PHOT-FRQ.tcl<br>• Set frequency to 70 Hz and phase to predetermined level<br>• Measure noise for 30 minutes (nominal – can be longer)<br>• Repeat for the following default settings<br>• 100 Hz<br>• 130 Hz<br>• 190 Hz<br>• Set to detectors nominal values | N/A | N/A | N/A | 20:34 |
| 3 | If requested by the I-EGSE, execute TCL script SPIRE-IST-DNS-PHOT.tcl to apply the IST nominal bias settings<br>**(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:<br>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<br>- Starts VM with parameters for PTC control determined during PTC optimisation procedure | | | | |
| 2 | Execute TCL script SPIRE-IST-DNA–PHOT-STAB.tcl<br>- Measure signal for 30 minutes at nominal bias amplitude of ~30mV<br>- Step bias to ½ nominal amplitude, appropriate phases and reset offsets<br>- Measure signal for 1 hour<br>- Step bias to nominal amplitude (30mV) and reset offsets<br>- 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** | | | | | |

NOT PERFORMED
SEE PTR MINUTES

**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

[redacted] **Procedure Steps:**
↓

[redacted] [redacted]

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

21/08
18:47
19:53

new NCR-4460

| **Step** | **Description** | **Parameters** | **Expected Values** | **Actual Values** | **Success/ Failure** |
|---|---|---|---|---|---|
| 3 | Execute TCL script SPIRE-IST-CPS-PHOT.tcl<br>• Standard PCAL flash for photometer | N/A | Detector signal<br>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<br>Start by resetting photometer offsets and collecting detector data for 5 minutes with PTC off | N/A | N/A | N/A | |

✓

Dh

22/08/08 02:42

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| | • Set PTC to first level and reset offsets<br>• Collect detector data for 20 minutes – observe PTC thermistor and detector signals<br>• *Loop n-times*<br>• Set PTC heater power to nth level +1<br>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<br>This sets the OBSID for the test | N/A | N/A | N/A | ✓ 23/08 01:04 |
| 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<br>~~1. SPIRE-IST-PTC-VM-PSWT1~~.tcl<br>→ 2. SPIRE-IST-PTC-VM-SUBKTEMP.tcl<br>~~3. SPIRE-IST-PTC-VM-TC2.tcl~~ | N/A | N/A | N/A | failed! NCR 4459 |
| 3 | Stop VM using pop up button when advised by I-EGSE staff<br>• It may be necessary to edit one or more of command parameters in these scripts and rerun the script.<br>• 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. | | | | N/A |
| 4 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID for the test | N/A | N/A | N/A | ✓ 23/08 01:27 |
| 5 | Repeat above steps as requested by I-EGSE staff. Three repeats are expected but may require more. | | | | N/A |
| 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 | ✓ 23/08 01:29 |
| **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

→SPIRE- IST-DNS-PHOT. – PVS19-

Start 21/08 19:18

**Procedure Steps:**

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

19:19

| 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<br>• Switch off PCAL | | | | |
| 2 | Execute TCL script SPIRE-IST-CPT-PHOT.tcl<br>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<br>PCAL is switched off at the end by the script. | N/A | N/A | N/A | ✓ 19:40 |
| 3 | If requested by the I-EGSE, execute the TCL script SPIRE-IST-DNS-PHOT.tcl to set the IST nominal detector settings | | | | Not Performed at this point |
| **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:**

22/08/08 08:10

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 08:10 1 | Execute TCL script SPIRE-IST-PHASEUP-SPEC80.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels<br>• 3 bias amplitudes, with each phase up taking ~20 minutes each | N/A | N/A | N/A | OK |
| 08:33 2 | Execute TCL script SPIRE-IST-PHASEUP-SPEC160.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels<br>• 3 bias amplitudes, with each phase up taking ~20 minutes each | N/A | N/A | N/A | OK |
| 8:57 3 | Execute TCL script SPIRE-IST-PHASEUP-SPEC240.tcl<br>• Observe signal levels and determine optimum phase setting for ILT bias levels<br>• 3 bias amplitudes, with each phase up taking ~20 minutes each | N/A | N/A | N/A | OK |
| 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 | skipped |
| 4 | Analyse data in real time to determine IST ground nominal operating parameters and compare to ILT results – confirm ILT table entries. | | | | skipped |

**Test Result (Pass/Fail):**

**Approximate optimum phase settings for each detector:**

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

See SPIRE AS-RUN.

**Final Configuration:**

QA R. Goossens Uwe Vlenke 22/8/2008 09:21

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

PVS#22

## 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<br>• Set frequency to 80 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise<br>• Set frequency to 160 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise<br>• Set frequency to 240 Hz and ILT nominal setting<br><br>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 | ✓ 22/08<br>12:40 |
| 2 | Execute TCL script SPIRE-IST-DNA-SPEC-AMP30.tcl<br>• Set frequency to 80 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise<br>• Set frequency to 160 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise<br>• Set frequency to 240 Hz and ILT nominal setting<br><br>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 | ✓ 22/08<br>13:16 |
| 3 | Execute TCL script SPIRE-IST-DNA-SPEC-AMP50.tcl<br>• Set frequency to 80 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe signal at each level and measure noise<br>• Set frequency to 160 Hz and ILT nominal setting<br>• Set bias amplitude to each predetermined level and phase - observe | N/A | N/A | N/A | ✓ 22/08<br>13:50 |

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| | signal at each level and measure noise<br>• Set frequency to 240 Hz and ILT nominal setting<br>If requested by the I-EGSE, execute TCL script SPIRE-RALILT-DNS-SPEC.tcl to apply the ILT nominal bias settings ✓ | 14:25 | | | ✓ |
| 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.**

22/08

14:[redacted]

**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

22/06
14:30

**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<br>• Measure noise for 30 minutes<br>• Repeat for the following default settings<br>• 160 Hz<br>• 240 Hz<br>• 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 ✓<br>**(The input values to the CUS script may need updating by the I-EGSE)** | N/A | N/A | N/A | 16:03 22/08 |
| **Test Result (Pass/Fail):** | | | | | |
| **Detailed analysis of data required by off line processing** | | | | | |

→ PVS23

In parallel

**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:**

PUS 24 →

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

16:06
+16:11

→ PUS 25

17:23

PUS 24(2)

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 3 | Execute TCL script SPIRE-IST-CPS-SPEC.tcl<br>• Standard PCAL flash for spectrometer | N/A | Detector signal N+/-dN mV | | ✓ 17:56 |
| 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 | ✓ 18:01 |
| **Test Result (Pass/Fail):** | | | | | |
| | | | | | |
| finished 18:05 | | | | | |

**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:**

22/08 18:2

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

PUS 25 (1) →

18:03

21:46

PUS → 25 [illegible])
(2+3+4+5)

PVS 25 (6) →

PVS25 (7) →

| 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<br>Standard PCAL flash for spectrometer | N/A | Detector signal N+/-dN mV | ✓ | 22/08 21:52 |
| 4 | Execute TCL script SPIRE-IST-LC-SPEC.tcl | N/A | N/A | ✓ | |
| 5 | Execute TCL script SPIRE-IST-CPS-SPEC.tcl<br>• Standard PCAL flash for spectrometer | N/A | Detector signal N+/-dN mV | ✓ | 22/08 22:20 |
| 6 | Execute SPIRE-IST-SCAL2-COOLDOWN.tcl<br>1. Press ok to Switch off SCAL2 | | | ✓ | 22/08 22:27 |
| 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 | N/A | |
| 8 | **Corresponding TCL scripts are also available for SCAL4, i.e. SPIRE-IST-SCAL4-WARMUP.tcl and SPIRE-IST-SCAL4-COOLDOWN.tcl.**<br>**It may be necessary to run these if advised by the I-EGSE staff.** | N/A | 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 | | |

PVS25 (8) →

| **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<br>• Set PCAL bias to 0.35 mA<br>• Wait for 10 seconds | N/A | N/A | N/A | |

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| | - Set PCAL to 0 mA<br>- Wait for 10 seconds<br>- 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<br>- Switch off PCAL | | | | |
| 2 | Execute TCL script SPIRE-IST-CPT-SPEC.tcl<br>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<br>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<br>*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:**

23/08/08 01:48

| | **Step** | **Description** | **Parameters** | **Expected Values** | **Actual Values** | **Success/ Failure** | |
|---|---|---|---|---|---|---|---|
| | 1 | Execute TCL script SPIRE-IST-DNS- PHOT126.tcl<br>• Set frequency to 126 Hz and phase to predetermined IST level | N/A | N/A | N/A | | 01:49 |
| | 2 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | | 01:51 |
| PFS29. | 3 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | N/A | N/A | N/A<br>TEST ABORTED | | 01:52<br>02:35 |
| | 4 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | | |
| | 5 | Execute TCL script SPIRE-IST-DNS- PHOT156.tcl<br>• 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<br>This sets the OBSID for the test | N/A | N/A | N/A | | |
| | 7 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | | | | | |
| | 8 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | | |
| | 9 | Execute TCL script SPIRE-IST-DNS- PHOT171.tcl<br>• 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<br>This sets the OBSID for the test | N/A | N/A | N/A | |
| 11 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | | | | |
| 12 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | |
| 13 | Execute TCL script SPIRE-IST-DNS-PHOT.tcl<br>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**

RVS29

**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 |
|---|---|---|---|---|---|
| PVS 26 (1) ><br>1 | Execute TCL script SPIRE-IST-DNS- SPEC175.tcl<br>• Set frequency to 175 Hz and phase to predetermined IST level | N/A | N/A | N/A | ✓ 22/08 22:41 |
| 2 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | ✓ 22/08 22:51 |
| 3 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | N/A | N/A | N/A | ✓ 22/08 23:23 |
| 4 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | ✓ 22/08 23:24 |
| PVS 26 (2) ><br>5 | Execute TCL script SPIRE-IST-DNS- SPEC240.tcl<br>Set frequency to 240 Hz and phase to predetermined IST level | N/A | N/A | N/A | ✓ 22/08 23:24 |
| 6 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | ✓ 22/08 23:28 |
| 7 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | N/A | N/A | N/A | ✓ 22/08 23:30 |
| 8 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | ✓ 22/08 23:57 |
| PVS 26 (3) ><br>9 | Execute TCL script SPIRE-IST-DNS- SPEC279.tcl<br>Set frequency to 279 Hz and phase to predetermined IST level | N/A | N/A | N/A | ✓ 22/08 23:57 |
| 10 | Execute TCL script SPIRE-IST-START-TEST.tcl | N/A | N/A | N/A | ✓ 23/08 00:00 |

| 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<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | N/A | N/A | N/A | ✓ 23/08<br>00:02 |
| 12 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | ✓ 23/08 00.28 |
| 13 | Execute TCL script SPIRE-IST-DNS-SPEC.tcl<br>Resets SPIRE spectrometer bias and readout parameters to the nominal settings | N/A | N/A | N/A | ✓ 23/08 00:29 |

**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<br>Generate high rate data – we are looking for fluctuations in SMEC velocity<br>Scan SMEC at 0.1 mm/s over full range for four scans<br>Scan SMEC at 0.2 mm/s over full range for four scans<br>Scan SMEC at 0.3 mm/s over full range for four scans<br>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<br>Generate high rate MCU engineering data – we are looking for fluctuations in SMEC velocity<br>Set SMEC continuously scanning at 0.5 mm/s (TBC) over full range<br>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<br>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<br>**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<br>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<br>(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<br>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<br>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<br>*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<br>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<br>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<br>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<br>*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 | Hel | Hell | 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**<br>• **Wait for the BSW to produce at least 2 TM(5,1) event packets**<br>*These TM(5,1) event packets are generated at 10 second interval with the following parameters:*<br>• *Event ID: 0x8008*<br>• *SID: 0x0003*<br>• *Last three parameters before packet checksum: 0xABAB, 0xCDCD, 0xAAAA*<br>*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<br>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<br>SCUTEMPSTAT<br>SUBKSTAT | DRCU_ON/SCU_ON<br>0x0000/0xFFFF<br>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 |
|---|---|---|---|---|
| PVS6 SPIRE-IST-SPT-BSM-ON.tcl | Switches on the BSM | CHOPSENSPWR<br>JIGGSENSPWR<br>MODE | 0/1<br>0/1<br>REDY/BSM_ON | 0/1<br>01/<br>BSM_ON. |
| SPIRE-IST-SPT-BSM-INIT.tcl | Initialises the BSM | CHOPLOOPMODE<br>JIGGLOOPMODE<br>MODE | 3 ~~0~~/1<br>3 ~~0~~/1<br>BSM_ON/BSM_INIT | 3/1<br>3/1.<br>BSM_INIT. |
| PVS5-2 SPIRE-IST-SPT-PDET-ON.tcl | Switches on the Photometer arrays | MODE | BSM_INIT/PHOTSTBY | |

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## 4.3 PHOTSTBY to REDY mode

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| 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<br>JIGGSENSPWR<br>MODE | 1/0<br>1/0<br>PDET_OFF/REDY | |

✓
✓

## 4.4 REDY to SPECSTBY mode

ArS6

| Test Script | Description | Parameters | Expected Values Before/After | Actual Values Before/After |
|---|---|---|---|---|
| SPIRE-IST-SPT-BSM-ON.tcl | Switches on the BSM | CHOPSENSPWR<br>JIGGSENSPWR<br>MODE | 0/1<br>0/1<br>REDY/BSM_ON | |
| SPIRE-IST-SPT-BSM-INIT.tcl | Initialises the BSM | CHOPLOOPMODE<br>JIGGLOOPMODE<br>MODE | 0/1<br>0/1<br>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<br>JIGGSENSPWR<br>MODE | 1/0<br>1/0<br>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<br>SUBKSTAT<br>MODE | 0xFFFF/0x0000<br>0x1/0x0<br>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 |

# 7 Appendix 3: As-Run Log of SPIRE EMC Test

Procedure SPIRE-RAL-PRC-003040

# SPIRE System Level CS Test Procedure

**Ref: SPIRE-RAL-PRC-003040**
**Issue: 1.1**
**Date: 16 July 2008**
**Page: 1 of 47**

Used for next SPIRE Result AS RUN

Change Control

| Issue | Change |
|---|---|
| 1.0 | As initially issued |
| 1.1 | Amended procedure for RS testing in 10-100MHz range (§1 and §6.3) |
|  | Removed specification of the test sequence to allow for flexibility (§5) |
|  | Changed injection specification to 60dBuA with a limit of 1W injection power (§1, §6.1 and §6.2) |
|  | OBSID Now automatically generated (§4) |

# 1. Introduction

This test procedure details the Conducted Susceptibility test to be performed on the PFM SPIRE instrument integrated with the FM Herschel Spacecraft in the context of the SPT test programme.

In Issue 1.1 of the procedure, the scope has been extended to cover the RS testing of the instrument in the 10-100MHz range. This covers the frequency range where SPIRE showed susceptibilities during the EQM and STM2 test campaigns.

This test was inserted into the SPIRE SPT test programme because a conducted susceptibility was identified during the ILT testing of the instrument (see RD 2). The purpose of this test is to determine/characterise the susceptibility (if it exists) in a flight-like environment when the instrument is integrated with the spacecraft.

The frequency range to be tested is 8-50MHz which brackets the frequencies of the main susceptibility seen during the ILT.

For Instrument and PCDU safety reasons, the current to be injected needs to be limited so that there is no risk of stressing or damaging the interface circuitry. During the spacecraft tests, the DM CE in the 1-50MHz range was below 20dBuA (10uA rms) and 33dBuA (45uA rms) in CM. The SPIRE FCU LCL is Class III (nominal current = 5A, minimum trip 6.0A). During Phot-Standby mode, the FCU draws 2.10A. The injected level for both CM and DM mode is to be set to 60dBuA which is sufficiently above the measured CE level to demonstrate margin while being low enough in comparison to the IID-A qualification levels to not pose a risk to the flight hardware. To further minimise the risk to the hardware, the injected power will be monitored with a probe and limited to be less than 1 W. Provision for the measurement of the injected voltage will also be included, though only as a test diagnostic if required.

The EMI seen on the SPIRE PMW detector array showed excess noise at ~1.5Hz on some channels. In order to identify spectral content of EMI on the detectors, the injection frequency will be stepped at $\Delta F/F$ steps of 4% (48 steps). At each step more than $2^{10}$ or 1024 samples will be ingested into the database which will allow noise spectra of each individual detector to be obtained. Since the nominal sampling frequency of the Photometer is 18Hz, more than 57 seconds of integration time is required to collect sufficient samples. The Spectrometer is sampled at 80Hz and thus requires more than 13 seconds to collect sufficient samples.

A QLA script has been written to analyse the data to produce spectra for each individual detector which will produce tables for inclusion in the test report. This analysis will be carried out in near real time so that the results will be available within two hours of the completion of the test.

The current procedure details the operations to be carried out during the initial phase of testing. Any follow-up tests to be inserted in the SPT1 campaign are not detailed.

## 2. Reference and Applicable Documents

| RD | Name | Doc Number |
|---|---|---|
| RD 1 | SPIRE SPT EMC CS Pre-calibration test | SPIRE-RAL-REP-003039 |
| RD 2 | SPIRE PFM5 EMC Test Report | SPIRE-RAL-REP-002852 |
| RD 3 | SPIRE CS Test Levels for SPT | SPIRE-RAL-NOT-003041 |

| RD | Name | Doc Number |
|---|---|---|
| AD 1 | SPIRE IST Specific Performance Test Procedures | SPIRE-RAL-PRC-002704, Iss. 3 |
| AD 2 | Herschel/Planck IID-A, Iss 4.0 | SCI-PT-IIDA-04624 |

## 3. Test Configuration

### 3.1 EUT

| Item | Description |
|---|---|
| FPU | PFM |
| Cryoharness | FM |
| WIH | FM |
| DCU | PFM |
| PSU | PFM |
| FCU | PFM |
| DPU | PFM |
| DPU 28V Power Harness | PFM |
| FCU/PSU 28V Power Harness | PFM with in-line test adaptor |
| SVM | PFM |
| PCDU | PFM |

### 3.2 Test Equipment

| Item | Description |
|---|---|
| Test Adaptor | DB01-J04 as per Figure 1 and Figure 2 |
| BCI Clamp | 8-50MHz<br>F-130A |
| Current Clamp Probe | 8-50MHz<br>F-16 |
| Signal generator | 8-100MHz<br>Agilent HP 33250 |
| RF Amplifier | 8-100MHz<br>Amplifier Research 50WD1000 |
| Spectrum Analyzer | HP4395A |
| Digital Oscilloscope | With isolated inputs |
| Test equipment benches / supports etc. | Sufficient bench space and/or secure locations to mount the test equipment close to the Test Adaptor |
| N-N Coax cables | |
| Inline power meter | |

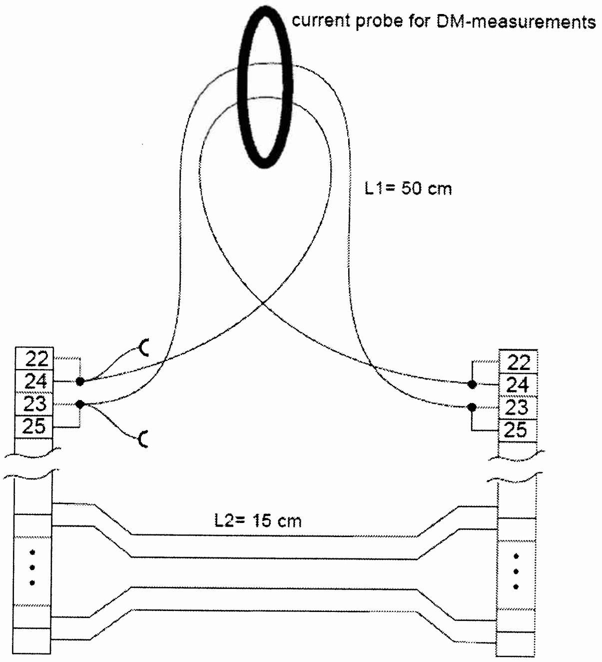

**Figure 1** – Wires to be 20AWG

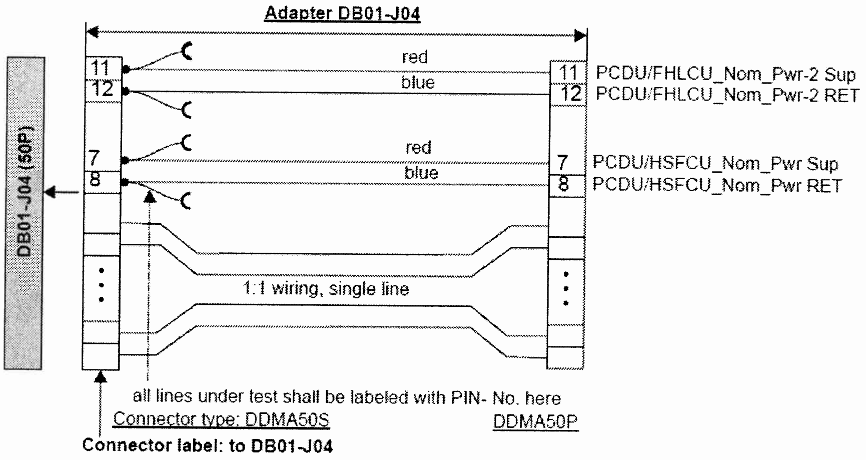

**Figure 2** – Details of SPIRE test adaptor

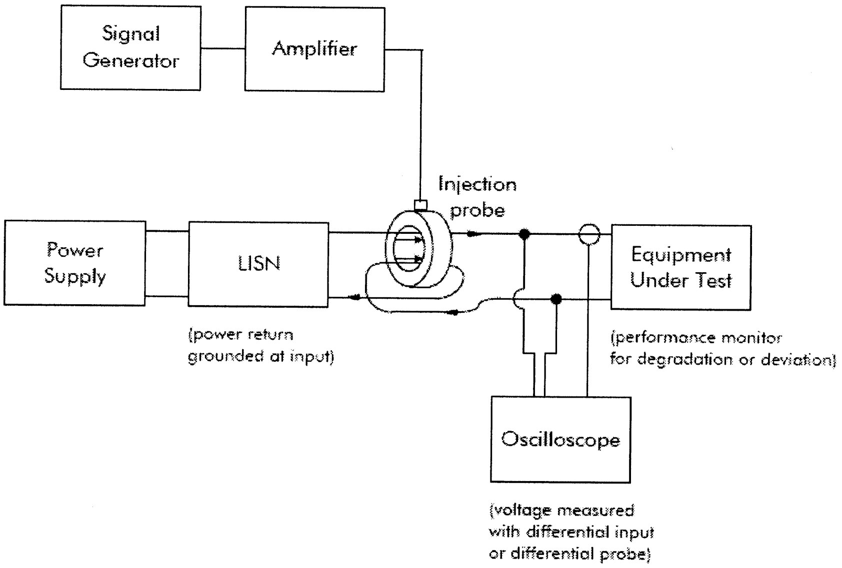

Figure 3 – DM configuration

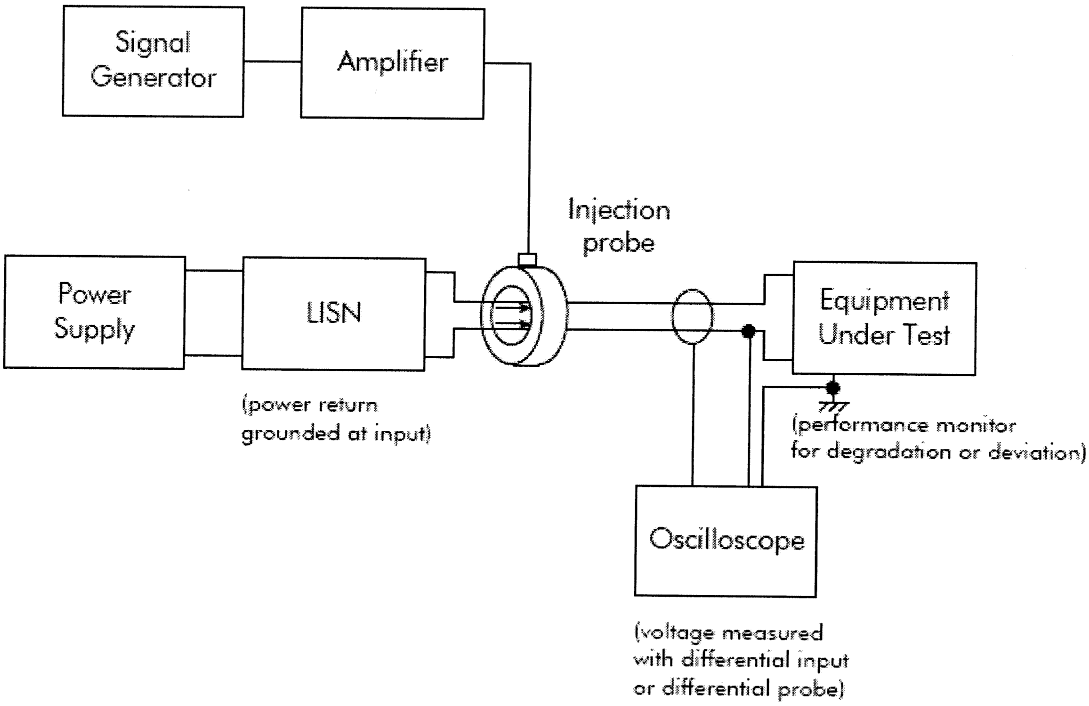

Figure 4 - CM configuration

## 4. Use of ObsID during testing

OBSID are generated automatically by the test scripts

## 5. Test Sequence

| The order of the six sub-tests listed below can be adapted in real time to operationally optimise the testing. **Sub-test** | **Time (hh:mm)** |
|---|---|
| 1. DM Phot. mode | 03:37 |
| 2. DM Spect. Mode | |
| 3. CM Phot. Mode | 03:37 |
| 4. CM Spect. Mode | |
| 5. RS test | 01:43 |

# 6. Test Procedure

## 6.1 *CS Differential Mode*

### 6.1.1 *Prerequisites / assumptions*

- The test adaptor as detailed in §3.2 and Figure 1 and Figure 2 has been installed on the spacecraft
- The cooler has been recycled and has sufficient predicted hold time to perform the test
- The test equipment is installed in the AIT clean room and has been checked out and is ready to be used prior to the commencement of the test steps. This includes
    - the mechanical securing of the BCI and Current Probes in the correct locations on/near the SVM
    - the connection of the leads to the equipment
- The orientation of the spacecraft is not important, apart from the fact that the test equipment must be able to be located close to the Test Adaptor and accessible by the AIT team
- There is radio communication between the CCS operator and the AIT staff operating the EMC test equipment
- The Current Clamp Probe calibration tables are programmed into a spreadsheet to allow real-time conversion of spectrum analyser voltage output to current
- The temperature of the cryostat cover is <50K and is stable to ±1 K/hour drifts

### 6.1.2 Detailed Procedure

← PUS 14

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 1 | Switch off DRCU | 03:00 | 00:03:00 | | | | |
| 2 | Switch off DPU | 03:00 | 00:06:00 | | | | |
| 3 | Switch off SPIRE DRCU (FCU) LCL | 02:00 | 00:08:00 | S102999SCVT028_ASDSPTSPIR_PWR_OFF_P | | | |
| 4 | Switch off SPIRE DPU LCL | 02:00 | 00:10:00 | | | | |
| 5 | Connect the Oscilloscope probe signal to test adaptor (Figure 1) contacts 22/24 (+28V-Red) | 02:00 | 00:12:00 | | | | |
| 6 | Connect the Oscilloscope probe reference to test adaptor (Figure 1) contacts 23/25 (Return-Blue)) | 02:00 | 00:14:00 | | | | |
| 7 | Route the +28V and Return wires through the BCI probe as per Figure 3 | 02:00 | 00:16:00 | | | | |
| 8 | Route the +28V wires through the current probe as per Figure 3 | 02:00 | 00:18:00 | → SCD06505 | A0C40DEB | | |
| 9 | Switch on SPIRE DPU | 05:00 | 00:23:00 | → S102999SCUT027_ASDSPTSPIR_PWR_ON_P | | | |
| 10 | Switch on SPIRE DRCU | 05:00 | 00:28:00 | | | | |
| 11 | Turn on the Pump HS heater and wait for 300-mK temp to stabilise | 30:00 | 00:58:00 | → Manual TC | ~~A0C40DEB~~ ~~(TC~~ | | |
| 12 | Switch instrument to Phot. Mode | 02:00 | 01:00:00 | | | SPIRE-IST-SPT-BSM-ON<br>SPIRE-IST-SPT-BSM-INIT<br>SPIRE-IST-SPT-PDET-ON | |
| 13 | Switch on Oscilloscope | 02:00 | 01:02:00 | | | | |
| 14 | Switch on Spectrum Analyser and tune to 8MHz, RBW< 20 kHz | 02:00 | 01:04:00 | | | | |
| 15 | Switch on the Synthesiser and set level to minimum, F=8MHz | 02:00 | 01:06:00 | | | | |
| 16 | Set power level of RF amplifier to minimum and switch on | 02:00 | 01:08:00 | | | | |

~~Start Test~~

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 17 | Adjust the level on the Power Amplifier until the injected level is 60 dBuA<br>Measure the injected power | 02:00 | 01:10:00 | | | | |
| 18 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator)<br>The ObsID to be used is supplied by the SPIRE Test Director | 01:00 | 01:11:00 | → Start Test | | | |
| 19 | Stop injecting current with BCI by setting the amplifier to standby | 01:00 | 01:12:00 | | | | |
| 22:12 20 | Set the ObsID Step to: 1 (Reference step) | 00:30 | 01:12:30 | 1 | | | |
| 21 | Accumulate > 70 seconds of detector data | 01:10 | 01:13:40 | | | | |
| 22 | Set the ObsID Step to: 65535 | 00:30 | 01:14:10 | 65535 | | | |
| 23 | Switch on RF amplifier and adjust injection level to 60 dBuA, and 8MHz. Record injected power | 00:30 | 01:14:40 | | | | |
| 22:16 24 | Set the ObsID Step to: 2 | | 01:14:40 | 2 | | | |
| 25 | Record the injected current | | 01:14:40 | | | | |
| 26 | After 01:10 set the step to, 65535 | 01:10 | 01:15:50 | 65535 | | | |
| 27 | Adjust injection level to 60dBuA, and 8.32 MHz. | 00:30 | 01:16:20 | | | | |
| 22:17 28 | Set the ObsID Step to: 3 | | 01:16:20 | 3 | | | |
| 29 | Record the injected power | | 01:16:20 | | | | |
| 30 | After 01:10 set the step to, 65535 | 01:10 | 01:17:30 | 65535 | | | |
| 31 | Adjust injection level to 60dBuA, and 8.65 MHz. | 00:30 | 01:18:00 | | | | |
| 22:19 32 | Set the ObsID Step to: 4 | | 01:18:00 | 4 | | | |
| 33 | Record the injected power | | 01:18:00 | | | | |
| 34 | After 01:10 set the step to, 65535 | 01:10 | 01:19:10 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 35 | Adjust injection level to 60dBuA, and 8.99 MHz. | 00:30 | 01:19:40 | | | | |
| 22:26 36 | Set the ObsID Step to: 5 | | 01:19:40 | 5 | | | |
| 37 | Record the injected power | | 01:19:40 | | | | |
| 38 | After 01:10 set the step to, 65535 | 01:10 | 01:20:50 | 65535 | | | |
| 39 | Adjust injection level to 60dBuA, and 9.35 MHz. | 00:30 | 01:21:20 | | | | |
| 22:22 40 | Set the ObsID Step to: 6 | | 01:21:20 | 6 | Detectors drift up (Spire) | | |
| 41 | Record the injected power | | 01:21:20 | | | | |
| 42 | After 01:10 set the step to, 65535 | 01:10 | 01:22:30 | 65535 | | | |
| 43 | Adjust injection level to 60dBuA, and 9.72 MHz. | 00:30 | 01:23:00 | | | | |
| 22:23 44 | Set the ObsID Step to: 7 | | 01:23:00 | 7 | | | |
| 45 | Record the injected power | | 01:23:00 | | | | |
| 46 | After 01:10 set the step to, 65535 | 01:10 | 01:24:10 | 65535 | | | |
| 47 | Adjust injection level to 60dBuA, and 10.11 MHz. | 00:30 | 01:24:40 | | | | |
| 22:25 48 | Set the ObsID Step to: 8 | | 01:24:40 | 8 | | | |
| 49 | Record the injected power | | 01:24:40 | | | | |
| 50 | After 01:10 set the step to, 65535 | 01:10 | 01:25:50 | 65535 | | | |
| 51 | Adjust injection level to 60dBuA, and 10.51 MHz. | 00:30 | 01:26:20 | | | | |
| 22:26 52 | Set the ObsID Step to: 9 | | 01:26:20 | 9 | | | |
| 53 | Record the injected power | | 01:26:20 | | | | |
| 54 | After 01:10 set the step to, 65535 | 01:10 | 01:27:30 | 65535 | | | |
| 55 | Adjust injection level to 60dBuA, and 10.93 MHz. | 00:30 | 01:28:00 | | | | |
| 22:27 56 | Set the ObsID Step to: 10 | | 01:28:00 | 10 | | | |
| 57 | Record the injected power | | 01:28:00 | | | | |
| 58 | After 01:10 set the step to, 65535 | 01:10 | 01:29:10 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 59 | Adjust injection level to 60dBuA, and 11.36 MHz. | 00:30 | 01:29:40 | | | | |
| 22:29 60 | Set the ObsID Step to: 11 | | 01:29:40 | 11 | | | |
| 61 | Record the injected power | | 01:29:40 | | | | |
| 62 | After 01:10 set the step to, 65535 | 01:10 | 01:30:50 | 65535 | | | |
| 63 | Adjust injection level to 60dBuA, and 11.81 MHz. | 00:30 | 01:31:20 | | | | |
| 22:30 64 | Set the ObsID Step to: 12 | | 01:31:20 | 12 | | | |
| 65 | Record the injected power | | 01:31:20 | | | | |
| 66 | After 01:10 set the step to, 65535 | 01:10 | 01:32:30 | 65535 | | | |
| 67 | Adjust injection level to 60dBuA, and 12.28 MHz. | 00:30 | 01:33:00 | | | | |
| 22:32 68 | Set the ObsID Step to: 13 | | 01:33:00 | 13 | | | |
| 69 | Record the injected power | | 01:33:00 | | | | |
| 70 | After 01:10 set the step to, 65535 | 01:10 | 01:34:10 | 65535 | | | |
| 71 | Adjust injection level to 60dBuA, and 12.77 MHz. | 00:30 | 01:34:40 | | | | |
| 22:33 72 | Set the ObsID Step to: 14 | | 01:34:40 | 14 | | | |
| 73 | Record the injected power | | 01:34:40 | | | | |
| 74 | After 01:10 set the step to, 65535 | 01:10 | 01:35:50 | 65535 | | | |
| 75 | Adjust injection level to 60dBuA, and 13.28 MHz. | 00:30 | 01:36:20 | | | | |
| 22:34 76 | Set the ObsID Step to: 15 | | 01:36:20 | 15 | | | |
| 77 | Record the injected power | | 01:36:20 | | | | |
| 78 | After 01:10 set the step to, 65535 | 01:10 | 01:37:30 | 65535 | | | |
| 79 | Adjust injection level to 60dBuA, and 13.81 MHz. | 00:30 | 01:38:00 | | | | |
| 22:36 80 | Set the ObsID Step to: 16 | | 01:38:00 | 16 | | | |
| 81 | Record the injected power | | 01:38:00 | | | | |
| 82 | After 01:10 set the step to, 65535 | 01:10 | 01:39:10 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 83 | Adjust injection level to 60dBuA, and 14.36 MHz. | 00:30 | 01:39:40 | | | | |
| 22:38 | 84 | Set the ObsID Step to: 17 | | 01:39:40 | 17 | | | |
| | 85 | Record the injected power | | 01:39:40 | | | | |
| | 86 | After 01:10 set the step to, 65535 | 01:10 | 01:40:50 | 65535 | | | |
| | 87 | Adjust injection level to 60dBuA, and 14.93 MHz. | 00:30 | 01:41:20 | | | | |
| 22:40 | 88 | Set the ObsID Step to: 18 | | 01:41:20 | 18 | | | |
| | 89 | Record the injected power | | 01:41:20 | | | | |
| | 90 | After 01:10 set the step to, 65535 | 01:10 | 01:42:30 | 65535 | | | |
| | 91 | Adjust injection level to 60dBuA, and 15.52 MHz. | 00:30 | 01:43:00 | | | | |
| 22:41 | 92 | Set the ObsID Step to: 19 | | 01:43:00 | 19 | | | |
| | 93 | Record the injected power | | 01:43:00 | | | | |
| | 94 | After 01:10 set the step to, 65535 | 01:10 | 01:44:10 | 65535 | | | |
| | 95 | Adjust injection level to 60dBuA, and 16.14 MHz. | 00:30 | 01:44:40 | | | | |
| 22:43 | 96 | Set the ObsID Step to: 20 | | 01:44:40 | 20 | | | |
| | 97 | Record the injected power | | 01:44:40 | | | | |
| | 98 | After 01:10 set the step to, 65535 | 01:10 | 01:45:50 | 65535 | | | |
| | 99 | Adjust injection level to 60dBuA, and 16.78 MHz. | 00:30 | 01:46:20 | | | | |
| 22:44 | 100 | Set the ObsID Step to: 21 | | 01:46:20 | 21 | | | |
| | 101 | Record the injected power | | 01:46:20 | | | | |
| | 102 | After 01:10 set the step to, 65535 | 01:10 | 01:47:30 | 65535 | | | |
| | 103 | Adjust injection level to 60dBuA, and 17.45 MHz. | 00:30 | 01:48:00 | | | | |
| 22:46 | 104 | Set the ObsID Step to: 22 | | 01:48:00 | 22 | | | |
| | 105 | Record the injected power | | 01:48:00 | | | | |
| | 106 | After 01:10 set the step to, 65535 | 01:10 | 01:49:10 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 107 | Adjust injection level to 60dBuA, and 18.14 MHz. | 00:30 | 01:49:40 | | | | |
| 22:47 | 108 | Set the ObsID Step to: 23 | | 01:49:40 | 23 | | | |
| | 109 | Record the injected power | | 01:49:40 | | | | |
| | 110 | After 01:10 set the step to, 65535 | 01:10 | 01:50:50 | 65535 | | | |
| | 111 | Adjust injection level to 60dBuA, and 18.86 MHz. | 00:30 | 01:51:20 | | | | |
| 22:49 | 112 | Set the ObsID Step to: 24 | | 01:51:20 | 24 | | | |
| | 113 | Record the injected power | | 01:51:20 | | | | |
| | 114 | After 01:10 set the step to, 65535 | 01:10 | 01:52:30 | 65535 | | | |
| | 115 | Adjust injection level to 60dBuA, and 19.61 MHz. | 00:30 | 01:53:00 | | | | |
| 22:50 | 116 | Set the ObsID Step to: 25 | | 01:53:00 | 25 | | | |
| | 117 | Record the injected power | | 01:53:00 | | | | |
| | 118 | After 01:10 set the step to, 65535 | 01:10 | 01:54:10 | 65535 | | | |
| | 119 | Adjust injection level to 60dBuA, and 20.39 MHz. | 00:30 | 01:54:40 | | | | |
| 22:52 | 120 | Set the ObsID Step to: 26 | | 01:54:40 | 26 | | | |
| | 121 | Record the injected power | | 01:54:40 | | | | |
| | 122 | After 01:10 set the step to, 65535 | 01:10 | 01:55:50 | 65535 | | | |
| | 123 | Adjust injection level to 60dBuA, and 21.20 MHz. | 00:30 | 01:56:20 | | | | |
| 22:53 | 124 | Set the ObsID Step to: 27 | | 01:56:20 | 27 | | | |
| | 125 | Record the injected power | | 01:56:20 | | | | |
| | 126 | After 01:10 set the step to, 65535 | 01:10 | 01:57:30 | 65535 | | | |
| | 127 | Adjust injection level to 60dBuA, and 22.05 MHz. | 00:30 | 01:58:00 | | | | |
| 22:55 | 128 | Set the ObsID Step to: 28 | | 01:58:00 | 28 | | | |
| | 129 | Record the injected power | | 01:58:00 | | | | |
| | 130 | After 01:10 set the step to, 65535 | 01:10 | 01:59:10 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 131 | Adjust injection level to 60dBuA, and 22.92 MHz. | 00:30 | 01:59:40 | | | | |
| 22:56 | 132 | Set the ObsID Step to: 29 | | 01:59:40 | 29 | | | |
| | 133 | Record the injected power | | 01:59:40 | | | | |
| | 134 | After 01:10 set the step to, 65535 | 01:10 | 02:00:50 | 65535 | | | |
| | 135 | Adjust injection level to 60dBuA, and 23.84 MHz. | 00:30 | 02:01:20 | | | | |
| 22:58 | 136 | Set the ObsID Step to: 30 | | 02:01:20 | 30 | | | |
| | 137 | Record the injected power | | 02:01:20 | | | | |
| | 138 | After 01:10 set the step to, 65535 | 01:10 | 02:02:30 | 65535 | | | |
| | 139 | Adjust injection level to 60dBuA, and 24.78 MHz. | 00:30 | 02:03:00 | | | | |
| 22:59 | 140 | Set the ObsID Step to: 31 | | 02:03:00 | 31 | | | |
| | 141 | Record the injected power | | 02:03:00 | | | | |
| | 142 | After 01:10 set the step to, 65535 | 01:10 | 02:04:10 | 65535 | | | |
| | 143 | Adjust injection level to 60dBuA, and 25.77 MHz. | 00:30 | 02:04:40 | | | | |
| 23:01 | 144 | Set the ObsID Step to: 32 | | 02:04:40 | 32 | | | |
| | 145 | Record the injected power | | 02:04:40 | | | | |
| | 146 | After 01:10 set the step to, 65535 | 01:10 | 02:05:50 | 65535 | | | |
| | 147 | Adjust injection level to 60dBuA, and 26.79 MHz. | 00:30 | 02:06:20 | | | | |
| 23:02 | 148 | Set the ObsID Step to: 33 | | 02:06:20 | 33 | | | |
| | 149 | Record the injected power | | 02:06:20 | | | | |
| | 150 | After 01:10 set the step to, 65535 | 01:10 | 02:07:30 | 65535 | | | |
| | 151 | Adjust injection level to 60dBuA, and 27.86 MHz. | 00:30 | 02:08:00 | | | | |
| 23:04 | 152 | Set the ObsID Step to: 34 | | 02:08:00 | 34 | | | |
| | 153 | Record the injected power | | 02:08:00 | | | | |
| | 154 | After 01:10 set the step to, 65535 | 01:10 | 02:09:10 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 155 | Adjust injection level to 60dBuA, and 28.97 MHz. | 00:30 | 02:09:40 | | | | |
| 23:05 | 156 | Set the ObsID Step to: 35 | | 02:09:40 | 35 | | | |
| | 157 | Record the injected power | | 02:09:40 | | | | |
| | 158 | After 01:10 set the step to, 65535 | 01:10 | 02:10:50 | 65535 | | | |
| | 159 | Adjust injection level to 60dBuA, and 30.12 MHz. | 00:30 | 02:11:20 | | | | |
| 23:07 | 160 | Set the ObsID Step to: 36 | | 02:11:20 | 36 | | | |
| | 161 | Record the injected power | | 02:11:20 | | | | |
| | 162 | After 01:10 set the step to, 65535 | 01:10 | 02:12:30 | 65535 | | | |
| | 163 | Adjust injection level to 60dBuA, and 31.32 MHz. | 00:30 | 02:13:00 | | | | |
| 23:08 | 164 | Set the ObsID Step to: 37 | | 02:13:00 | 37 | | | |
| | 165 | Record the injected power | | 02:13:00 | | | | |
| | 166 | After 01:10 set the step to, 65535 | 01:10 | 02:14:10 | 65535 | | | |
| | 167 | Adjust injection level to 60dBuA, and 32.56 MHz. | 00:30 | 02:14:40 | | | | |
| 23:09 | 168 | Set the ObsID Step to: 38 | | 02:14:40 | 38 | | | |
| | 169 | Record the injected power | | 02:14:40 | | | | |
| | 170 | After 01:10 set the step to, 65535 | 01:10 | 02:15:50 | 65535 | | | |
| | 171 | Adjust injection level to 60dBuA, and 33.86 MHz. | 00:30 | 02:16:20 | | | | |
| 23:11 | 172 | Set the ObsID Step to: 39 | | 02:16:20 | 39 | | | |
| | 173 | Record the injected power | | 02:16:20 | | | | |
| | 174 | After 01:10 set the step to, 65535 | 01:10 | 02:17:30 | 65535 | | | |
| | 175 | Adjust injection level to 60dBuA, and 35.20 MHz. | 00:30 | 02:18:00 | | | | |
| 23:12 | 176 | Set the ObsID Step to: 40 | | 02:18:00 | 40 | | | |
| | 177 | Record the injected power | | 02:18:00 | | | | |
| | 178 | After 01:10 set the step to, 65535 | 01:10 | 02:19:10 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 179 | Adjust injection level to 60dBuA, and 36.60 MHz. | 00:30 | 02:19:40 | | | | |
| 23:14 | 180 | Set the ObsID Step to: 41 | | 02:19:40 | 41 | | | |
| | 181 | Record the injected power | | 02:19:40 | | | | |
| | 182 | After 01:10 set the step to, 65535 | 01:10 | 02:20:50 | 65535 | | | |
| | 183 | Adjust injection level to 60dBuA, and 38.06 MHz. | 00:30 | 02:21:20 | | | | |
| 23:15 | 184 | Set the ObsID Step to: 42 | | 02:21:20 | 42 | | | |
| | 185 | Record the injected power | | 02:21:20 | | | | |
| | 186 | After 01:10 set the step to, 65535 | 01:10 | 02:22:30 | 65535 | | | |
| | 187 | Adjust injection level to 60dBuA, and 39.57 MHz. | 00:30 | 02:23:00 | | | | |
| 23:17 | 188 | Set the ObsID Step to: 43 | | 02:23:00 | 43 | | | |
| | 189 | Record the injected power | | 02:23:00 | | | | |
| | 190 | After 01:10 set the step to, 65535 | 01:10 | 02:24:10 | 65535 | | | |
| | 191 | Adjust injection level to 60dBuA, and 41.14 MHz. | 00:30 | 02:24:40 | | | | |
| 23:18 | 192 | Set the ObsID Step to: 44 | | 02:24:40 | 44 | | | |
| | 193 | Record the injected power | | 02:24:40 | | | | |
| | 194 | After 01:10 set the step to, 65535 | 01:10 | 02:25:50 | 65535 | | | |
| | 195 | Adjust injection level to 60dBuA, and 42.78 MHz. | 00:30 | 02:26:20 | | | | |
| 23:20 | 196 | Set the ObsID Step to: 45 | | 02:26:20 | 45 | | | |
| | 197 | Record the injected power | | 02:26:20 | | | | |
| | 198 | After 01:10 set the step to, 65535 | 01:10 | 02:27:30 | 65535 | | | |
| | 199 | Adjust injection level to 60dBuA, and 44.48 MHz. | 00:30 | 02:28:00 | | | | |
| 23:21 | 200 | Set the ObsID Step to: 46 | | 02:28:00 | 46 | | | |
| | 201 | Record the injected power | | 02:28:00 | | | | |
| | 202 | After 01:10 set the step to, 65535 | 01:10 | 02:29:10 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 203 | Adjust injection level to 60dBuA, and 46.25 MHz. | 00:30 | 02:29:40 | | | | |
| 23:23 204 | Set the ObsID Step to: 47 | | 02:29:40 | 47 | | | |
| 205 | Record the injected power | | 02:29:40 | | | | |
| 206 | After 01:10 set the step to, 65535 | 01:10 | 02:30:50 | 65535 | | | |
| 207 | Adjust injection level to 60dBuA, and 48.09 MHz. | 00:30 | 02:31:20 | | | | |
| 23:24 208 | Set the ObsID Step to: 48 | | 02:31:20 | 48 | | | |
| 209 | Record the injected power | | 02:31:20 | | | | |
| 210 | After 01:10 set the step to, 65535 | 01:10 | 02:32:30 | 65535 | | | |
| 211 | Adjust injection level to 60dBuA, and 50.00 MHz. | 00:30 | 02:33:00 | | | | |
| 23:26 212 | Set the ObsID Step to: 49 | | 02:33:00 | 49 | | | |
| 213 | Record the injected power | | 02:33:00 | | | | |
| 214 | After 01:10 set the step to, 65535 | 01:10 | 02:34:10 | 65535 | | | |
| 215 | Switch off RF amplifier | 00:30 | 02:34:40 | | | | |
| 216 | Set the ObsID Step to: 50 | | 02:34:40 | 50 | | | |
| 217 | After 01:10 Exit the SPIRE-IST-EMC-SPOT.tcl (CCS operator) | | 02:34:40 | | | | |
| 23:41 218 | Change to Spectrometer mode | 05:00 | 02:39:40 | → chapter | | | |
| 219 | Switch on RF amplifier and injection frequency to 8.00 MHz | 02:00 | 02:41:40 | | | | |
| 220 | Switch on RF amplifier and adjust injection level to 60 dBuA, and 8MHz. Record injected power | 01:00 | 02:42:40 | | | | |
| 00:10 221 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator)<br>The ObsID to be used is supplied by the SPIRE Test Director | 01:00 | 02:43:40 | | | | |
| 222 | Stop injecting current with BCI by setting the amplifier to standby | 01:00 | 02:44:40 | | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| 00:09 | 223 | Set the ObsID Step to: 1 (Reference step) | 00:30 | 02:45:10 | 1 | | | |
| | 224 | Accumulate > 70 seconds of detector data | 00:20 | 02:45:30 | | | | |
| | 225 | Set the ObsID Step to: 65535 | 00:30 | 02:46:00 | 65535 | | | |
| | 226 | Adjust injection level to 60dBuA, and 8.00 MHz. | 00:30 | 02:46:30 | | | | |
| 00:13 | 227 | Set the ObsID Step to: 2 | | 02:46:30 | 2 | | | |
| | 228 | Record the injected power | | 02:46:30 | | | | |
| | 229 | After 00:20 set the step to, 65535 | 00:20 | 02:46:50 | 65535 | | | |
| | 230 | Adjust injection level to 60dBuA, and 8.32 MHz. | 00:30 | 02:47:20 | | | | |
| 00:13 | 231 | Set the ObsID Step to: 3 | | 02:47:20 | 3 | | | |
| | 232 | Record the injected power | | 02:47:20 | | | | |
| | 233 | After 00:20 set the step to, 65535 | 00:20 | 02:47:40 | 65535 | | | |
| | 234 | Adjust injection level to 60dBuA, and 8.65 MHz. | 00:30 | 02:48:10 | | | | |
| 00:14 | 235 | Set the ObsID Step to: 4 | | 02:48:10 | 4 | | | |
| | 236 | Record the injected power | | 02:48:10 | | | | |
| | 237 | After 00:20 set the step to, 65535 | 00:20 | 02:48:30 | 65535 | | | |
| | 238 | Adjust injection level to 60dBuA, and 8.99 MHz. | 00:30 | 02:49:00 | | | | |
| 00:14 | 239 | Set the ObsID Step to: 5 | | 02:49:00 | 5 | | | |
| | 240 | Record the injected power | | 02:49:00 | | | | |
| | 241 | After 00:20 set the step to, 65535 | 00:20 | 02:49:20 | 65535 | | | |
| | 242 | Adjust injection level to 60dBuA, and 9.35 MHz. | 00:30 | 02:49:50 | | | | |
| 00:15 | 243 | Set the ObsID Step to: 6 | | 02:49:50 | 6 | | | |
| | 244 | Record the injected power | | 02:49:50 | | | | |
| | 245 | After 00:20 set the step to, 65535 | 00:20 | 02:50:10 | 65535 | | | |
| | 246 | Adjust injection level to 60dBuA, and 9.72 MHz. | 00:30 | 02:50:40 | | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| 00:16 | 247 | Set the ObsID Step to: 7 | | 02:50:40 | 7 | | | |
| | 248 | Record the injected power | | 02:50:40 | | | | |
| | 249 | After 00:20 set the step to, 65535 | 00:20 | 02:51:00 | 65535 | | | |
| | 250 | Adjust injection level to 60dBuA, and 10.11 MHz. | 00:30 | 02:51:30 | | | | |
| 00:17 | 251 | Set the ObsID Step to: 8 | | 02:51:30 | 8 | | | |
| | 252 | Record the injected power | | 02:51:30 | | | | |
| | 253 | After 00:20 set the step to, 65535 | 00:20 | 02:51:50 | 65535 | | | |
| | 254 | Adjust injection level to 60dBuA, and 10.51 MHz. | 00:30 | 02:52:20 | | | | |
| 00:18 | 255 | Set the ObsID Step to: 9 | | 02:52:20 | 9 | | | |
| | 256 | Record the injected power | | 02:52:20 | | | | |
| | 257 | After 00:20 set the step to, 65535 | 00:20 | 02:52:40 | 65535 | | | |
| | 258 | Adjust injection level to 60dBuA, and 10.93 MHz. | 00:30 | 02:53:10 | | | | |
| 00:18 | 259 | Set the ObsID Step to: 10 | | 02:53:10 | 10 | | | |
| | 260 | Record the injected power | | 02:53:10 | | | | |
| | 261 | After 00:20 set the step to, 65535 | 00:20 | 02:53:30 | 65535 | | | |
| | 262 | Adjust injection level to 60dBuA, and 11.36 MHz. | 00:30 | 02:54:00 | | | | |
| 00:19 | 263 | Set the ObsID Step to: 11 | | 02:54:00 | 11 | | | |
| | 264 | Record the injected power | | 02:54:00 | | | | |
| | 265 | After 00:20 set the step to, 65535 | 00:20 | 02:54:20 | 65535 | | | |
| | 266 | Adjust injection level to 60dBuA, and 11.81 MHz. | 00:30 | 02:54:50 | | | | |
| 00:20 | 267 | Set the ObsID Step to: 12 | | 02:54:50 | 12 | | | |
| | 268 | Record the injected power | | 02:54:50 | | | | |
| | 269 | After 00:20 set the step to, 65535 | 00:20 | 02:55:10 | 65535 | | | |
| | 270 | Adjust injection level to 60dBuA, and 12.28 MHz. | 00:30 | 02:55:40 | | | | |
| 00:20 | 271 | Set the ObsID Step to: 13 | | 02:55:40 | 13 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 272 | Record the injected power | | 02:55:40 | | | | |
| | 273 | After 00:20 set the step to, 65535 | 00:20 | 02:56:00 | 65535 | | | |
| | 274 | Adjust injection level to 60dBuA, and 12.77 MHz. | 00:30 | 02:56:30 | | | | |
| 00:21 | 275 | Set the ObsID Step to: 14 | | 02:56:30 | 14 | | | |
| | 276 | Record the injected power | | 02:56:30 | | | | |
| | 277 | After 00:20 set the step to, 65535 | 00:20 | 02:56:50 | 65535 | | | |
| | 278 | Adjust injection level to 60dBuA, and 13.28 MHz. | 00:30 | 02:57:20 | | | | |
| 00:22 | 279 | Set the ObsID Step to: 15 | | 02:57:20 | 15 | | | |
| | 280 | Record the injected power | | 02:57:20 | | | | |
| | 281 | After 00:20 set the step to, 65535 | 00:20 | 02:57:40 | 65535 | | | |
| | 282 | Adjust injection level to 60dBuA, and 13.81 MHz. | 00:30 | 02:58:10 | | | | |
| 00:23 | 283 | Set the ObsID Step to: 16 | | 02:58:10 | 16 | | | |
| | 284 | Record the injected power | | 02:58:10 | | | | |
| | 285 | After 00:20 set the step to, 65535 | 00:20 | 02:58:30 | 65535 | | | |
| | 286 | Adjust injection level to 60dBuA, and 14.36 MHz. | 00:30 | 02:59:00 | | | | |
| 00:23 | 287 | Set the ObsID Step to: 17 | | 02:59:00 | 17 | | | |
| | 288 | Record the injected power | | 02:59:00 | | | | |
| | 289 | After 00:20 set the step to, 65535 | 00:20 | 02:59:20 | 65535 | | | |
| | 290 | Adjust injection level to 60dBuA, and 14.93 MHz. | 00:30 | 02:59:50 | | | | |
| 00:24 | 291 | Set the ObsID Step to: 18 | | 02:59:50 | 18 | | | |
| | 292 | Record the injected power | | 02:59:50 | | | | |
| | 293 | After 00:20 set the step to, 65535 | 00:20 | 03:00:10 | 65535 | | | |
| | 294 | Adjust injection level to 60dBuA, and 15.52 MHz. | 00:30 | 03:00:40 | | | | |
| 00:25 | 295 | Set the ObsID Step to: 19 | | 03:00:40 | 19 | | | |
| | 296 | Record the injected power | | 03:00:40 | | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 297 | After 00:20 set the step to, 65535 | 00:20 | 03:01:00 | 65535 | | | |
| | 298 | Adjust injection level to 60dBuA, and 16.14 MHz. | 00:30 | 03:01:30 | | | | |
| 00:26 | 299 | Set the ObsID Step to: 20 | | 03:01:30 | 20 | | | |
| | 300 | Record the injected power | | 03:01:30 | | | | |
| | 301 | After 00:20 set the step to, 65535 | 00:20 | 03:01:50 | 65535 | | | |
| | 302 | Adjust injection level to 60dBuA, and 16.78 MHz. | 00:30 | 03:02:20 | | | | |
| 00:27 | 303 | Set the ObsID Step to: 21 | | 03:02:20 | 21 | | | |
| | 304 | Record the injected power | | 03:02:20 | | | | |
| | 305 | After 00:20 set the step to, 65535 | 00:20 | 03:02:40 | 65535 | | | |
| | 306 | Adjust injection level to 60dBuA, and 17.45 MHz. | 00:30 | 03:03:10 | | | | |
| | 307 | Set the ObsID Step to: 22 | | 03:03:10 | 22 | | | |
| 00:28 | 308 | Record the injected power | | 03:03:10 | | | | |
| | 309 | After 00:20 set the step to, 65535 | 00:20 | 03:03:30 | 65535 | | | |
| | 310 | Adjust injection level to 60dBuA, and 18.14 MHz. | 00:30 | 03:04:00 | | | | |
| | 311 | Set the ObsID Step to: 23 | | 03:04:00 | 23 | | | |
| 00 28 | 312 | Record the injected power | | 03:04:00 | | | | |
| | 313 | After 00:20 set the step to, 65535 | 00:20 | 03:04:20 | 65535 | | | |
| | 314 | Adjust injection level to 60dBuA, and 18.86 MHz. | 00:30 | 03:04:50 | | | | |
| | 315 | Set the ObsID Step to: 24 | | 03:04:50 | 24 | | | |
| 00:29 | 316 | Record the injected power | | 03:04:50 | | | | |
| | 317 | After 00:20 set the step to, 65535 | 00:20 | 03:05:10 | 65535 | | | |
| | 318 | Adjust injection level to 60dBuA, and 19.61 MHz. | 00:30 | 03:05:40 | | | | |
| 00.30 | 319 | Set the ObsID Step to: 25 | | 03:05:40 | 25 | | | |
| | 320 | Record the injected power | | 03:05:40 | | | | |
| | 321 | After 00:20 set the step to, 65535 | 00:20 | 03:06:00 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 322 | Adjust injection level to 60dBuA, and 20.39 MHz. | 00:30 | 03:06:30 | | | | |
| | 323 | Set the ObsID Step to: 26 | | 03:06:30 | 26 | | | |
| 00:31 | 324 | Record the injected power | | 03:06:30 | | | | |
| | 325 | After 00:20 set the step to, 65535 | 00:20 | 03:06:50 | 65535 | | | |
| | 326 | Adjust injection level to 60dBuA, and 21.20 MHz. | 00:30 | 03:07:20 | | | | |
| | 327 | Set the ObsID Step to: 27 | | 03:07:20 | 27 | | | |
| 00:31 | 328 | Record the injected power | | 03:07:20 | | | | |
| | 329 | After 00:20 set the step to, 65535 | 00:20 | 03:07:40 | 65535 | | | |
| | 330 | Adjust injection level to 60dBuA, and 22.05 MHz. | 00:30 | 03:08:10 | | | | |
| | 331 | Set the ObsID Step to: 28 | | 03:08:10 | 28 | | | |
| 00:32 | 332 | Record the injected power | | 03:08:10 | | | | |
| | 333 | After 00:20 set the step to, 65535 | 00:20 | 03:08:30 | 65535 | | | |
| | 334 | Adjust injection level to 60dBuA, and 22.92 MHz. | 00:30 | 03:09:00 | | | | |
| | 335 | Set the ObsID Step to: 29 | | 03:09:00 | 29 | | | |
| 00:33 | 336 | Record the injected power | | 03:09:00 | | | | |
| | 337 | After 00:20 set the step to, 65535 | 00:20 | 03:09:20 | 65535 | | | |
| | 338 | Adjust injection level to 60dBuA, and 23.84 MHz. | 00:30 | 03:09:50 | | | | |
| | 339 | Set the ObsID Step to: 30 | | 03:09:50 | 30 | | | |
| 00:34 | 340 | Record the injected power | | 03:09:50 | | | | |
| | 341 | After 00:20 set the step to, 65535 | 00:20 | 03:10:10 | 65535 | | | |
| | 342 | Adjust injection level to 60dBuA, and 24.78 MHz. | 00:30 | 03:10:40 | | | | |
| | 343 | Set the ObsID Step to: 31 | | 03:10:40 | 31 | | | |
| 00:34 | 344 | Record the injected power | | 03:10:40 | | | | |
| | 345 | After 00:20 set the step to, 65535 | 00:20 | 03:11:00 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 346 | Adjust injection level to 60dBuA, and 25.77 MHz. | 00:30 | 03:11:30 | | | | |
| | 347 | Set the ObsID Step to: 32 | | 03:11:30 | 32 | | | |
| 0:35 | 348 | Record the injected power | | 03:11:30 | | | | |
| | 349 | After 00:20 set the step to, 65535 | 00:20 | 03:11:50 | 65535 | | | |
| | 350 | Adjust injection level to 60dBuA, and 26.79 MHz. | 00:30 | 03:12:20 | | | | |
| | 351 | Set the ObsID Step to: 33 | | 03:12:20 | 33 | | | |
| 0:36 | 352 | Record the injected power | | 03:12:20 | | | | |
| | 353 | After 00:20 set the step to, 65535 | 00:20 | 03:12:40 | 65535 | | | |
| | 354 | Adjust injection level to 60dBuA, and 27.86 MHz. | 00:30 | 03:13:10 | | | | |
| 00:37 | 355 | Set the ObsID Step to: 34 | | 03:13:10 | 34 | | | |
| | 356 | Record the injected power | | 03:13:10 | | | | |
| | 357 | After 00:20 set the step to, 65535 | 00:20 | 03:13:30 | 65535 | | | |
| | 358 | Adjust injection level to 60dBuA, and 28.97 MHz. | 00:30 | 03:14:00 | | | | |
| | 359 | Set the ObsID Step to: 35 | | 03:14:00 | 35 | | | |
| 00:37 | 360 | Record the injected power | | 03:14:00 | | | | |
| | 361 | After 00:20 set the step to, 65535 | 00:20 | 03:14:20 | 65535 | | | |
| | 362 | Adjust injection level to 60dBuA, and 30.12 MHz. | 00:30 | 03:14:50 | | | | |
| | 363 | Set the ObsID Step to: 36 | | 03:14:50 | 36 | | | |
| 00:38 | 364 | Record the injected power | | 03:14:50 | | | | |
| | 365 | After 00:20 set the step to, 65535 | 00:20 | 03:15:10 | 65535 | | | |
| | 366 | Adjust injection level to 60dBuA, and 31.32 MHz. | 00:30 | 03:15:40 | | | | |
| | 367 | Set the ObsID Step to: 37 | | 03:15:40 | 37 | | | |
| 00:39 | 368 | Record the injected power | | 03:15:40 | | | | |
| | 369 | After 00:20 set the step to, 65535 | 00:20 | 03:16:00 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 370 | Adjust injection level to 60dBuA, and 32.56 MHz. | 00:30 | 03:16:30 | | | | |
| 00 40 | 371 | Set the ObsID Step to: 38 | | 03:16:30 | 38 | | | |
| | 372 | Record the injected power | | 03:16:30 | | | | |
| | 373 | After 00:20 set the step to, 65535 | 00:20 | 03:16:50 | 65535 | | | |
| | 374 | Adjust injection level to 60dBuA, and 33.86 MHz. | 00:30 | 03:17:20 | | | | |
| | 375 | Set the ObsID Step to: 39 | | 03:17:20 | 39 | | | |
| 00:40 | 376 | Record the injected power | | 03:17:20 | | | | |
| | 377 | After 00:20 set the step to, 65535 | 00:20 | 03:17:40 | 65535 | | | |
| | 378 | Adjust injection level to 125mV rms, and 35.20 MHz | 00:30 | 03:18:10 | | | | |
| 00:41 | 379 | Set the ObsID Step to: 40 | | 03:18:10 | 40 | | | |
| | 380 | Record the injected current | | 03:18:10 | | | | |
| | 381 | After 00:20 set the step to, 65535 | 00:20 | 03:18:30 | 65535 | | | |
| | 382 | Adjust injection level to 125mV rms, and 36.60 MHz | 00:30 | 03:19:00 | | | | |
| 00:42 | 383 | Set the ObsID Step to: 41 | | 03:19:00 | 41 | | | |
| | 384 | Record the injected current | | 03:19:00 | | | | |
| | 385 | After 00:20 set the step to, 65535 | 00:20 | 03:19:20 | 65535 | | | |
| | 386 | Adjust injection level to 125mV rms, and 38.06 MHz | 00:30 | 03:19:50 | | | | |
| 0043 | 387 | Set the ObsID Step to: 42 | | 03:19:50 | 42 | | | |
| | 388 | Record the injected current | | 03:19:50 | | | | |
| | 389 | After 00:20 set the step to, 65535 | 00:20 | 03:20:10 | 65535 | | | |
| | 390 | Adjust injection level to 125mV rms, and 39.57 MHz | 00:30 | 03:20:40 | | | | |
| 00:44 | 391 | Set the ObsID Step to: 43 | | 03:20:40 | 43 | | | |
| | 392 | Record the injected current | | 03:20:40 | | | | |
| | 393 | After 00:20 set the step to, 65535 | 00:20 | 03:21:00 | 65535 | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 394 | Adjust injection level to 125mV rms, and 41.14 MHz | 00:30 | 03:21:30 | | | | |
| 00:45 | 395 | Set the ObsID Step to: 44 | | 03:21:30 | 44 | | | |
| | 396 | Record the injected current | | 03:21:30 | | | | |
| | 397 | After 00:20 set the step to, 65535 | 00:20 | 03:21:50 | 65535 | | | |
| | 398 | Adjust injection level to 125mV rms, and 42.78 MHz | 00:30 | 03:22:20 | | | | |
| 00:45 | 399 | Set the ObsID Step to: 45 | | 03:22:20 | 45 | | | |
| | 400 | Record the injected current | | 03:22:20 | | | | |
| | 401 | After 00:20 set the step to, 65535 | 00:20 | 03:22:40 | 65535 | | | |
| | 402 | Adjust injection level to 125mV rms, and 44.48 MHz | 00:30 | 03:23:10 | | | | |
| 00:46 | 403 | Set the ObsID Step to: 46 | | 03:23:10 | 46 | | | |
| | 404 | Record the injected current | | 03:23:10 | | | | |
| | 405 | After 00:20 set the step to, 65535 | 00:20 | 03:23:30 | 65535 | | | |
| | 406 | Adjust injection level to 125mV rms, and 46.25 MHz | 00:30 | 03:24:00 | | | | |
| 00:47 | 407 | Set the ObsID Step to: 47 | | 03:24:00 | 47 | | | |
| | 408 | Record the injected current | | 03:24:00 | | | | |
| | 409 | After 00:20 set the step to, 65535 | 00:20 | 03:24:20 | 65535 | | | |
| | 410 | Adjust injection level to 125mV rms, and 48.09 MHz | 00:30 | 03:24:50 | | | | |
| 00:48 | 411 | Set the ObsID Step to: 48 | | 03:24:50 | 48 | | | |
| | 412 | Record the injected current | | 03:24:50 | | | | |
| | 413 | After 00:20 set the step to, 65535 | 00:20 | 03:25:10 | 65535 | | | |
| | 414 | Adjust injection level to 125mV rms, and 50.00 MHz | 00:30 | 03:25:40 | | | | |
| 00 49 | 415 | Set the ObsID Step to: 49 | | 03:25:40 | 49 | | | |
| | 416 | Record the injected current | | 03:25:40 | | | | |
| | 417 | After 00:20 set the step to, 65535 | 00:20 | 03:26:00 | 65535 | | | |
| | 418 | Set the RF amplifier to standby | | 03:26:00 | | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 419 | Set the ObsID Step to: 50 | | 03:26:00 | 50 | | | |
| 60:50 420 | After 01:10 exit SPIRE-IST-EMC-SPOT.tcl (CCS operator) | 01:10 | 03:27:10 | | | | |
| 421 | Switch off RF amplifier | 00:30 | 03:27:40 | | | | |
| 422 | Shut down DRCU | 05:00 | 03:32:40 | | | | |
| 423 | Shut down DPU | 05:00 | 03:37:40 | | | | |
| | End of DM Tests | | | | | | |

## *6.2 CS Common Mode*

### *6.2.1 Prerequisites / assumptions*

- The test adaptor as detailed in §3.2 and Figure 1 and Figure 2 has been installed on the spacecraft
- The cooler has been recycled and has sufficient predicted hold time to perform the test
- The test equipment is installed in the AIT clean room and has been checked out and is ready to be used prior to the commencement of the test steps. This includes
    - the mechanical securing of the BCI and Current Probes in the correct locations on/near the SVM
    - the connection of the leads to the equipment
- The orientation of the spacecraft is not important, apart from the fact that the test equipment must be able to be located close to the Test Adaptor and accessible by the AIT team
- There is radio communication between the CCS operator and the AIT staff operating the EMC test equipment
- The Current Clamp Probe calibration tables are programmed into a spreadsheet to allow real-time conversion of spectrum analyser voltage output to current
- The temperature of the cryostat cover is <50K and is stable to ±1 K/hour drifts

### 6.2.2 Detailed Procedure

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 1 | Reconfigure the BCI to inject CM current as per Figure 4 | 01:00 | 03:38:40 | | | | |
| 2 | Reconfigure the Current Clamp Probe to measure CM current as per Figure 4 | 05:00 | 03:43:40 | | | | |
| 3 | Connect the Oscilloscope probe reference to test adaptor (Figure 1) contacts 23/25 (Return-Blue)) | 01:00 | 03:44:40 | | | | |
| 4 | Connect the Oscilloscope probe reference to Spacecraft chassis | 01:00 | 03:45:40 | | | | |
| 5 | Switch on SPIRE DPU | 05:00 | 03:50:40 | | | | |
| 6 | Switch on SPIRE DRCU | 05:00 | 03:55:40 | | | | |
| 7 | Turn on the Pump HS heater and wait for 300-mK temp to stabilise | 30:00 | 04:25:40 | | | | |
| 8 | Switch instrument to Phot. Mode | 02:00 | 04:27:40 | | | | |
| 9 | Switch on Oscilloscope | 02:00 | 04:29:40 | | | | |
| 10 | Switch on Spectrum Analyser and tune to 8MHz, RBW< 20 kHz | 02:00 | 04:31:40 | | | | |
| 11 | Switch on the Synthesiser and set level to minimum, F=8MHz | 02:00 | 04:33:40 | | | | |
| 12 | Set power level of RF amplifier to minimum and switch on | 02:00 | 04:35:40 | | | | |
| 13 | Adjust the level on the Power Amplifier until the injected current is 60dBuA | 02:00 | 04:37:40 | | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| → 14 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) The ObsID to be used is supplied by the SPIRE Test Director | 01:00 | 04:38:40 | | | | |
| 15 | Stop injecting current with BCI by setting the amplifier to standby | 01:00 | 04:39:40 | | | | |
| 01:28 16 | Set the ObsID Step to: 1 (Reference step) | 00:30 | 04:40:10 | 1 | | | |
| 17 | Accumulate > 70 seconds of detector data | 01:10 | 04:41:20 | | | | |
| 18 | Set the ObsID Step to: 65535 | 00:30 | 04:41:50 | 65535 | | | |
| 19 | Switch on RF amplifier and adjust injection level to 60 dBuA, and 8MHz | 00:30 | 04:42:20 | | | | |
| 01:30 20 | Set the ObsID Step to: 2 | | 04:42:20 | 2 | | | |
| 21 | Record the injected power | | 04:42:20 | | | | |
| 22 | After 01:10 set the step to, 65535 | 01:10 | 04:43:30 | 65535 | | | |
| 23 | Adjust injection to 60dBuA, and 8.32MHz | 00:30 | 04:44:00 | | | | |
| 01:32 24 | Set the ObsID Step to: 3 | | 04:44:00 | 3 | | | |
| 25 | Record the injected power | | 04:44:00 | | | | |
| 26 | After 01:10 set the step to, 65535 | 01:10 | 04:45:10 | 65535 | | | |
| 27 | Adjust injection to 60dBuA, and 8.65MHz | 00:30 | 04:45:40 | | | | |
| 01:33 28 | Set the ObsID Step to: 4 | | 04:45:40 | 4 | | | |
| 29 | Record the injected power | | 04:45:40 | | | | |
| 30 | After 01:10 set the step to, 65535 | 01:10 | 04:46:50 | 65535 | | | |
| 31 | Adjust injection to 60dBuA, and 8.99MHz | 00:30 | 04:47:20 | | | | |
| 01:35 32 | Set the ObsID Step to: 5 | | 04:47:20 | 5 | | | |
| 33 | Record the injected power | | 04:47:20 | | | | |

| | Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|---|
| | 34 | After 01:10 set the step to, 65535 | 01:10 | 04:48:30 | 65535 | | | |
| | 35 | Adjust injection to 60dBuA, and 9.35MHz | 00:30 | 04:49:00 | | | | |
| 01:36 | 36 | Set the ObsID Step to: 6 | | 04:49:00 | 6 | | | |
| | 37 | Record the injected power | | 04:49:00 | | | | |
| | 38 | After 01:10 set the step to, 65535 | 01:10 | 04:50:10 | 65535 | | | |
| | 39 | Adjust injection to 60dBuA, and 9.72MHz | 00:30 | 04:50:40 | | | | |
| 01:38 | 40 | Set the ObsID Step to: 7 | | 04:50:40 | 7 | | | |
| | 41 | Record the injected power | | 04:50:40 | | | | |
| | 42 | After 01:10 set the step to, 65535 | 01:10 | 04:51:50 | 65535 | | | |
| | 43 | Adjust injection to 60dBuA, and 10.11MHz | 00:30 | 04:52:20 | | | | |
| 01:39 | 44 | Set the ObsID Step to: 8 | | 04:52:20 | 8 | | | |
| | 45 | Record the injected power | | 04:52:20 | | | | |
| | 46 | After 01:10 set the step to, 65535 | 01:10 | 04:53:30 | 65535 | | | |
| | 47 | Adjust injection to 60dBuA, and 10.51MHz | 00:30 | 04:54:00 | | | | |
| 01:41 | 48 | Set the ObsID Step to: 9 | | 04:54:00 | 9 | | | |
| | 49 | Record the injected power | | 04:54:00 | | | | |
| | 50 | After 01:10 set the step to, 65535 | 01:10 | 04:55:10 | 65535 | | | |
| | 51 | Adjust injection to 60dBuA, and 10.93MHz | 00:30 | 04:55:40 | | | | |
| 01:42 | 52 | Set the ObsID Step to: 10 | | 04:55:40 | 10 | | | |
| | 53 | Record the injected power | | 04:55:40 | | | | |
| | 54 | After 01:10 set the step to, 65535 | 01:10 | 04:56:50 | 65535 | | | |
| | 55 | Adjust injection to 60dBuA, and 11.36MHz | 00:30 | 04:57:20 | | | | |
| 01:44 | 56 | Set the ObsID Step to: 11 | | 04:57:20 | 11 | | | |
| | 57 | Record the injected power | | 04:57:20 | | | | |
| | 58 | After 01:10 set the step to, 65535 | 01:10 | 04:58:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 59 | Adjust injection to 60dBuA, and 11.81MHz | 00:30 | 04:59:00 | | | | |
| 01:45 60 | Set the ObsID Step to: 12 | | 04:59:00 | 12 | | | |
| 61 | Record the injected power | | 04:59:00 | | | | |
| 62 | After 01:10 set the step to, 65535 | 01:10 | 05:00:10 | 65535 | | | |
| 63 | Adjust injection to 60dBuA, and 12.28MHz | 00:30 | 05:00:40 | | | | |
| 01:47 64 | Set the ObsID Step to: 13 | | 05:00:40 | 13 | | | |
| 65 | Record the injected power | | 05:00:40 | | | | |
| 66 | After 01:10 set the step to, 65535 | 01:10 | 05:01:50 | 65535 | | | |
| 67 | Adjust injection to 60dBuA, and 12.77MHz | 00:30 | 05:02:20 | | | | |
| 01:49 68 | Set the ObsID Step to: 14 | | 05:02:20 | 14 | | | |
| 69 | Record the injected power | | 05:02:20 | | | | |
| 70 | After 01:10 set the step to, 65535 | 01:10 | 05:03:30 | 65535 | | | |
| 71 | Adjust injection to 60dBuA, and 13.28MHz | 00:30 | 05:04:00 | | | | |
| 01:51 72 | Set the ObsID Step to: 15 | | 05:04:00 | 15 | | | |
| 73 | Record the injected power | | 05:04:00 | | | | |
| 74 | After 01:10 set the step to, 65535 | 01:10 | 05:05:10 | 65535 | | | |
| 75 | Adjust injection to 60dBuA, and 13.81MHz | 00:30 | 05:05:40 | | | | |
| 01:52 76 | Set the ObsID Step to: 16 | | 05:05:40 | 16 | | | |
| 77 | Record the injected power | | 05:05:40 | | | | |
| 78 | After 01:10 set the step to, 65535 | 01:10 | 05:06:50 | 65535 | | | |
| 79 | Adjust injection to 60dBuA, and 14.36MHz | 00:30 | 05:07:20 | | | | |
| 01:54 80 | Set the ObsID Step to: 17 | | 05:07:20 | 17 | | | |
| 81 | Record the injected power | | 05:07:20 | | | | |
| 82 | After 01:10 set the step to, 65535 | 01:10 | 05:08:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 83 | Adjust injection to 60dBuA, and 14.93MHz | 00:30 | 05:09:00 | | | | |
| 01:56 84 | Set the ObsID Step to: 18 | | 05:09:00 | 18 | | | |
| 85 | Record the injected power | | 05:09:00 | | | | |
| 86 | After 01:10 set the step to, 65535 | 01:10 | 05:10:10 | 65535 | | | |
| 87 | Adjust injection to 60dBuA, and 15.52MHz | 00:30 | 05:10:40 | | | | |
| 01:57 88 | Set the ObsID Step to: 19 | | 05:10:40 | 19 | | | |
| 89 | Record the injected power | | 05:10:40 | | | | |
| 90 | After 01:10 set the step to, 65535 | 01:10 | 05:11:50 | 65535 | | | |
| 91 | Adjust injection to 60dBuA, and 16.14MHz | 00:30 | 05:12:20 | | | | |
| 01:59 92 | Set the ObsID Step to: 20 | | 05:12:20 | 20 | | | |
| 93 | Record the injected power | | 05:12:20 | | | | |
| 94 | After 01:10 set the step to, 65535 | 01:10 | 05:13:30 | 65535 | | | |
| 95 | Adjust injection to 60dBuA, and 16.78MHz | 00:30 | 05:14:00 | | | | |
| 02:00 96 | Set the ObsID Step to: 21 | | 05:14:00 | 21 | | | |
| 97 | Record the injected power | | 05:14:00 | | | | |
| 98 | After 01:10 set the step to, 65535 | 01:10 | 05:15:10 | 65535 | | | |
| 99 | Adjust injection to 60dBuA, and 17.45MHz | 00:30 | 05:15:40 | | | | |
| 02:02 100 | Set the ObsID Step to: 22 | | 05:15:40 | 22 | | | |
| 101 | Record the injected power | | 05:15:40 | | | | |
| 102 | After 01:10 set the step to, 65535 | 01:10 | 05:16:50 | 65535 | | | |
| 103 | Adjust injection to 60dBuA, and 18.14MHz | 00:30 | 05:17:20 | | | | |
| 02:04 104 | Set the ObsID Step to: 23 | | 05:17:20 | 23 | | | |
| 105 | Record the injected power | | 05:17:20 | | | | |
| 106 | After 01:10 set the step to, 65535 | 01:10 | 05:18:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 107 | Adjust injection to 60dBuA, and 18.86MHz | 00:30 | 05:19:00 | | | | |
| 02:05 108 | Set the ObsID Step to: 24 | | 05:19:00 | 24 | | | |
| 109 | Record the injected power | | 05:19:00 | | | | |
| 110 | After 01:10 set the step to, 65535 | 01:10 | 05:20:10 | 65535 | | | |
| 111 | Adjust injection to 60dBuA, and 19.61MHz | 00:30 | 05:20:40 | | | | |
| 02:07 112 | Set the ObsID Step to: 25 | | 05:20:40 | 25 | | | |
| 113 | Record the injected power | | 05:20:40 | | | | |
| 114 | After 01:10 set the step to, 65535 | 01:10 | 05:21:50 | 65535 | | | |
| 115 | Adjust injection to 60dBuA, and 20.39MHz | 00:30 | 05:22:20 | | | | |
| 02:08 116 | Set the ObsID Step to: 26 | | 05:22:20 | 26 | | | |
| 117 | Record the injected power | | 05:22:20 | | | | |
| 118 | After 01:10 set the step to, 65535 | 01:10 | 05:23:30 | 65535 | | | |
| 119 | Adjust injection to 60dBuA, and 21.20MHz | 00:30 | 05:24:00 | | | | |
| 120 | Set the ObsID Step to: 27 | | 05:24:00 | 27 | | | |
| 121 | Record the injected power | | 05:24:00 | | | | |
| 122 | After 01:10 set the step to, 65535 | 01:10 | 05:25:10 | 65535 | | | |
| 123 | Adjust injection to 60dBuA, and 22.05MHz | 00:30 | 05:25:40 | | | | |
| 124 | Set the ObsID Step to: 28 | | 05:25:40 | 28 | | | |
| 125 | Record the injected power | | 05:25:40 | | | | |
| 126 | After 01:10 set the step to, 65535 | 01:10 | 05:26:50 | 65535 | | | |
| 127 | Adjust injection to 60dBuA, and 22.92MHz | 00:30 | 05:27:20 | | | | |
| 128 | Set the ObsID Step to: 29 | | 05:27:20 | 29 | | | |
| 129 | Record the injected power | | 05:27:20 | | | | |
| 130 | After 01:10 set the step to, 65535 | 01:10 | 05:28:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 131 | Adjust injection to 60dBuA, and 23.84MHz | 00:30 | 05:29:00 | | | | |
| 132 | Set the ObsID Step to: 30 | | 05:29:00 | 30 | | | |
| 133 | Record the injected power | | 05:29:00 | | | | |
| 134 | After 01:10 set the step to, 65535 | 01:10 | 05:30:10 | 65535 | | | |
| 135 | Adjust injection to 60dBuA, and 24.78MHz | 00:30 | 05:30:40 | | | | |
| 136 | Set the ObsID Step to: 31 | | 05:30:40 | 31 | | | |
| 137 | Record the injected power | | 05:30:40 | | | | |
| 138 | After 01:10 set the step to, 65535 | 01:10 | 05:31:50 | 65535 | | | |
| 139 | Adjust injection to 60dBuA, and 25.77MHz | 00:30 | 05:32:20 | | | | |
| 140 | Set the ObsID Step to: 32 | | 05:32:20 | 32 | | | |
| 141 | Record the injected power | | 05:32:20 | | | | |
| 142 | After 01:10 set the step to, 65535 | 01:10 | 05:33:30 | 65535 | | | |
| 143 | Adjust injection to 60dBuA, and 26.79MHz | 00:30 | 05:34:00 | | | | |
| 144 | Set the ObsID Step to: 33 | | 05:34:00 | 33 | | | |
| 145 | Record the injected power | | 05:34:00 | | | | |
| 146 | After 01:10 set the step to, 65535 | 01:10 | 05:35:10 | 65535 | | | |
| 147 | Adjust injection to 60dBuA, and 27.86MHz | 00:30 | 05:35:40 | | | | |
| 148 | Set the ObsID Step to: 34 | | 05:35:40 | 34 | | | |
| 149 | Record the injected power | | 05:35:40 | | | | |
| 150 | After 01:10 set the step to, 65535 | 01:10 | 05:36:50 | 65535 | | | |
| 151 | Adjust injection to 60dBuA, and 28.97MHz | 00:30 | 05:37:20 | | | | |
| 152 | Set the ObsID Step to: 35 | | 05:37:20 | 35 | | | |
| 153 | Record the injected power | | 05:37:20 | | | | |
| 154 | After 01:10 set the step to, 65535 | 01:10 | 05:38:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 155 | Adjust injection to 60dBuA, and 30.12MHz | 00:30 | 05:39:00 | | | | |
| 156 | Set the ObsID Step to: 36 | | 05:39:00 | 36 | | | |
| 157 | Record the injected power | | 05:39:00 | | | | |
| 158 | After 01:10 set the step to, 65535 | 01:10 | 05:40:10 | 65535 | | | |
| 159 | Adjust injection to 60dBuA, and 31.32MHz | 00:30 | 05:40:40 | | | | |
| 160 | Set the ObsID Step to: 37 | | 05:40:40 | 37 | | | |
| 161 | Record the injected power | | 05:40:40 | | | | |
| 162 | After 01:10 set the step to, 65535 | 01:10 | 05:41:50 | 65535 | | | |
| 163 | Adjust injection to 60dBuA, and 32.56MHz | 00:30 | 05:42:20 | | | | |
| 164 | Set the ObsID Step to: 38 | | 05:42:20 | 38 | | | |
| 165 | Record the injected power | | 05:42:20 | | | | |
| 166 | After 01:10 set the step to, 65535 | 01:10 | 05:43:30 | 65535 | | | |
| 167 | Adjust injection to 60dBuA, and 33.86MHz | 00:30 | 05:44:00 | | | | |
| 168 | Set the ObsID Step to: 39 | | 05:44:00 | 39 | | | |
| 169 | Record the injected power | | 05:44:00 | | | | |
| 170 | After 01:10 set the step to, 65535 | 01:10 | 05:45:10 | 65535 | | | |
| 171 | Adjust injection to 60dBuA, and 35.20MHz | 00:30 | 05:45:40 | | | | |
| 172 | Set the ObsID Step to: 40 | | 05:45:40 | 40 | | | |
| 173 | Record the injected power | | 05:45:40 | | | | |
| 174 | After 01:10 set the step to, 65535 | 01:10 | 05:46:50 | 65535 | | | |
| 175 | Adjust injection to 60dBuA, and 36.60MHz | 00:30 | 05:47:20 | | | | |
| 176 | Set the ObsID Step to: 41 | | 05:47:20 | 41 | | | |
| 177 | Record the injected power | | 05:47:20 | | | | |
| 178 | After 01:10 set the step to, 65535 | 01:10 | 05:48:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 179 | Adjust injection to 60dBuA, and 38.06MHz | 00:30 | 05:49:00 | | | | |
| 180 | Set the ObsID Step to: 42 | | 05:49:00 | 42 | | | |
| 181 | Record the injected power | | 05:49:00 | | | | |
| 182 | After 01:10 set the step to, 65535 | 01:10 | 05:50:10 | 65535 | | | |
| 183 | Adjust injection to 60dBuA, and 39.57MHz | 00:30 | 05:50:40 | | | | |
| 184 | Set the ObsID Step to: 43 | | 05:50:40 | 43 | | | |
| 185 | Record the injected power | | 05:50:40 | | | | |
| 186 | After 01:10 set the step to, 65535 | 01:10 | 05:51:50 | 65535 | | | |
| 187 | Adjust injection to 60dBuA, and 41.14MHz | 00:30 | 05:52:20 | | | | |
| 188 | Set the ObsID Step to: 44 | | 05:52:20 | 44 | | | |
| 189 | Record the injected power | | 05:52:20 | | | | |
| 190 | After 01:10 set the step to, 65535 | 01:10 | 05:53:30 | 65535 | | | |
| 191 | Adjust injection to 60dBuA, and 42.78MHz | 00:30 | 05:54:00 | | | | |
| 192 | Set the ObsID Step to: 45 | | 05:54:00 | 45 | | | |
| 193 | Record the injected power | | 05:54:00 | | | | |
| 194 | After 01:10 set the step to, 65535 | 01:10 | 05:55:10 | 65535 | | | |
| 195 | Adjust injection to 60dBuA, and 44.48MHz | 00:30 | 05:55:40 | | | | |
| 196 | Set the ObsID Step to: 46 | | 05:55:40 | 46 | | | |
| 197 | Record the injected power | | 05:55:40 | | | | |
| 198 | After 01:10 set the step to, 65535 | 01:10 | 05:56:50 | 65535 | | | |
| 199 | Adjust injection to 60dBuA, and 46.25MHz | 00:30 | 05:57:20 | | | | |
| 200 | Set the ObsID Step to: 47 | | 05:57:20 | 47 | | | |
| 201 | Record the injected power | | 05:57:20 | | | | |
| 202 | After 01:10 set the step to, 65535 | 01:10 | 05:58:30 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 203 | Adjust injection to 60dBuA, and 48.09MHz | 00:30 | 05:59:00 | | | | |
| 204 | Set the ObsID Step to: 48 | | 05:59:00 | 48 | | | |
| 205 | Record the injected power | | 05:59:00 | | | | |
| 206 | After 01:10 set the step to, 65535 | 01:10 | 06:00:10 | 65535 | | | |
| 207 | Adjust injection to 60dBuA, and 50.00MHz | 00:30 | 06:00:40 | | | | |
| 208 | Set the ObsID Step to: 49 | | 06:00:40 | 49 | | | |
| 209 | Record the injected power | | 06:00:40 | | | | |
| 210 | After 01:10 set the step to, 65535 | 01:10 | 06:01:50 | 65535 | | | |
| 211 | Switch off RF amplifier | 00:30 | 06:02:20 | | | | |
| 212 | Set the ObsID Step to: 50 | | 06:02:20 | 50 | | | |
| 213 | After 01:10 Exit the SPIRE-IST-EMC-SPOT.tcl (CCS operator) | | 06:02:20 | | | | |
| 214 | Change to Spectrometer mode | 05:00 | 06:07:20 | | | | |
| 215 | Switch on RF amplifier and injection frequency to 8.00 MHz | 02:00 | 06:09:20 | | | | |
| 216 | Adjust the level on the Power Amplifier until the injected level is 177mV rms<br>(Note: -12dB from IID-A)<br>Voltage measurement as indicated by oscilloscope | 01:00 | 06:10:20 | | | | |
| OBSID<br>00014E1 217 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator)<br>The ObsID to be used is supplied by the SPIRE Test Director | 01:00 | 06:11:20 | | | | |
| 218 | Stop injecting current with BCI by setting the amplifier to standby | 01:00 | 06:12:20 | | | | |
| 02:29 219 | Set the ObsID Step to: 1 (Reference step) | 00:30 | 06:12:50 | 1 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 220 | Accumulate > 70 seconds of detector data | 00:20 | 06:13:10 | | | | |
| 221 | Set the ObsID Step to: 65535 | 00:30 | 06:13:40 | 65535 | | | |
| 222 | Adjust injection to 60dBuA, and 8.00MHz | 00:30 | 06:14:10 | | | | |
| 02:32 223 | Set the ObsID Step to: 2 | | 06:14:10 | 2 | | | |
| 224 | Record the injected power | | 06:14:10 | | | | |
| 225 | After 00:20 set the step to, 65535 | 00:20 | 06:14:30 | 65535 | | | |
| 226 | Adjust injection to 60dBuA, and 8.32MHz | 00:30 | 06:15:00 | | | | |
| 02:33 227 | Set the ObsID Step to: 3 | | 06:15:00 | 3 | | | |
| 228 | Record the injected power | | 06:15:00 | | | | |
| 229 | After 00:20 set the step to, 65535 | 00:20 | 06:15:20 | 65535 | | | |
| 230 | Adjust injection to 60dBuA, and 8.65MHz | 00:30 | 06:15:50 | | | | |
| 02:33 231 | Set the ObsID Step to: 4 | | 06:15:50 | 4 | | | |
| 232 | Record the injected power | | 06:15:50 | | | | |
| 233 | After 00:20 set the step to, 65535 | 00:20 | 06:16:10 | 65535 | | | |
| 234 | Adjust injection to 60dBuA, and 8.99MHz | 00:30 | 06:16:40 | | | | |
| 02:34 235 | Set the ObsID Step to: 5 | | 06:16:40 | 5 | | | |
| 236 | Record the injected power | | 06:16:40 | | | | |
| 237 | After 00:20 set the step to, 65535 | 00:20 | 06:17:00 | 65535 | | | |
| 238 | Adjust injection to 60dBuA, and 9.35MHz | 00:30 | 06:17:30 | | | | |
| 02:35 239 | Set the ObsID Step to: 6 | | 06:17:30 | 6 | | | |
| 240 | Record the injected power | | 06:17:30 | | | | |
| 241 | After 00:20 set the step to, 65535 | 00:20 | 06:17:50 | 65535 | | | |
| 242 | Adjust injection to 60dBuA, and 9.72MHz | 00:30 | 06:18:20 | | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 02:36 243 | Set the ObsID Step to: 7 | | 06:18:20 | 7 | | | |
| 244 | Record the injected power | | 06:18:20 | | | | |
| 245 | After 00:20 set the step to, 65535 | 00:20 | 06:18:40 | 65535 | | | |
| 246 | Adjust injection to 60dBuA, and 10.11MHz | 00:30 | 06:19:10 | | | | |
| 02:36 247 | Set the ObsID Step to: 8 | | 06:19:10 | 8 | | | |
| 248 | Record the injected power | | 06:19:10 | | | | |
| 249 | After 00:20 set the step to, 65535 | 00:20 | 06:19:30 | 65535 | | | |
| 250 | Adjust injection to 60dBuA, and 10.51MHz | 00:30 | 06:20:00 | | | | |
| 02:37 251 | Set the ObsID Step to: 9 | | 06:20:00 | 9 | | | |
| 252 | Record the injected power | | 06:20:00 | | | | |
| 253 | After 00:20 set the step to, 65535 | 00:20 | 06:20:20 | 65535 | | | |
| 254 | Adjust injection to 60dBuA, and 10.93MHz | 00:30 | 06:20:50 | | | | |
| 02:38 255 | Set the ObsID Step to: 10 | | 06:20:50 | 10 | | | |
| 256 | Record the injected power | | 06:20:50 | | | | |
| 257 | After 00:20 set the step to, 65535 | 00:20 | 06:21:10 | 65535 | | | |
| 258 | Adjust injection to 60dBuA, and 11.36MHz | 00:30 | 06:21:40 | | | | |
| 02:39 259 | Set the ObsID Step to: 11 | | 06:21:40 | 11 | | | |
| 260 | Record the injected power | | 06:21:40 | | | | |
| 261 | After 00:20 set the step to, 65535 | 00:20 | 06:22:00 | 65535 | | | |
| 262 | Adjust injection to 60dBuA, and 11.81MHz | 00:30 | 06:22:30 | | | | |
| 02:40 263 | Set the ObsID Step to: 12 | | 06:22:30 | 12 | | | |
| 264 | Record the injected power | | 06:22:30 | | | | |
| 265 | After 00:20 set the step to, 65535 | 00:20 | 06:22:50 | 65535 | | | |
| 266 | Adjust injection to 60dBuA, and 12.28MHz | 00:30 | 06:23:20 | | | | |
| 02:42 267 | Set the ObsID Step to: 13 | | 06:23:20 | 13 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 268 | Record the injected power | | 06:23:20 | | | | |
| 269 | After 00:20 set the step to, 65535 | 00:20 | 06:23:40 | 65535 | | | |
| 270 | Adjust injection to 60dBuA, and 12.77MHz | 00:30 | 06:24:10 | | | | |
| 02:42 271 | Set the ObsID Step to: 14 | | 06:24:10 | 14 | | | |
| 272 | Record the injected power | | 06:24:10 | | | | |
| 273 | After 00:20 set the step to, 65535 | 00:20 | 06:24:30 | 65535 | | | |
| 274 | Adjust injection to 60dBuA, and 13.28MHz | 00:30 | 06:25:00 | | | | |
| 02:43 275 | Set the ObsID Step to: 15 | | 06:25:00 | 15 | | | |
| 276 | Record the injected power | | 06:25:00 | | | | |
| 277 | After 00:20 set the step to, 65535 | 00:20 | 06:25:20 | 65535 | | | |
| 278 | Adjust injection to 60dBuA, and 13.81MHz | 00:30 | 06:25:50 | | | | |
| 02:44 279 | Set the ObsID Step to: 16 | | 06:25:50 | 16 | | | |
| 280 | Record the injected power | | 06:25:50 | | | | |
| 281 | After 00:20 set the step to, 65535 | 00:20 | 06:26:10 | 65535 | | | |
| 282 | Adjust injection to 60dBuA, and 14.36MHz | 00:30 | 06:26:40 | | | | |
| 02:45 283 | Set the ObsID Step to: 17 | | 06:26:40 | 17 | | | |
| 284 | Record the injected power | | 06:26:40 | | | | |
| 285 | After 00:20 set the step to, 65535 | 00:20 | 06:27:00 | 65535 | | | |
| 286 | Adjust injection to 60dBuA, and 14.93MHz | 00:30 | 06:27:30 | | | | |
| 02:46 287 | Set the ObsID Step to: 18 | | 06:27:30 | 18 | | | |
| 288 | Record the injected power | | 06:27:30 | | | | |
| 289 | After 00:20 set the step to, 65535 | 00:20 | 06:27:50 | 65535 | | | |
| 290 | Adjust injection to 60dBuA, and 15.52MHz | 00:30 | 06:28:20 | | | | |
| 02:47 291 | Set the ObsID Step to: 19 | | 06:28:20 | 19 | | | |
| 292 | Record the injected power | | 06:28:20 | | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 293 | After 00:20 set the step to, 65535 | 00:20 | 06:28:40 | 65535 | | | |
| 294 | Adjust injection to 60dBuA, and 16.14MHz | 00:30 | 06:29:10 | | | | |
| 02:48 295 | Set the ObsID Step to: 20 | | 06:29:10 | 20 | | | |
| 296 | Record the injected power | | 06:29:10 | | | | |
| 297 | After 00:20 set the step to, 65535 | 00:20 | 06:29:30 | 65535 | | | |
| 298 | Adjust injection to 60dBuA, and 16.78MHz | 00:30 | 06:30:00 | | | | |
| 02:49 299 | Set the ObsID Step to: 21 | | 06:30:00 | 21 | | | |
| 300 | Record the injected power | | 06:30:00 | | | | |
| 301 | After 00:20 set the step to, 65535 | 00:20 | 06:30:20 | 65535 | | | |
| 302 | Adjust injection to 60dBuA, and 17.45MHz | 00:30 | 06:30:50 | | | | |
| 02:49 303 | Set the ObsID Step to: 22 | | 06:30:50 | 22 | | | |
| 304 | Record the injected power | | 06:30:50 | | | | |
| 305 | After 00:20 set the step to, 65535 | 00:20 | 06:31:10 | 65535 | | | |
| 306 | Adjust injection to 60dBuA, and 18.14MHz | 00:30 | 06:31:40 | | | | |
| 02:50 307 | Set the ObsID Step to: 23 | | 06:31:40 | 23 | | | |
| 308 | Record the injected power | | 06:31:40 | | | | |
| 309 | After 00:20 set the step to, 65535 | 00:20 | 06:32:00 | 65535 | | | |
| 310 | Adjust injection to 60dBuA, and 18.86MHz | 00:30 | 06:32:30 | | | | |
| 02:51 311 | Set the ObsID Step to: 24 | | 06:32:30 | 24 | | | |
| 312 | Record the injected power | | 06:32:30 | | | | |
| 313 | After 00:20 set the step to, 65535 | 00:20 | 06:32:50 | 65535 | | | |
| 314 | Adjust injection to 60dBuA, and 19.61MHz | 00:30 | 06:33:20 | | | | |
| 02:51 315 | Set the ObsID Step to: 25 | | 06:33:20 | 25 | | | |
| 316 | Record the injected power | | 06:33:20 | | | | |
| 317 | After 00:20 set the step to, 65535 | 00:20 | 06:33:40 | 65535 | | | |

02:52
REFERENCE TEST

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 318 | Adjust injection to 60dBuA, and 20.39MHz | 00:30 | 06:34:10 | | | | |
| 319 | Set the ObsID Step to: 26 | | 06:34:10 | 26 | | | |
| 320 | Record the injected power | | 06:34:10 | | | | |
| 321 | After 00:20 set the step to, 65535 | 00:20 | 06:34:30 | 65535 | | | |
| 322 | Adjust injection to 60dBuA, and 21.20MHz | 00:30 | 06:35:00 | | | | |
| 323 | Set the ObsID Step to: 27 | | 06:35:00 | 27 | | | |
| 324 | Record the injected power | | 06:35:00 | | | | |
| 325 | After 00:20 set the step to, 65535 | 00:20 | 06:35:20 | 65535 | | | |
| 326 | Adjust injection to 60dBuA, and 22.05MHz | 00:30 | 06:35:50 | | | | |
| 327 | Set the ObsID Step to: 28 | | 06:35:50 | 28 | | | |
| 328 | Record the injected power | | 06:35:50 | | | | |
| 329 | After 00:20 set the step to, 65535 | 00:20 | 06:36:10 | 65535 | | | |
| 330 | Adjust injection to 60dBuA, and 22.92MHz | 00:30 | 06:36:40 | | | | |
| 331 | Set the ObsID Step to: 29 | | 06:36:40 | 29 | | | |
| 332 | Record the injected power | | 06:36:40 | | | | |
| 333 | After 00:20 set the step to, 65535 | 00:20 | 06:37:00 | 65535 | | | |
| 334 | Adjust injection to 60dBuA, and 23.84MHz | 00:30 | 06:37:30 | | | | |
| 335 | Set the ObsID Step to: 30 | | 06:37:30 | 30 | | | |
| 336 | Record the injected power | | 06:37:30 | | | | |
| 337 | After 00:20 set the step to, 65535 | 00:20 | 06:37:50 | 65535 | | | |
| 338 | Adjust injection to 60dBuA, and 24.78MHz | 00:30 | 06:38:20 | | | | |
| 339 | Set the ObsID Step to: 31 | | 06:38:20 | 31 | | | |
| 340 | Record the injected power | | 06:38:20 | | | | |
| 341 | After 00:20 set the step to, 65535 | 00:20 | 06:38:40 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 342 | Adjust injection to 60dBuA, and 25.77MHz | 00:30 | 06:39:10 | | | | |
| 343 | Set the ObsID Step to: 32 | | 06:39:10 | 32 | | | |
| 344 | Record the injected power | | 06:39:10 | | | | |
| 345 | After 00:20 set the step to, 65535 | 00:20 | 06:39:30 | 65535 | | | |
| 346 | Adjust injection to 60dBuA, and 26.79MHz | 00:30 | 06:40:00 | | | | |
| 347 | Set the ObsID Step to: 33 | | 06:40:00 | 33 | | | |
| 348 | Record the injected power | | 06:40:00 | | | | |
| 349 | After 00:20 set the step to, 65535 | 00:20 | 06:40:20 | 65535 | | | |
| 350 | Adjust injection to 60dBuA, and 27.86MHz | 00:30 | 06:40:50 | | | | |
| 351 | Set the ObsID Step to: 34 | | 06:40:50 | 34 | | | |
| 352 | Record the injected power | | 06:40:50 | | | | |
| 353 | After 00:20 set the step to, 65535 | 00:20 | 06:41:10 | 65535 | | | |
| 354 | Adjust injection to 60dBuA, and 28.97MHz | 00:30 | 06:41:40 | | | | |
| 355 | Set the ObsID Step to: 35 | | 06:41:40 | 35 | | | |
| 356 | Record the injected power | | 06:41:40 | | | | |
| 357 | After 00:20 set the step to, 65535 | 00:20 | 06:42:00 | 65535 | | | |
| 358 | Adjust injection to 60dBuA, and 30.12MHz | 00:30 | 06:42:30 | | | | |
| 359 | Set the ObsID Step to: 36 | | 06:42:30 | 36 | | | |
| 360 | Record the injected power | | 06:42:30 | | | | |
| 361 | After 00:20 set the step to, 65535 | 00:20 | 06:42:50 | 65535 | | | |
| 362 | Adjust injection to 60dBuA, and 31.32MHz | 00:30 | 06:43:20 | | | | |
| 363 | Set the ObsID Step to: 37 | | 06:43:20 | 37 | | | |
| 364 | Record the injected power | | 06:43:20 | | | | |
| 365 | After 00:20 set the step to, 65535 | 00:20 | 06:43:40 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 366 | Adjust injection to 60dBuA, and 32.56MHz | 00:30 | 06:44:10 | | | | |
| 367 | Set the ObsID Step to: 38 | | 06:44:10 | 38 | | | |
| 368 | Record the injected power | | 06:44:10 | | | | |
| 369 | After 00:20 set the step to, 65535 | 00:20 | 06:44:30 | 65535 | | | |
| 370 | Adjust injection to 60dBuA, and 33.86MHz | 00:30 | 06:45:00 | | | | |
| 371 | Set the ObsID Step to: 39 | | 06:45:00 | 39 | | | |
| 372 | Record the injected power | | 06:45:00 | | | | |
| 373 | After 00:20 set the step to, 65535 | 00:20 | 06:45:20 | 65535 | | | |
| 374 | Adjust injection to 60dBuA, and 35.20MHz | 00:30 | 06:45:50 | | | | |
| 375 | Set the ObsID Step to: 40 | | 06:45:50 | 40 | | | |
| 376 | Record the injected power | | 06:45:50 | | | | |
| 377 | After 00:20 set the step to, 65535 | 00:20 | 06:46:10 | 65535 | | | |
| 378 | Adjust injection to 60dBuA, and 36.60MHz | 00:30 | 06:46:40 | | | | |
| 379 | Set the ObsID Step to: 41 | | 06:46:40 | 41 | | | |
| 380 | Record the injected power | | 06:46:40 | | | | |
| 381 | After 00:20 set the step to, 65535 | 00:20 | 06:47:00 | 65535 | | | |
| 382 | Adjust injection to 60dBuA, and 38.06MHz | 00:30 | 06:47:30 | | | | |
| 383 | Set the ObsID Step to: 42 | | 06:47:30 | 42 | | | |
| 384 | Record the injected power | | 06:47:30 | | | | |
| 385 | After 00:20 set the step to, 65535 | 00:20 | 06:47:50 | 65535 | | | |
| 386 | Adjust injection to 60dBuA, and 39.57MHz | 00:30 | 06:48:20 | | | | |
| 387 | Set the ObsID Step to: 43 | | 06:48:20 | 43 | | | |
| 388 | Record the injected power | | 06:48:20 | | | | |
| 389 | After 00:20 set the step to, 65535 | 00:20 | 06:48:40 | 65535 | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 390 | Adjust injection to 60dBuA, and 41.14MHz | 00:30 | 06:49:10 | | | | |
| 391 | Set the ObsID Step to: 44 | | 06:49:10 | 44 | | | |
| 392 | Record the injected power | | 06:49:10 | | | | |
| 393 | After 00:20 set the step to, 65535 | 00:20 | 06:49:30 | 65535 | | | |
| 394 | Adjust injection to 60dBuA, and 42.78MHz | 00:30 | 06:50:00 | | | | |
| 395 | Set the ObsID Step to: 45 | | 06:50:00 | 45 | | | |
| 396 | Record the injected power | | 06:50:00 | | | | |
| 397 | After 00:20 set the step to, 65535 | 00:20 | 06:50:20 | 65535 | | | |
| 398 | Adjust injection to 60dBuA, and 44.48MHz | 00:30 | 06:50:50 | | | | |
| 399 | Set the ObsID Step to: 46 | | 06:50:50 | 46 | | | |
| 400 | Record the injected power | | 06:50:50 | | | | |
| 401 | After 00:20 set the step to, 65535 | 00:20 | 06:51:10 | 65535 | | | |
| 402 | Adjust injection to 60dBuA, and 46.25MHz | 00:30 | 06:51:40 | | | | |
| 403 | Set the ObsID Step to: 47 | | 06:51:40 | 47 | | | |
| 404 | Record the injected power | | 06:51:40 | | | | |
| 405 | After 00:20 set the step to, 65535 | 00:20 | 06:52:00 | 65535 | | | |
| 406 | Adjust injection to 60dBuA, and 48.09MHz | 00:30 | 06:52:30 | | | | |
| 407 | Set the ObsID Step to: 48 | | 06:52:30 | 48 | | | |
| 408 | Record the injected power | | 06:52:30 | | | | |
| 409 | After 00:20 set the step to, 65535 | 00:20 | 06:52:50 | 65535 | | | |
| 410 | Adjust injection to 60dBuA, and 50.00MHz | 00:30 | 06:53:20 | | | | |
| 411 | Set the ObsID Step to: 49 | | 06:53:20 | 49 | | | |
| 412 | Record the injected power | | 06:53:20 | | | | |
| 413 | After 00:20 set the step to, 65535 | 00:20 | 06:53:40 | 65535 | | | |
| 414 | Set the RF amplifier to standby | | 06:53:40 | | | | |

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | ObsID Step | Injected Voltage | Injected power | Comment |
|---|---|---|---|---|---|---|---|
| 415 | Set the ObsID Step to: 50 | | 06:53:40 | 50 | | | |
| 416 | After 01:10 exit SPIRE-IST-EMC-SPOT.tcl (CCS operator) | 01:10 | 06:54:50 | | | | |
| 417 | Switch off RF amplifier | 00:30 | 06:55:20 | | | | |
| 418 | Shut down DRCU | 05:00 | 07:00:20 | | | | |
| 419 | Shut down DPU | 05:00 | 07:05:20 | | | | |
| 420 | Disconnect BCI and Current Clamp Probe | 05:00 | 07:10:20 | | | | |
| 421 | Disconnect Oscilloscope probe | 05:00 | 07:15:20 | | | | |
| | End of CM Tests | | | | | | |

## *6.3 RS Test*

### *6.3.1 Prerequisites / assumptions*

- The cooler has been recycled and has sufficient predicted hold time to perform the test
- The test equipment is installed in the AIT clean room and has been checked out and is ready to be used prior to the commencement of the test steps.
- The orientation of the spacecraft is not important though the scaffolding between the radiating antenna and spacecraft should be minimised
- There is radio communication between the CCS operator and the AIT staff operating the EMC test equipment
- The temperature of the cryostat cover is <50K and is stable to ±1 K/hour drifts

### 6.3.2 *Detailed Procedure*

| Procedure Step | Action | Time (mm:ss) | Cumulative (hh:mm:ss) | Comment |
|---|---|---|---|---|
| 1 | Switch on SPIRE DPU | 05:00 | 00:00:00 | |
| 2 | Switch on SPIRE DRCU | 05:00 | 00:05:00 | |
| 3 | Turn on the Pump HS heater and wait for 300-mK temp to stabilise | 30:00 | 00:35:00 | |
| 4 | Switch instrument to Phot. Mode | 02:00 | 00:37:00 | |
| ~~03:16 STEP 2~~ 5 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) | 01:00 | 00:38:00 | |
| 6 | Set the ObsID Step to: (Reference step) | 00:30 | 00:38:30 | |
| 7 | Accumulate > 70 seconds of detector data | 01:10 | 00:39:40 | |
| 8 | Start Sweep (10-100MHz, 120 steps, 15 sec dwell) | 30:00 | 01:09:40 | |
| 9 | Switch off injection | 02:00 | 01:11:40 | |
| 10 | Accumulate > 70 seconds of detector data | 01:10 | 01:12:50 | |
| 11 | Exit SPIRE-IST-EMC-SPOT.tcl (CCS operator) | 01:00 | 01:13:50 | |
| 12 | Change to Spectrometer mode | 15:00 | 01:28:50 | |
| 03:16 STEP2 13 | Execute SPIRE-IST-EMC-SPOT.tcl (CCS operator) | 01:00 | 01:29:50 | |
| 14 | Set the ObsID Step to: (Reference step) | 00:30 | 01:30:20 | |
| 15 | Accumulate > 70 seconds of detector data | 01:10 | 01:31:30 | |
| 16 | Start Sweep (10-100MHz, 120 steps, 15 sec dwell) | 00:30 | 01:32:00 | |
| 17 | Switch off injection | 00:30 | 01:32:30 | |
| 18 | Accumulate > 70 seconds of detector data | 01:10 | 01:33:40 | |
| 19 | Shut down DRCU | 05:00 | 01:38:40 | |
| 20 | Shut down DPU | 05:00 | 01:43:40 | |

# 8 Appendix 4: As-Run Log of SPIRE SPT PVS

| | | |
|---|---|---|
| ThalesAlenia Space<br>A Thales / Finmeccanica Company | TRR Minutes Applicable<br>H-P-ASED-MN- 1599 | REF.: H-P-TASF-AS-RUN-LOG |
| | | HERSCHEL |
| | | DATE : 19-08-08 \| PAGE : 1 of |
| **AS-RUN DOCUMENTS RAISED** | | PLACE : ESTEC |

| | |
|---|---|
| TEST NAME: SPIRE SPT in HeII<br>~~SPIRE IST Specific Performance Test~~ | TEST CONDUCTOR:<br>S. HAMER |
| ACTIVITY CONTROL SHEET No's:<br>HP-2-ASED-SD-0406 iss 1.0 | |

| LEADING PROCEDURE (Title) | Doc No | Issue |
|---|---|---|
| SPIRE IST Specific Performance Test | HP-2-ASED-TP-0204 | 1.2 |

| FUNCTIONAL PROCEDURE (Title) | Doc No | Issue |
|---|---|---|
| Herschel PCDU & CDMS nom switch ON/OFF | HP-2-ASED-PR-0070-2 | 2 |

Session ID/s & Tag
2008_08_19_18_25_hercdmu_hpws22_REALTIME_SPIRE_SPT
HP_2_ASED_TP_0204_iss1_SPIRE_IST_SPT_END_001

| PVS # / Raised against | Description (brief summary of reason document is raised) |
|---|---|
| #1 PR-0070 | G.U.I. has changed (BS SCOE) |
| #1 TP-0204 | CCU data in 8 sec update rate (instead of 512 sec) |
| #2 TP0204 | Check IEGSE-CCS time sync |
| #3 TP-0204 | PERFORM GYRO CAL USING TP 0227 steps 100 to 260 |
| #4 TP-0204 | PERFORM SYNCRO. |
| #5 TP-0204 | Cryo temperatures out of range |
| #6 TP-0204 | Nom. HK not Restarted |
| #7 TP-0204 | XPND CHECK, OUTSIDE SCOPE OF SPIRE TEST |

| SPR # / Raised against | Description (same as SPR title) |
|---|---|
| SPR-698 | Time synchronization problems |
| SPR-701 | Install SPIRE Scripts for SPIRE SPT |
| SPR-703 | Install corrected SPIRE scripts on CCS |

| NCR # / Raised against | Description (same as NCR title) |
|---|---|
| 4458 SPIRE SPT | SPIRE SPT: NOM HK does not restart when commanded |
| 4459 SPIRE SPT | ~~Multiple scripts fail~~, SPIRE SPT: script fails TC info count mismatch. |
| 4462 SPIRE SPT | SPIRE-SPT missing command in cooler script |
| 4460 SPIRE SPT | SPIRE-SPT - script fails improper TC name seq. |
| 446[illegible] - SPIRE SPT | SPIRE-SPT - script errors: waiting time |

THALES

| | | |
|---|---|---|
| ThalesAlenia Space<br>A Thales / Finmeccanica Company | TRR Minutes Applicable<br>H-P-ASED-MN-1599 | REF.: H-P-TASF-AS-RUN-LOG<br>HERSCHEL<br>DATE :<br>PAGE : 2 of |
| **AS-RUN DOCUMENTS RAISED Continuation Sheet** | | PLACE : ESTEC |

| PVS # / Raised against | Description (brief summary of reason document is raised) |
|---|---|
| #8 TP0204 | - BSM test failed → switch-off |
| #9 TP0204 | - Cryo operations |
| #10 TP0204 | - Additional RS test in parallel with test |
| #11 TP0204 | - DRY RUN FOR EMC PROCEDURE |
| #12 TP0204 | - MISSING SCRIPTS |
| #13 TP0204 | - SKIP STEPS PRIOR TO EMC |
| #14 TP0204 | - SCRIPTS TO BE RUN FOR EMC |
| #15 TP0204 | - day 2 of SPT after EMC CS & DEWAR EXCH. |
| #16 TP0204 | - Too warm..... |
| #17 TP0204 | - Packet Store FULL Event. |
| #18 TP0204 | - Additional Steps Needed |
| #19 TP0204 | - problem with script |
| #20 TP0204 | - Repeat test after script correction |

| SPR # / Raised against | Description (same as SPR title) |
|---|---|
| | |

| NCR # / Raised against | Description (same as NCR title) |
|---|---|
| | |

| | | |
|---|---|---|
| ThalesAlenia Space<br>A Thales / Finmeccanica Company | TRR Minutes Applicable<br>H-P-ASED-MN-1599 | REF.: H-P-TASF-AS-RUN-LOG<br>HERSCHEL<br>DATE :<br>PAGE : 3 of |
| **AS-RUN DOCUMENTS RAISED Continuation Sheet** | | PLACE : ESTEC |

| PVS # / Raised against | Description (brief summary of reason document is raised) |
|---|---|
| #21 TP0204 | Move to Spectrometer tests. |
| #22 TP0204 | Cooler Recycle Req'd before Continuing. |
| #23 TP0204 | Microvibration Test (order) |
| #24 TP0204 | Repeat script (Spectrometer Ambient Background Verification) |
| #25 TP0204 | change data rate to 1.5 Mbps |
| #26 TP0204 | CHANGES TO STEPS OF Spec DETECTOR MICROPHONICS TEST |
| #27 TP0204 | RESHUFFLE OF TEST SEQUENCE |
| #28 TP0204 | TABLE IN SECTION 4.1 INCORRECT. |
| #29 TP0204 | ABORT PHOTOMETER DETECTOR MICROPHONICS TEST. |
| #30 TP0204 | Rerun aborted test |
| #31 TP0204 | New load curves |
| #32 TP0204 | SWITCH OFF SPIRE |

| SPR # / Raised against | Description (same as SPR title) |
|---|---|
| | |

| NCR # / Raised against | Description (same as NCR title) |
|---|---|
| | |

THALES

Input PTR for SPIRE SPT

PVS's on PR-0070

| ID | Description |
|---|---|
| 1 | BS SCOE GUI has changed – issue 3 of Procedure released |

PVS's on PR-0204

| ID | Description |
|---|---|
| 1 | CCU data to 8 second update rate instead of 512 (default) |
| 2 | Check IEGSE-CCS time sync |
| 3 | Perform GYRO calibration using TP0227 steps 100 to 260 |
| 4 | Perform OBT time synchronization |
| 5 | Cryo Temperatures OOR |
| 6 | SPIRE Nom HK not restarted when going to PHOTSTBY mode |
| 7 | XPND check, outside of scope of SPIRE tests |
| 8 | BSM test failed -> switch off |
| 9 | CRYO operations |
| 10 | Additional RS test in parallel with SPT CS |
| 11 | Dry run for EMC procedure script |
| 12 | Missing scripts |
| 13 | Skip steps prior to EMC test |
| 14 | Script to be run for EMC |
| 15 | Dewar exchange during day 2 after EMC CS |
| 16 | Changes because FPU too warm |
| 17 | Packet store full (dump, clear CEL) |
| 18 | Additional steps needed in Photometer bias noise optimization (chapter 2.5) |
| 19 | Problem with script in Photometer Ambient Background Verification (chapter 2.8) + changed order of execution |
| 20 | Repeat test after script correction (Photometer Ambient Background Verification - chapter 2.8) |
| 21 | Move to spectrometer tests |
| 22 | Cooler recycle needed |
| 23 | Microvibration configuration |
| 24 | Steps changed during Spectrometer Ambient Background Verification (chapter 2.15) |
| 25 | Change TM rate to 1.5 Mbps |
| 26 | Steps changed during Spectrometer Detector Microphonics |
| 27 | Reshuffle of test sequence + changes needed on Photometer Thermal Control Verification (chapter 2.10) |
| 28 | Test Timeline mismatch between TP-0204 & PRC2704 |
| 29 | Cooler Recycle plus recovery |
| 30 | Repeat previously aborted Photometer Microphonics |
| 31 | Repeat Photometer Ambient Background Verification with new load curves |
| 32 | Switch OFF SPIRE |

SPRs

| ID | Description |
|---|---|
| 673 (re-occurred) | Boot report failure |
| 698 | Time synchronization problems |
| 701 | Install SPIRE scripts for SPIRE SPT |
| 703 | Install corrected SPIRE scripts for SPIRE SPT |

NCRs

| ID | Description |
|---|---|
| 4423 | IEGSE QLA machine setup problems (day 1) |
| 4457 | Problem with settings of VM for:<br>• SPIRE-IST-SCAL2-WARMUP |
| 4458 | SPIRE-IST-SPT-BSM-ON (HK not re-enabled when commanded) – See PVS 6 |
| 4459 Script Change | Script problems due to CUS – scripts inconsistencies:<br>• SPIRE-IST-COLD-FUNC-BSM-01-P<br>• SPIRE-IST-COLD-FUNC-BSM-02-P - missing<br>• SPIRE-IST-COLD-FUNC-BSM-03-P<br>• SPIRE-IST-BSM-CHOP-POS2<br>• SPIRE-IST-LC-PHOT<br>• SPIRE-IST-LC-SPEC<br>• SPIRE-IST-CPS-SPEC<br>• SPIRE-IST-CPS-PHOT<br>• SPIRE-IST-PTC-VM-SUBKTEMP |
| 4460 | SPIRE-IST-BSM-CHOP-POS1 script fails with Improper TC name sequence |
| 4462 | SPIRE-IST-CRECa: Command to switch pump heater back cannot be executed |
| New NCR | Problem with CDMU DFE. System was not time synch every minute with CCS server. AboutTime program (that perform time sync) not running See SPR 698. |
| New NCR | Required L1 Cryo Conditions exceeded 8K compared to 1K |
| 4181 (recurrence) | Problem with IEGSE-CCS communication occurred in SPIRE test. (seen 9 times so far)<br>Note a lot of TMplotting windows open on many workstations. Close |
| New NCR | VC1 Overflow after RAL changed CUS parameters (after previous successful run of script SPIRE-IST-CPS-SPEC). Switch to 1.5Mbps |
| 4008<br>3946 | IFMGR crash(es) maybe related to the 2 existing NCRs listed |
| 4181 | Packets out of order for ACMS script, added to 4181 |

Sunday August 24 2008 2:32 PM

| **Company** | **Project Name** | NCR-No: H-P-112000-ASED-NC-4459 |
|---|---|---|
| ALCATEL | HERSCHEL-PLANCK | Related internal NCR-No: |
| | | Critical Item:Yes ☐ No ☒ Revision 0 |
| | | Page 1 of 3 |

## Nonconformance Report

NCR **Title** SPIRE-SPT in He2: script fails with

NC Item **Identification** HERSCHEL SATELITE,SPIRE,HERSCHEL SVM

Next Higher Assembly HERSCHEL-PLANCK COMPOSITE,HERSCHEL INSTRUMENTS AND TELESCOPE (CFE),HERSCHEL SATELITE

Drawing No Sr No.

Procedure No

Supplier Purchase Order

Subsystem Model FM

**NC Observation**
Date: 20-AUG-08 Location: ESTEC

NC Detected During Test

**Description of Nonconformance**

Requirements Violated

During execution of SPIRE SPT in He2 when executing SPIRE-IST-COLD-FUNC-BSM-01-P the script fails
with "Tcinfos count mismatch", see attached printout.
session i.d.= 2008_08_19_18_25_hercdmu_hpws22_REALTIME_SPIRE_SPT
CDMS=3.6.0.4
ACMS=3.8
HPSDB=Li-1441 iss 17
HPCCS=2.0-1317

On 24 Aug, D.Lamonby input the following updates:
Tcinfos count mismatch attachment added to NCR.

During SPIRE SPT in He2 testing, the following errors arose that are to be included in this NCR:

SPIRE-RAL-PRC-2704 Chapter 2.1 (Start BSM control loop setting)
Script error in SPIRE-IST-BSM-CHOP-POS1 that was delivered on 21-08-08, already a patched script, error is wait time is set to negative 1, remaining part of the script will be executed manually, SPIRE-IST-BSM-CHOP-POS2 also has the same error, both have been modified and patched onto the system.

SPIRE-RAL-PRC-2704 Chapter 2.15 (Start of Spectrometer Ambient Background Verification)
Run SPIRE-IST-CPS-SPEC.tcl two times, run SPIRE-IST-CPS-PHOT.tcl because PCAL flash failed twice with previous script.

SPIRE request modification to test script SPIRE-IST-PTC-VM-SUBKTEMP.tcl
Original script was printed, modified script was printed.
Modified script locally patched, ran script, however no CMD's were sent. Looking at the script, the cmd's sent lines have been commented out. SPIRE request that the script be modified to allow cmd's to be sent.
Modified and locally patched.
Changes to parameters: set point, loop period, Kp, Ki, Kd, lpfgain, lpfcb1, lpfcb2.

Initiator: Date, Name and Signature 23-AUG-08 R. Goossens/ S. Hamer

**Cause of NC**

**Corrective/Preventative Action(s)**

**Verification**

Sunday August 24 2008 2:32 PM

| **Company** | **Project Name** | |
|---|---|---|
| ALCATEL | HERSCHEL-PLANCK | NCR-No: H-P-112000-ASED-NC-4459<br>Related internal NCR-No:<br>Critical Item:Yes ☐ No ☒ Revision 0<br>Page 2 of 3 |

## Nonconformance Report - Continuation Sheet -

| | | |
|---|---|---|
| **NCR Close Out**<br>Close Out Status: Open<br>Reference: | Close Out Date | Disposition: |

Date:
Name:
Signature:

Sunday August 24 2008 2:32 PM

| **Company** | **Project Name** | |
|---|---|---|
| ALCATEL | HERSCHEL-PLANCK | NCR-No: H-P-112000-ASED-NC-4459<br>Related internal NCR-No:<br>Critical Item:Yes ☐ No ☒ Revision 0<br>Page 3 of 3 |

## Nonconformance Report - Continuation Sheet -

**NCR/NRB Attachments**

| | Description | Filename | Last Updated |
|---|---|---|---|
| 1 | Tcinfos count mismatch | Tcinfos count mismatch.pdf | 24-AUG-08 13:28:14 |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: # 1<br>Date 19-08-08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation Herschel PCDU&CDMS nominal switch on/off procedure | Test Procedure HP-2-ASED-PR-0070 | Issue 2 | Rev. |

| | |
|---|---|
| Test step changed Section 7.5 Step 10 | Reason for Change G.U.I. has changed. |

At the dialogue prompt in the script, follow the options in the attached print-out

| | | |
|---|---|---|
| Prepared by: O. Norton | Resp. Test Leader | Project Engineer |
| PA/QA D. Lamonby | Prime | Customer |

NCR.

ORIGINAL SCRIPT.

```
#$Id: SPIRE-IST-PTC-VM-SUBKTEMP.tcl,v 1.1 2008/08/18 16:29:02 herplm Exp $
# @author       $Author: herplm $
# @date         $Date: 2008/08/18 16:29:02 $
# @version      $Revision: 1.1 $
# @purpose      PTC Manual VM test using SUBKTEMP
#
#package require Tk
#
# Set PTC command
#
# Enable logging to screen
setup_win
set ptc_command "tcsend SCV02500 "
logm $ptc_command
#
# Set PTC command parameters
#
set ptc_tab "{SPV4N500 0x51 RAW} "
set ptc_idx "{SPV5N500 0 RAW} "
set ptc_nparm "{SPV6N500 15 RAW} "
set ptc_setpoint "{SPV7N500 0xE74 RAW} "
set ptc_cmd_ctrl "{SPV7N500 0xA8F00000 RAW} "
set ptc_loop_period "{SPV7N500 0xF4240 RAW} "
set ptc_kp "{SPV7N500    0x3BCCCCCD RAW} "
set ptc_ki "{SPV7N500    0x38D1B717 RAW} "
set ptc_kd "{SPV7N500    0x273424DC RAW} "
set ptc_kilimit "{SPV7N500 0x47435000 RAW} "
set ptc_lpfgain "{SPV7N500 0x3F800000 RAW} "
set ptc_lpfcb1 "{SPV7N500  0xC0000000 RAW} "
set ptc_lpfcb2 "{SPV7N500  0xBF800000 RAW} "
set ptc_dacoff "{SPV7N500 0 RAW} "
set ptc_maxdac "{SPV7N500 2048 RAW} "
set ptc_pwmflag "{SPV7N500 1 RAW} "
set ptc_tmflag "{SPV7N500 1 RAW} "
set ptc_initcount "{SPV7N500 60 RAW}"

set ptcparms $ptc_tab$ptc_idx$ptc_nparm$ptc_setpoint$ptc_cmd_ctrl$ptc_loop_perio
d$ptc_kp$ptc_ki$ptc_kd$ptc_kilimit$ptc_lpfgain$ptc_lpfcb1$ptc_lpfcb2$ptc_dacoff$
ptc_maxdac$ptc_pwmflag$ptc_tmflag$ptc_initcount
logm $ptcparms
#
# Send PTC VM command
#
yesorno "Run PTC VM?"
waittime 00.00.01.0000
if  { $user_gen == 4 } {
        infom "User chose No...!!!"
    exit
}

#       eval $ptc_command$ptcparms
        logm $ptc_command$ptcparms
        infom "Press ok to stop VM and switch off PTC heater"
#   tcsend SCV03500
#       tcsend SCD06505 {SPD4N505 "0xA0C60000" RAW} {SPD9N505 "0x0" RAW}

exit
```

MODIFIED 1

CHANGED PARAM's

```
#$Id: SPIRE-IST-PTC-VM-SUBKTEMP.tcl,v 1.1 2008/08/18 16:29:02 herplm Exp $
# @author        $Author: herplm $
# @date          $Date: 2008/08/18 16:29:02 $
# @version       $Revision: 1.1 $
# @purpose       PTC Manual VM test using SUBKTEMP
#
#package require Tk
#
# Set PTC command
#
# Enable logging to screen
setup_win
set ptc_command "tcsend SCV02500 "
logm $ptc_command
#
# Set PTC command parameters
#
set ptc_tab "{SPV4N500 0x51 RAW} "
set ptc_idx "{SPV5N500 0 RAW} "
set ptc_nparm "{SPV6N500 15 RAW} "
set ptc_setpoint "{SPV7N500 0x234A RAW} "
set ptc_cmd_ctrl "{SPV7N500 0xA8F00000 RAW} "
set ptc_loop_period "{SPV7N500 0x30D40 RAW} "
set ptc_kp "{SPV7N500    0xBF4CCCCD RAW} "
set ptc_ki "{SPV7N500    0xBD4CCCCD RAW} "
set ptc_kd "{SPV7N500    0xB2D6BF95 RAW} "
set ptc_kilimit "{SPV7N500 0x47435000 RAW} "
set ptc_lpfgain "{SPV7N500 0x3FC8547F RAW} "
set ptc_lpfcb1 "{SPV7N500  0xBF924D2F RAW} "
set ptc_lpfcb2 "{SPV7N500  0xBED35ABB RAW} "
set ptc_dacoff "{SPV7N500 0 RAW} "
set ptc_maxdac "{SPV7N500 2048 RAW} "
set ptc_pwmflag "{SPV7N500 1 RAW} "
set ptc_tmflag "{SPV7N500 1 RAW} "
set ptc_initcount "{SPV7N500 60 RAW}"

set ptcparms $ptc_tab$ptc_idx$ptc_nparm$ptc_setpoint$ptc_cmd_ctrl$ptc_loop_perio
d$ptc_kp$ptc_ki$ptc_kd$ptc_kilimit$ptc_lpfgain$ptc_lpfcb1$ptc_lpfcb2$ptc_dacoff$
ptc_maxdac$ptc_pwmflag$ptc_tmflag$ptc_initcount
logm $ptcparms
#
# Send PTC VM command
#
yesorno "Run PTC VM?"
waittime 00.00.01.0000
if  { $user_gen == 4 } {
        infom "User chose No...!!!"
    exit
}

#       eval $ptc_command$ptcparms
        logm $ptc_command$ptcparms
        infom "Press ok to stop VM and switch off PTC heater"
#   tcsend SCV03500
#       tcsend SCD06505 {SPD4N505 "0xA0C60000" RAW} {SPD9N505 "0x0" RAW}

exit
```

MOD 2

```
#$Id: SPIRE-IST-PTC-VM-SUBKTEMP.tcl,v 1.1 2008/08/18 16:29:02 herplm Exp $
# @author       $Author: herplm $
# @date         $Date: 2008/08/18 16:29:02 $
# @version      $Revision: 1.1 $
# @purpose      PTC Manual VM test using SUBKTEMP
#
#package require Tk
#
# Set PTC command
#
# Enable logging to screen
setup_win
set ptc_command "tcsend SCV02500 "
logm $ptc_command
#
# Set PTC command parameters
#
set ptc_tab "{SPV4N500 0x51 RAW} "
set ptc_idx "{SPV5N500 0 RAW} "
set ptc_nparm "{SPV6N500 15 RAW} "
set ptc_setpoint "{SPV7N500 0x234A RAW} "
set ptc_cmd_ctrl "{SPV7N500 0xA8F00000 RAW} "
set ptc_loop_period "{SPV7N500 0x30D40 RAW} "
set ptc_kp "{SPV7N500    0xBF4CCCCD RAW} "
set ptc_ki "{SPV7N500    0xBD4CCCCD RAW} "
set ptc_kd "{SPV7N500    0xB2D6BF95 RAW} "
set ptc_kilimit "{SPV7N500 0x47435000 RAW} "
set ptc_lpfgain "{SPV7N500 0x3FC8547F RAW} "
set ptc_lpfcb1 "{SPV7N500  0xBF924D2F RAW} "
set ptc_lpfcb2 "{SPV7N500  0xBED35ABB RAW} "
set ptc_dacoff "{SPV7N500 0 RAW} "
set ptc_maxdac "{SPV7N500 2048 RAW} "
set ptc_pwmflag "{SPV7N500 1 RAW} "
set ptc_tmflag "{SPV7N500 1 RAW} "
set ptc_initcount "{SPV7N500 60 RAW}"

set ptcparms $ptc_tab$ptc_idx$ptc_nparm$ptc_setpoint$ptc_cmd_ctrl$ptc_loop_perio
d$ptc_kp$ptc_ki$ptc_kd$ptc_kilimit$ptc_lpfgain$ptc_lpfcb1$ptc_lpfcb2$ptc_dacoff$
ptc_maxdac$ptc_pwmflag$ptc_tmflag$ptc_initcount
logm $ptcparms
#
# Send PTC VM command
#
yesorno "Run PTC VM?"
waittime 00.00.01.0000
if  { $user_gen == 4 } {
        infom "User chose No...!!!"
    exit
}


        eval $ptc_command$ptcparms
        logm $ptc_command$ptcparms
        infom "Press ok to stop VM and switch off PTC heater"
    tcsend SCV03500
        tcsend SCD06505 {SPD4N505 "0xA0C60000" RAW} {SPD9N505 "0x0" RAW}

exit
```

UNCOMMENTED CMD'S TO

ALLOW COMMANDS TO BE

SENT.

```
                           TM Packet Query Display
                           =======================

   TM Packet Details
   -----------------

Mnemonic: SVMCPYTBLFLT   Description: VM_COPYTABLE_FAULT                    Simulated: N

S/C ID: 486        G/S ID: 0          SLE ID: 0      OCC ID: 0      VCID: 0      HFA D/S: 65535

Data Unit Type: GOOD SP               Time Stamp Type: PG           Time Quality: G

APID: 1280         SSC: 9705          Type: 5        Subtype: 1     PI1: 1302    PI2: 20886

SPID: 190760500          TPSD: -1          HFA Counter: 6           Filing: E  Distribution: E

Time Field: Y         Packet Period:       0 [msec]      CRC: ?      Event Severity: ?


   TM Packet Parameter Data
   ------------------------
Generation time: 2008.236.01.12.39.001    Reception time: 2008.236.01.12.44.884


   TM Packet Raw Data
   ------------------

SCOS-2000 Header:
0000:0000 0000 0764 AF48 7804 0000 0C64 AF48 6380 0D00 0100 0000 E601 0000 8001 0000
0020:1138 FFFF 0600 0000 34C6 5E0B 0000 0000 0000 0000 FFFF FFFF 10FF 0005 E925 0501

Packet Raw Data:
0000:0D00 E5E9 0139 0005 0100 5F41 C287 004B 0516 5196 B000 1562 8000 0000 1EA6 0001
0020:0051 0120 6152 0028 0000 0001 3C68 FFFF FFFF 0000 0000 0000 0000 0000 FFFF 0000
0040:0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0060:0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 FFFF
0080:0000 0052 0000 0000 0000 0064 0000 0000 0000 014B 0000 0173 0000 0028 0000 0000
00A0:0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
00C0:014B 0000 07D0 0000 0000 0000 0BB8 BD4C CCCD B2D6 BF95 C743 5000 3FC8 547F BF92
00E0:4D2F BED3 5ABB 0000 0000 0000 0800 0000 0001 0000 0001 0000 0001 0000 0000 0000
0100:0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0120:0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0100 0000 0000 0000 0000 1959
```

| | | |
|---|---|---|
| | Test Change | Curr. No.: 1<br>Date 18/08/2008<br>Page 1 of 1 |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT at He2 | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed<br>Chapter 7.5.1.5 | Reason for Change<br>CCU data in 8 second update rate (instead of 512) | | |

- Do not execute K102999ECVT001_ASDGENCCU_MnEBOTH1.tcl (if it has been performed already, execute K102999ECVT001_ASDGENCCU_MnDBOTH1.tcl) ✓
- Execute K102999ECVT001_ASDGENCCU_MnEBOTH2.tcl ✓
- EXECUTE K102999ECVT031_ASDGEN_CCU_LOG.tcl TO RECORD TEMPS ✓
- FROM TEST CONDUCTOR CONSOLE EXECUTE "resetsccparams K*" ✓

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsen | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby | Prime | Customer |

| | Test Change | Curr. No.: 2<br>Date 18/08/2008<br>Page 1 of 1 |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT at He2 | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| Chapter 7.5.1.9 | Check IEGSE-CCS time sync |

- Execute Y102999ETVT036_ASDGEN_VERSPIREIEGSE.tcl.
- Check that the time difference is lower than 1 second (IEGSE in the future). If not, request RAL/SPIRE to synchronise with the CCS server. Use operator note 48 if SPIRE requires some help with the synchronisation.

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsen | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby | Prime | Customer |

# Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | Curr. No.: #3<br>Date 19/8/08<br>Page 1 of 1 | |
| Test designation<br>SPIRE IST SPT | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed<br>STEP 7.5.15 | Reason for Change<br>PERFORM GYRO CAL | | |

PERFORM STEPS 100 TO 260 OF TP - 0227 (GYRO EARTH RATE CALIBRATION)

✓

| | | |
|---|---|---|
| Prepared by:<br>S. ELSLEY | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

|  |  |  |  |
|---|---|---|---|
|  | Test Change | Curr. No.: #4<br>Date 20/08/08<br>Page 1 of 1 | |
| Test designation<br>SPIRE SPT @ HELL | Test Procedure<br>TP 0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed<br>7.5.18. | Reason for Change<br>TIME SYNCRO ERROR | | |

Perform SYNCRO

EXECUTE TEST SCRIPT

✓ D102159SCUT032 TIMESYNCRO.tcl

04:34
20.08.08

17.46 → retry.

|  |  |  |
|---|---|---|
| Prepared by: B HOGG | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | Test Change | Curr. No.: 5<br>Date 20/08/08<br>Page 1 of |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT | TP-204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| Section 7.5.3.1.<br>7.5.3.2. | Cryo temperatures out of range. |

1) Skip above test step for now and continue with section 7.5.3.2 & 7.5.3.3

2) In ~~Step~~ Section 7.5.3.2.1.
Skip SPIRE-IST-SPT-PDET-ON.
Continue with section 7.5.3.3 with
Mode in BSM_INIT (PHOTO STBY expected)

3) In Section 7.5.3.3.
Because 7.5.3.3.1 SPIRE-IST-COLD-FUNC-BSM-01-P
failed (cause unknown - NCR reqd)
continue with 7.5.3.3-2.

4) In Section 7.5.3.3.
Because SPIRE-IST-COLD_FUNC-BSM-02-P
missing continue with 7.5.3.3.3.
(Performs Chop & Jiggle). Then continue with
7.5.3.3.4

| Prepared by:<br>S.HAMER | Resp. Test Leader | Project Engineer |
|---|---|---|
| PA/QA<br>R. Goossens | Prime | Customer |

# Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | Curr. No.: 6<br>Date 20/08/08<br>Page 1 of | |
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-204 | Issue<br>1 | Rev.<br>2 |
| Test step changed Section 7.5.3.2<br>7.5.3.2.1 | Reason for Change<br>Nom HK Not Restarted | | |

SPIRE-IST-SPT-BSM-ON does not restart Nom HK. TM. Send restart HK manually
- SCR00500 Define New HK Report. OK SH

| | |
|---|---|
| ↳ SPR0N500 | 0x301 |
| SPR1N500 | 0x301 |
| SPR2N500 | 0x3E8 |
| SPR3N500 | 0x1 |
| SPR4N500 | 0x1 |

| | | |
|---|---|---|
| Prepared by:<br>S. Hamer | Resp. Test Leader | Project Engineer |
| PA/QA<br>R. Goossens | Prime | Customer |

# Procedure Variation Summary

| | Test Change | Curr. No.: #7<br>Date 200808<br>Page 1 of 1 |
|---|---|---|

| Test designation<br>XPND Check | Test Procedure<br>TP_0204 | Issue<br>1 | Rev.<br>2 |
|---|---|---|---|

| Test step changed<br>additional test | Reason for Change<br>Perform this check outside scope of SPIEE test |
|---|---|

① Switch XPND 1 ON. sending TC DCN83170 ~~DC13E170~~ Ttc Command XPND1 ~~IXT~~
and DC03E170 ~~DC16E170~~. Ttc Command Tx1OFF ~~Xpnd1On~~.

② Configure XPND1 by sending with TOPE (not Manual Stack)
TC DCT18170 with parameters

| | | | |
|---|---|---|---|
| 4DH019170 | "XpndInUseLogic.4 | 4DH020170 | 0 4 |
| " 220 " | 1 | 021 | 0 |
| 221 | 1 | 022 | 0 |
| : : : | : | 023 | 0 |
| " 227 " | 1 | 024 | ON |
| DH228170 | 7 | 025 | 0 |
| DH229170 | 15 | 026 | 0 |
| DH230170 | 1 | 027 | 0 |
| DH.231170 | 1 | 028 | 0.6 |
| 4DH232170 | 15.4 | 029 | 1.2 |
| | | 030 | 0 |
| | | 031 | 0 |
| | | 032 | -4 |

③ Switch XPND1 OFF sending TC. DCN82170 Ttc Command XpndInUseOff.

| | | |
|---|---|---|
| Prepared by:<br>OM/ADE | Resp. Test Leader<br>~~ADE~~ | Project Engineer |
| PA/QA R. Goossens | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 8<br>Date 20/08/08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |

| | |
|---|---|
| Test step changed<br>before 7.5.31.2 | Reason for Change<br>BSM ~~test~~ failed → switch off. |

① Call script SPIRE_IST_SPT_BSM_OFF.

| | | |
|---|---|---|
| Prepared by:<br>N. SONN. | Resp. Test Leader | Project Engineer |
| PA/QA<br>R Goossens | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 9<br>Date 20/08/08<br>Page of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |

| | |
|---|---|
| Test step changed<br>See below | Reason for Change<br>Cryo Operations |

In SPIRE-RAL-PRC-2704 Iss 3.4. Section 2.2.1

Stop cooler Recycling, early to allow for cryo operations., by continuing script SPIRE-IST-CRECM

| | | |
|---|---|---|
| Prepared by:<br>S. HAMER | Resp. Test Leader | Project Engineer |
| PA/QA<br>R. Goossens | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.# 10<br>Date 20-08-08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT in He 2 | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |

| | |
|---|---|
| Test step changed<br>7.5.3.10.1 | Reason for Change<br>new issue |

Use SPIRE CS Test procedure issue 1.1 instead 1.0

SPIRE-RAL-PRC-003040

This procedure also includes RS tests

(as discussed during TRR)

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsen | Resp. Test Leader<br>S. Ilsen | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No #11<br>Date 20 – 08 – 08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT in He2 | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |

| | |
|---|---|
| Test step changed<br>After 7.5.3.3.4. | Reason for Change<br>DRY RUN FOR EMC PROCEDURE |

Run script: SPIRE=IST-EMC-SPOT,tcl

| | | |
|---|---|---|
| Prepared by:<br>D.LAMONBY | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby. | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 12<br>Date 20/08/08<br>Page of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT (EMC) | Test Procedure<br>TP 204 | Issue<br>1 | Rev.<br>2 |
| Test step changed<br>7.5.3.4.5 chapter 7.5.3.4 | Reason for Change<br>missing scripts | | |

→ from chapter 2.4 of SPIRE-RAL-PRC-2704
skip steps 1 – 4.

Run step 5

run SPIRE-IST-RESET_PHOT-OFFSETS.tcl

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsen | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: [illegible] 13<br>Date 20/08/08<br>Page 1 of 1 |

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPiRE SPT | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| 7.5.3 | skip tests |

start of Enc tests

skip 7.5.3.5 & 7.5.3.6 & 7.5.3.7 & 7.5.3.8 &
7.5.3.9 &
→ start SPiRE-IST-OUS-PHOT156.tcl
start 7.5.3.10

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

page 1
PVS 14

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: ~~[illegible]~~ 14<br>Date 20/06/06<br>Page 1 of 2 |

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT + EMC | TP 0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| 7.5.3.10 | more details on execution EMC |

chapter 6.1.2 of SPIRE-RAL-PRC-003040

Switch from PHOTSTBY to REDY → chapter 4.3 of SPIRE-RAL-PRC-2704 21:10

Steps 1 → 4 → S 102 999 SCUT 028 _ ASD SPT SPIR _ PWR _ OFF _ P 21:14

Steps 9 → 10 → S 102 999 SCUT 027 _ ASD SPT SPIR _ PWR _ ON _ P 21:29

Step 11 → Send manual command

~~> SPIRE-IST-OVS-PHOT.tcl~~ SC D06505 with value 0x A0C40DEB 21:37

Step 12 → SPIRE-IST-SPT-BSM-ON 21:38

→ SPIRE-IST-SPT-BSM-INIT 21:40

→ SPIRE-IST-SPT-PDET-ON 21:44

> Switch back to REDY because No HK on APID 1280 (HK on APID 1282 ok)

→ SPIRE-IST-SPT-PDET-OFF.tcl 21:46

→ SPIRE-IST-SPT-BSM-OFF.tcl 21:50

> switch back to PHOTSTBY

SPIRE-IST-SPT-BSM-ON.tcl

→ apply PUS 6 again (to send SCR00500)

SPIRE-IST-SPT-BSM-INIT.tcl

SPIRE-IST-SPT-PDET-ON.tcl 22:05

> SPIRE-IST-OVS-PHOT156.tcl 22:06

> SPIRE-IST-RESET-PHOT-OFFSETS.tcl

> SPIRE-IST-START-TEST.tcl

> SPIRE-IST-EMC-SPOT.tcl

22:13

| | | |
|---|---|---|
| Prepared by:<br>S. Ibn | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

page 2

PUS 14

CONTINUATION

# Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | Curr. No.:<br>Date<br>Page of | |
| Test designation | Test Procedure | Issue | Rev. |
| Test step changed | Reason for Change | | |

at step 218 of SPIRE-RAL-PRC-003040:

SPIRE-IST-END-TEST.tcl

23:30 chapter 4.3 of SPIRE-RAL-PRC-2704 ) Switch from

23:35 chapter 4.4 of " ) PHOTSTBY to REDY to SPECSTBY

↳ repeat PUS 6

SPIRE-IST-DNS-SPEC240.tcl

SPIRE-IST-RESET-SPEC-OFFSET.tcl

SPIRE-IST-start-Test.tcl

→ perform tests to steps 421 + SPIRE-IST-END-TEST. + chapter 4.5 (SPECSTBY to REDY)

Steps 422 + 423 → S102999SCUT028-ASDSPTPIR-PWR-OFF-P

continue chapter 6.2.2 of SPIRE-RAL-PRC-003040

steps 5 + 6 → S102999SCUT027-ASDSPTSPIR-PWR-ON-P

step 7 send manually SCD06505 (0xA0C40DEB)

01:16 step 8 : chapter 4.2 of SPIRE-RAL-PRC-003040

+ PUS 6 repeat

SPIRE_IST_DNS_PHOT156 + SPIRE_IST_RESET_PHOT_OFFSETS

SPIRE_IST_START_Test

→ continue at step 14 of chapter 6.22

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

Page 3
P/S # 14
CONTINUATION

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.:<br>Date<br>Page of |

| | | | |
|---|---|---|---|
| Test designation | Test Procedure | Issue | Rev. |

| | |
|---|---|
| Test step changed | Reason for Change |

~~STOP @ STEP 116 OF 003040~~
EMC PART 3 COMPLETED PERFORM THE FOLLOWING

Section 4.3 of TP SPIRE_RAL-PRC-2704
Section 4.4 of —— " ——
PERFORM P/S # 6.
EXECUTE SCRIPT SPIRE-IST-DNS-SPEC 240
SPIRE_IST_RESET_SPEC-OFFSET
SPIRE_IST_START_TEST

CONTINUE @ STEP 216 OF SPIRE-RAL-PRC-003040
STOP @ STEP 319 OF PRC 003040
EXECUTE SPIRE_IST_END_TEST
JUMP TO STEP 632 OF 003040
EXEC IST_START_TEST
IST_EMC_SPOT.

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: #15<br>Date 21-08-'08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed<br>See below | Reason for Change<br>Day 2 of SPT after EMCCS & Dewar Exch | | |

Restart SPT. after Dewar Exchange.!

1) Perform section 7.5.3.2 step 7.5.3.2.1

2) Continue from section 7.5.3.4.4

3) Before step 1 of 2.4 (PRC-2704) execute script SPIRE-IST-DNS-PHOT. to set default settings for photometer detectors.

| | | |
|---|---|---|
| Prepared by:<br>S. Hancal | Resp. Test Leader | Project Engineer |
| PA/QA<br>Rien Goossens | Prime | Customer |

# Procedure Variation Summary

|  | Test Change | Curr. No.: #16<br>Date 21-08-'08<br>Page 1 of 1 |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| See below. | Too warm. |

16.1 - In Annex 2.1 (PRC-2704) Section 2.4 after step 2 perform automatic cooler recycling as per section 7.5.5.2.3 of TP-0204.

~~When complete continue with step 3~~

16.2 - ~~In Annex 2.1 (PRC-2704) Section 2.4 of TP-0204~~

Send manual command to restart pump heater:

SCD06505, SPD4N505 = 0XA0C40DEB (NCR- )

16.3 Return SPIRE to PHOTOSTANDBY by executing Section 4.2 of PRC-2704. (Running PVS6 after step 1)

When complete continue with step 3 of section 2.4 (PRC-2704)

| Prepared by: | Resp. Test Leader | Project Engineer |
|---|---|---|
| S. HAMER | | |
| **PA/QA** | **Prime** | **Customer** |
| R. Goossens | | |

Prs #16.

### 7.5.5.2 Cooler Recycle (automatic) . 21/08/08 09:48

| 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.5 Procedure: IST-SPECSTBY to REDY mode** | | | REDY. | | ✓ | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-SCU-07** | | | N/A | | ✓ | |
| 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:<br>**2.3 Procedure: Cooler Recycle (automatic)** | | | OK | | ✓ | |
| | **SPIRE in REDY mode with cooler recycled and detectors at <= 300 mK** | | | | | | |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: # 17<br>Date 21-08-08<br>Page 1 of 2 |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRESPT in He2 | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |
| Test step changed | Reason for Change<br>Packet Store Full Event | | |

→ CEL store full (5,4) event received

1) Dump packet store CEL A & B (14:22 - 15:09)

Dcl 159SCVT188_IST_DUMP_PKT_STORE CEL_A CEL_B

2) Delete packet store CEL A&B upto 15:00 (15:12)
Using tc DC167160 N=2 storeid=7F storeId=FF

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader<br>Stijn | Project Engineer |
| PA/QA | Prime | Customer |

PVS#17 sht 2 of 2

```
                              TM Packet Query Display
                              =======================

   TM Packet Details
   -----------------

Mnemonic: D_EvRp_416     Description: CdmuBsw Event 5-4 Packet Store Full          Simulated: N

S/C ID: 486        G/S ID: 0             SLE ID: 0        OCC ID: 0        VCID: 0        HFA D/S: 65535

Data Unit Type: GOOD SP                  Time Stamp Type: PG               Time Quality: G

APID: 16           SSC: 7642             Type: 5          Subtype: 4       PI1: 16        PI2: 16

SPID: 45416160           TPSD: -1              HFA Counter: 0              Filing: E   Distribution: E

Time Field: Y          Packet Period:        0 [msec]        CRC: ?        Event Severity: ?


   TM Packet Parameter Data
   ------------------------
Generation time: 2008.234.14.19.33.603    Reception time: 2008.234.14.19.37.055


   TM Packet Raw Data
   ------------------

SCOS-2000 Header:
0000:0000 0000 7579 AD48 FE33 0900 7979 AD48 39DA 0000 0100 0000 E601 0000 6000 0000
0020:1138 FFFF 0000 0000 E0FE B402 0000 0000 0000 0000 FFFF FFFF 10FF 1000 DA1D 0504

Packet Raw Data:
0000:0810 DDDA 0019 0005 0400 5F3F D7F5 9A67 0010 0010 0000 007F 0000 0000 0007 0544
```

Packetstore ID

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No. # 18<br>Date 21-08-08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>Spire SPT He2 | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |

| | |
|---|---|
| Test step changed<br>chapter 2.5 of RAL-PRC-2704 | Reason for Change<br>additional steps needed. |

after step 2 execute:

→ SPIRE-IST-RESET-PHOT-OFFSETS.tcl

| | | |
|---|---|---|
| Prepared by:<br>S.Th | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonty | Prime | Customer |

# SPR Formsheet

**Nr.:** 701

**Date:** 21/08/2008

**Author:** U. Klenke

**Classification:**

**Test:** SPIRE SPT

**Session ID:** 2008_08_19_18_25_hercdmv_hpws22_REALTIME_SPIRE_SPT

**Subsystem:**

**Title:** Install SPIRE scripts for SPIRE SPT

**Type: (Script/Picture /Test structure):**

**Name:**

**Version:**

**Problem description (to be filled by Test conductor (TC) / Test operator (TO)):**

**Time (UTC):** 06:34 **Step no:**

Some SPIRE scripts are missing for the SPIRE SPT. These scripts shall be installed on the HPCCS.

**Proposed solution (to be filled by TC / TO):**

Install the missing scripts

**Review board decision (to be filled by TC, TO, QA plus Engineering / experts if required):**

**Implement as proposed:** ☒ **Reject:** ☐

**Other:**

**Proposed rerun (Date / Test case):** 21/08/2008 SPIRE SPT

**Date:** 21/08/2008

**Participants:** U. Klenke S. Hamer

**Implemented:** ☒

**Code inspected:** ☐ N/A

**Confirmed by Test Conductor(s) / Experts to check-in:** ☐

**Date:** 21/08/2008

**Name:** S. Hamer

**Close out (Functional team member & QA):**

**Verified during test case / ID:** SPIRE SPT / 2008_08_19_18_25_ _SPIRE_SPT

**Date:** 21/08/2008

**Version:** N/A

**Func. Team Name:** U. Klenke

**Date:** 21 08 '08

**QA:** R. Goossens

```
21/08/2008  07:21        242,768 SPIRE-IST-PHASEUP-PHOT100.tcl  ✓
21/08/2008  07:21        242,768 SPIRE-IST-PHASEUP-PHOT130.tcl  ✓
21/08/2008  07:20        242,768 SPIRE-IST-PHASEUP-PHOT190.tcl  ✓
21/08/2008  07:21        242,767 SPIRE-IST-PHASEUP-PHOT70.tcl  ✓
21/08/2008  07:20        217,930 SPIRE-IST-PHASEUP-SPEC160.tcl  ✓
21/08/2008  07:20        217,930 SPIRE-IST-PHASEUP-SPEC240.tcl  ✓
21/08/2008  07:20        217,929 SPIRE-IST-PHASEUP-SPEC80.tcl  ✓
21/08/2008  07:19        133,873 SPIRE-IST-PTC-PWR.tcl        ✓
```

SPIRE FM SPTs Release Note: SPIRE_FM_SPTs_12August2008_release_note.txt

================================================================================================

Date of Release : 16th July 2008
SPT Scripts Archive: SPIRE_FM_SPT_Scripts_12August2008.tar.gz
Author: Sunil D. Sidher

Description:

============

Extra procedures and scripts missing from the 12th August release for the SPIRE Specific Performance Tests (SPTs) at ESTEC. Tests are to be performed in the presence of SPIRE I-EGSE staff.

First Delivery:

=============================================================================================================

Previously Known Issues:

========================

Procedure:

==========

SPIRE-RAL-PRC-002704, Issue 2.4, 12th August 2008

Test Scripts:

=============

Number of scripts in SPT Scripts Archive: 10

Contents of SPT Scripts Archive:

-------------------------

The following get parameters from the IEGSE:
SPIRE-IST-PHASEUP-PHOT70.tcl
SPIRE-IST-PHASEUP-PHOT100.tcl
SPIRE-IST-PHASEUP-PHOT130.tcl
SPIRE-IST-PHASEUP-PHOT190.tcl ) already loaded
SPIRE-IST-PHASEUP-SPEC80.tcl
SPIRE-IST-PHASEUP-SPEC160.tcl
SPIRE-IST-PHASEUP-SPEC240.tcl
SPIRE-IST-PTC-PWR.tcl
SPIRE-IST-CPS-SPEC.tcl → ✓
SPIRE-IST-CPS-PHOT.tcl → ✓

The following should run WITHOUT parameters from the IEGSE:
./Standalone Scripts/SPIRE-IST-BSM-CHOP-POS1.tcl ✓
./Standalone Scripts/SPIRE-IST-BSM-CHOP-POS2.tcl ✓

-----------------------------------------------------------------

Scripts need to be tagged SPIRE_SPT_PROC_V3_4 in the SPIRE CVS respository.

-----------------------------------------------------------------

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: # 19<br>Date 21-08-08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT He2 | Test Procedure<br>TP-0204 | Issue<br>1.2 | Rev. |
| Test step changed<br>2.8 of RAL-PRC-2704 | Reason for Change<br>problem with Script in 2.8 + change of order during night 2 | | |

- load curve failed (script error)
- -> skip rest of 2.8
- + skip 2.9
- + skip 2.10
- → SPIRE-IST-ONS-PHOT
- continue with 2.11 PCAL Photometer Characterisation ✓
- after 2.11 continue with 2.6 Photometer noise stability versus bias frequency

- goto 2.1 BSM control loop setting
  ↳ During execution of SPIRE-IST-BSM-CHOP-POS1.tcl waittime -1 caused TOPE error
  Remaining part of commands executed by pasting them into SPIRE-IST-BSM-CHOP-POS1_remainingaftererror.tcl
  patch SPIRE-IST-BSM-CHOP-POS2.tcl to correct for the same problem
- -> SPIRE-IST-RESET-PHOT-OFFSETS.tcl

← ~~SPIRE-IST-ONS-PHOT.tcl~~

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsen | Resp. Test Leader | Project Engineer |
| PA/QA D. Lamonby | Prime | Customer |

page 2 of

# Procedure Variation Summary

CONTINUATION

|  | Test Change | Curr. No.: # 19 CONT<br>Date 22/08/08<br>Page 2 of |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT He2 | TP-020d | 1.2 |  |

| Test step changed | Reason for Change |
|---|---|
| see below | on request |

02:16 + SPIRE_IST_DNS_PHOT.tcl

02:12 + SPIRE_IST_RESET_PHOT_OFFSETS.tcl

02:42 + SPIRE_IST_PTC_PWR.tcl

| Prepared by: | Resp. ~~Test~~ Leader | Project Engineer |
|---|---|---|
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: #20<br>Date 22/08/08<br>Page 1 of 1 + 2 ann. |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |

| | |
|---|---|
| Test step changed<br>See Below | Reason for Change<br>Repeat test after Script Correction (SPR-703) |

1) End of section 7.5.3.8.
Repeat section 7.5.3.7 (i.e. section 2.8 of PRC-2704) after upload of script 'SPIRE-IST-LC-PHOT.tcl.

| | | |
|---|---|---|
| Prepared by:<br>S HAMER | Resp. Test Leader | Project Engineer |
| PA/QA<br>R Goossens | Prime | Customer |

PVS #20 p1

## 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:**

22/8/2008

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure | |
|---|---|---|---|---|---|---|
| 1 | Execute TCL script SPIRE-IST-CPS-PHOT.tcl<br>• Standard PCAL flash for photometer | N/A | Detector signal N+/-dN mV | | OK | 06:54 |
| 2 | Execute TCL script SPIRE-IST-LC-PHOT.tcl<br>• Standard Load Curve | N/A | N/A | | NOK 07:05 OK 07:41 | 06:58<br>07:15 |

QA: R. Goossens 22/8/2008 07:05
07:41

PV#20 p 2

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 3 | Execute TCL script SPIRE-IST-CPS-PHOT.tcl<br>• Standard PCAL flash for photometer | N/A | Detector signal N+/-dN mV | | OK |
| 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):** | | | | | |
| | | | | | |

07:42

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

22/8/2008 07:46

# Procedure Variation Summary

| | Test Change | Curr. No.: #21<br>Date 22/08/08<br>Page 1 of |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT. | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| See Below | Move to Spectrometer Tests. |

22/08/08 1) At end of 7.5.3.7.

07:50 - Switch from PHOT STBY to REDY (PRC-2704 section 4.3)

07:54 - Switch from REDY to SPEC STBY (PRC-2704 section 4.4)
(using PVSB where appropriate)

2) Continue testing from section 7.5.5.3

08:02 - Run SPIRE-IST-RESET-SPEC-OFFSETS

| Prepared by: | Resp. Test Leader | Project Engineer |
|---|---|---|
| S. HARGR | | |
| PA/QA R. Goossens | Prime | Customer |

# Procedure Variation Summary

|  | Test Change | Curr. No.: #22<br>Date 22 08 08<br>Page 1 of |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| See Below | Cooler Recycle Req'd before continuing |

22/08/08 At end of Section 7.5.5.3:

09:26 1.) Bring SPIRE back to REDY: (PRC-2704 Section 4.5)

09:33 2) Perform Cooler Recycle (Auto): (PRC-2704 Section 2.3) with updated Script (SPR-703 refers)

12:30 3) Bring SPIRE back to SPEC STDBY (PRC-2704 Section 4.4) + PUS 6

| Prepared by: | Resp. Test Leader | Project Engineer |
|---|---|---|
| S. Hamer | S. Hamer |  |
| PA/QA R. Goossens | Prime | Customer |

# Procedure Variation Summary

|  | Test Change | Curr. No.: 23<br>Date 22-8-08<br>Page 1 of |
|---|---|---|

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT @ He 2 | TP-0204 | 1 | 2 |

Test step changed

Reason for Change
Microvibration test (order)

Run chapter 7.5.5.7 to pre-configure for Microvibration Test

→ 7.5.5.7.14 : Acc mode is 'OCM pnt fine'
instead of 'OCM pnt coarse'

Run 7.5.5.8 and wait at 7.5.5.8.2 until SPIRE is ready

→ A102109SPUT208_ACMS_RWL-SPIRE_uVIB.tcl
should be
A102109SPUT213_ACMS_RWL-SPIRE_uVIB.tcl

update procedure

| | | |
|---|---|---|
| Prepared by: S. [illegible] | Resp. Test Leader | Project Engineer |
| PA/QA D.Lamonby | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 24<br>Date 22-8-08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT @ He 2 | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed | Reason for Change<br>repeat script (Spectrometer Ambient Background verification) | | |

1) repeat SPIRE-IST-CPS-SPEC.tcl
SPIRE-IST-CPS-PHOT.tcl
SPIRE-IST-CPS-SPEC.tcl
SPIRE-IST-DNS-SPEC.tcl
SPIRE-IST-CPS-SPEC.tcl
SPIRE-IST-CPS-SPEC.tcl

2) Run SPIRE-IST-CCS-LC-SPEC.tcl instead of
SPIRE-IST-LC-SPEC.tcl

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsa | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby | Prime | Customer |

# Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | Curr. No.: 25<br>Date 22-8-08<br>Page 1 of | |
| Test designation<br>SPIRE SPT @ He 2 | Test Procedure<br>TP-0204 | Issue<br>1 | Rev.<br>2 |
| Test step changed | Reason for Change<br>change data rate to 1.5 Mbps | | |

VC 1 que full received → too much science data ~~received~~. being generated.

change data rate to 1.5 Mbps → use TC DC27F170

| | | |
|---|---|---|
| Prepared by:<br>S. Ilsn | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. lamonby | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 25<br>Date<br>Page of |

| | | | |
|---|---|---|---|
| Test designation | Test Procedure | Issue | Rev. |

| | |
|---|---|
| Test step changed<br>chapter 2.16 step 2 | Reason for Change<br>changes to 2.16 SCAL Photometric Verification |

1) run SPIRE-IST-DNS-SPEC.tcl
SPIRE-IST-RESET-SPEC-OFFSETS.tcl
SPIRE-IST-CPS-SPEC.tcl

2) run SPIRE-IST-SCAL 2-WARMUP.tcl

3) PERFORM Sec 4.5 of SARE-RAL-PRC-2704 (SPEC STBY to READY)

4) SEND MANUAL CMD - REPORT TABLE 0x50, 0, ~~100~~ 0x64
SEND ——— " ——— UPDATABLE CMD TABLE ID 0x50
INDEX 73 DEC
N 1
DATA 0X 63FD0010
SEND ——— " ———> REPORT TABLE 0x50, 0, 0X64.

5) PERFORM Sec 4.4 SPIRE REDY TO SPEC STBY NEED TO INCLUDE PUS#6 AFTER 1ST SCRIPT EXECUTION.

Run SPIRE_IST_RESET_SPEC_OFFSETS.tcl..
SPIRE_IST_DNS_SPEC.tcl
SPIRE_IST_RESET_SPEC_OFFSETS.tcl
SPIRE_IST_CPS_SPEC

6) SPIRE-IST-RESET-SPEC-OFFSETS.tcl

7) run SPIRE-IST-CCS-LC-SPEC instead of SPIRE-IST-LC-SPEC

8) continue with Chapter 2.22

| | | |
|---|---|---|
| Prepared by:<br>S. Ilson | Resp. Test Leader | Project Engineer |
| PA/QA<br>D. Lamonby | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: 26<br>Date<br>Page of |

| | | | |
|---|---|---|---|
| Test designation | Test Procedure<br>TP-0204 | Issue | Rev. |

| | |
|---|---|
| Test step changed<br>chapter 2.22 of SPIRE-RAL-PRC-2704 | Reason for Change<br>Changes to steps of ~~[illegible]~~ Spectrometer Detector Microphonics Test (chapter 2.22) |

1) ~~[illegible]~~ execute SPIRE-IST-RESET-SPEC-OFFSETS

2) " "

3) " "

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: ~~#~~27<br>Date 23/08/08<br>Page of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT. | Test Procedure<br>TP - 204 | Issue<br>1 | Rev.<br>2 |

| | |
|---|---|
| Test step changed<br>BEFORE 7.5.5.12 | Reason for Change<br>RESHUFFLE of TEST SEQ. |

RUN SCRIPTS

SPECSTBY → READY IN PREPARATION FOR PROC 2.10
(PHOTOMETER THERMAL CONTROL VERIFICATION. sec 4.5 of PRC-2704

READY → PHOT SBTY. INCLUDING PVS # 6. sec 4.2. of PRC-2704

~~SWITCH ON DET~~

SPIRE-IST-DNS-PHOT

RESET PHOT OFFSETS - SPIRE-IST-RESET-PHOT-OFFSETS.tcl.

PERFORM Section 210 - PRC-2704 ABORT TEST.

SPIRE-IST-END TEST.
CONTINUE WITH STEP 6 of 210.

| | | |
|---|---|---|
| Prepared by: | Resp. Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: #28<br>Date 28/07/06<br>Page 1 of |

| Test designation | Test Procedure | Issue | Rev. |
|---|---|---|---|
| SPIRE SPT | TP-0204 | 1 | 2 |

| Test step changed | Reason for Change |
|---|---|
| 4.1 | TEST FLOW TABLE INCORRECT |

SPIRE SPECIAL PERFORMANCE TABLE NOT INLINE WITH SPIRE-RAL-PRC-2704 Section No.s NOT CORRECT FOR TESTS.

| | | |
|---|---|---|
| Prepared by: | Resp Test Leader | Project Engineer |
| PA/QA | Prime | Customer |

# Procedure Variation Summary

| | Test Change | Curr. No.: #29<br>Date 23/08/08<br>Page of |
|---|---|---|

| Test designation SPIRE SPT | Test Procedure TP 0204 | Issue 1 | Rev. 2 |
|---|---|---|---|

| Test step changed 7.5.5.11 ?? | Reason for Change ABORT TEST |
|---|---|

1) ABORT PHOTOMETER DETECTOR MIRCOPHONICS TEST

EXECUTE SPIRE -IST - END - TEST.

~~SPIRE - DSN - PHOT~~

SPIRE - IST - DNS - PHOT

SPIRE -IST_RESET - PHOT - OFFSETS

SPIRE - IST - CPS - PHOT

PERFORM 4.3 of PRC 2703 — PHOT STBY → REDY

SPIRE_IST_BSM_OFF

SPIRE_IST_CRECa. (03:00)

05:45. 2) configure back to PHOTO STBY (PRC-2704 Section 4.2)

3) Run SPIRE-IST-RESET - PHOT - OFFSETS (PRC-2704 Section 5)

4) Run SPIRE-IST-DNS - PHOT (PRC-2704 Section 2.7 ~~[illegible]~~ step 3)

5) Run SPIRE - IST - RESET - PHOT - OFFSETS (PRC-2704 Section 5)

Prepared by:

Resp. Test Leader

Project Engineer

PA/QA

Prime

Customer

# Procedure Variation Summary

| | | | |
|---|---|---|---|
| | Test Change | Curr. No.: 30<br>Date 23/08/2008<br>Page of | |
| Test designation<br>SPIRE SPT | Test Procedure<br>TP-204 | Issue<br>1 | Rev.<br>2 |
| Test step changed Before<br>7.5.5.12. | Reason for Change<br>Repeat aborted Test | | |

1) Run section 7.5.5.10 and 7.5.5.11 again
2) In ~~step~~ 7.5.5.11 skip steps 9→12 then execute step 13
3) Return to main procedure section 7.5.5.12

| | | |
|---|---|---|
| Prepared by:<br>U. Klenke | Resp. Test Leader | Project Engineer |
| PA/QA R. Goossens | Prime | Customer |

PVS#30

## 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.**

09:15

| Step | Reaction Wheel Activation | Nominal Value | Tolerance | Actual Value | Remark | P | N |
|---|---|---|---|---|---|---|---|
| 7.5.5.10.1 | From Test Conductor Console, execute script:<br>'A102109SPVT~~208~~ 213_ACMS_RWL_SPIRE_uVIB.tcl' | OK | | OK | | ✓ | |
| 7.5.5.10.2 | At the following prompt:<br>'Positive Spin. Click OK'<br>Check from ACMS Synoptic that RWL 1-2-3-4 are ON. Then Click OK to start positive spinning | Click OK | | OK | | ✓ | |
| 7.5.5.10.3 | From a 'TM Plotting Tool' follow RWL spinning, monitoring parameters:<br>AEWR1002<br>AEWR2002<br>AEWR3002<br>AEWR4002 | OK | | OK | | ✓ | |
| 7.5.5.10.4 | At the following prompt:<br>'Negative Spin. Click OK'<br>Click OK to start negative spinning | Click OK | | OK | | ✓ | |
| 7.5.5.10.5 | From 'TM Plotting Tool' (above step) follow RWL negative spinning | OK | | OK | | ✓ | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Enter Date / Time:** | 23/08/08 | 10:30 | **Location:** | ESTEC / HYDRA | **Sign OFF:** | **TD:** | | **PA:** |

PVS#30

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

| Enter Date / Time: | 23/08/08 | 10:30 | Location: | ESTEC/HHPLA | Sign OFF: | TD: | PA: D. Lamaty |
|---|---|---|---|---|---|---|---|

PVS #30

### 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**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.5 Procedure: IST-SPECSTBY to REDY mode** | | | N/A | | NA | |
| 7.5.5.9.2 | Switch **SPIRE REDY to PHOTSTBY mode**<br>On HPCCS execute the following test scripts for the SPIRE SPT in accordance to the ANNEX 2 of this procedure:<br>**4.2 Procedure: REDY mode to PHOTSTBY** | | | ~~N/A~~<br>N/A | already in PHOTSTBY | N/A | |
| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-04P** | | | N/A | | N/A | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Enter Date / Time:** | 23/08/08 | 10:30 | **Location:** | ESTEC HYDRA | **Sign OFF:** | **TD:** | | **PA:** | |

PVS#30

| 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.**<br>If answer is **YES**:<br>proceed with next test step<br>If answer is **NO**:<br>On HPCCS execute the following test script:<br>**SPIRE-IST-COLD-FUNC-DCU-13P** | | | N/A | | N/A | |
| 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:<br>**2.21 Procedure: Photometer Detector Microphonics Test** | | | OK | | QC | |
| | **SPIRE in PHOTSTBY mode with bias set to ILT nominal values** | | | | | | |

| Enter Date / Time: | 23/08/08 | 10:30 | Location: | ESTEC/HYDRA | Sign OFF: | TD: | PA: |
|---|---|---|---|---|---|---|---|

PVS #30

## 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:**

PVS#30

23/08/08 09:19

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 1 | Execute TCL script SPIRE-IST-DNS- PHOT126.tcl<br>• Set frequency to 126 Hz and phase to predetermined IST level | N/A | N/A | N/A | OK |
| 2 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | OK |
| 3 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | N/A | N/A | N/A | OK. |
| 4<br>09:50 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | OK |
| 5 | Execute TCL script SPIRE-IST-DNS- PHOT156.tcl<br>• Set frequency to 156 Hz and phase to predetermined IST level | N/A | N/A | N/A | OK |
| 6 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | OK. |
| 7 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | | | | OK |
| 8<br>PVS9-2 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | OK |
| 9<br>PVS9-2 | Execute TCL script SPIRE-IST-DNS- PHOT171.tcl<br>• Set frequency to 171 Hz and phase to predetermined IST level | N/A | N/A | N/A | Skip |

23/08/08.

D. Lamonby.

PVS #30

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 10 | Execute TCL script SPIRE-IST-START-TEST.tcl<br>This sets the OBSID for the test | N/A | N/A | N/A | SKIP |
| 11 | Execute standalone TCL script SPIRE-IST-MICROPHONICS.tcl<br>• **Confirm GO to S/C operators**<br>• S/C operators to ramp reaction wheels from stationary to maximum allowed rotation rate and back to stationary<br>• **S/C operators confirm reaction wheel sweep complete** | | | | SKIP |
| 12 | Execute TCL script SPIRE-IST-END-TEST.tcl<br>This resets the OBSID after the test | N/A | N/A | N/A | SKIP |
| 13 | Execute TCL script SPIRE-IST-DNS-PHOT.tcl<br>Resets SPIRE photometer bias and readout parameters to the nominal settings | N/A | N/A | N/A | OK |

**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

23/08/08.

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: #31<br>Date 23 08 08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP 0204 | Issue<br>1 | Rev. 2 |
| Test step changed<br>See below | Reason for Change<br>New load curves | | |

Repeat PRC-2704 section 2.8 steps 1-3

| | | |
|---|---|---|
| Prepared by:<br>S Ilsen | Resp. Test Leader<br>S Ilsen | Project Engineer |
| PA/QA<br>R. Goossens | Prime | Customer |

## 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<br>• Standard PCAL flash for photometer | N/A | Detector signal<br>N+/-dN mV | | ✓ 23/08 | 11:03 |
| 2 | Execute TCL script SPIRE-IST-LC-PHOT.tcl<br>• Standard Load Curve | N/A | N/A | | ✓ 23/08 | 11:09 |

| Step | Description | Parameters | Expected Values | Actual Values | Success/ Failure |
|---|---|---|---|---|---|
| 3 | Execute TCL script SPIRE-IST-CPS-PHOT.tcl<br>• Standard PCAL flash for photometer | N/A | Detector signal<br>N+/-dN mV | | ✓ 23/08 |
| 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 | N/A |
| **Test Result (Pass/Fail):** | | | | | |
| | | | | | |

11:36

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

# Procedure Variation Summary

| | | |
|---|---|---|
| | Test Change | Curr. No.: # 32<br>Date 23 08 08<br>Page 1 of |

| | | | |
|---|---|---|---|
| Test designation<br>SPIRE SPT | Test Procedure<br>TP 0204 | Issue<br>1 | Rev.<br>2 |

| | |
|---|---|
| Test step changed | Reason for Change<br>SWITCH OFF SPIRE |

11:45 ✓ perform ch. 4.3 of TP 2704

11.51 ✓ perform ch. 7.5.6. of TP-0204

| | | |
|---|---|---|
| Prepared by:<br>R. Goossens | Resp. Test Leader<br>S. Ilsen | Project Engineer |
| PA/QA<br>R. Goossens | Prime | Customer |

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 | X | 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 |
| | 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 | | | |
| | 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 | X | ESA/ESTEC | ESA |
| | Jolk Matthias | AET1 | X | Thales Alenia Space Cannes | TAS-F |
| | Klenke Uwe | ASG72 | | Thales Alenia Space Torino | TAS-I |
| | Kölle Markus | ASA43 | | | |
| | König Werner | AET32 | | | |
| X | Koppe Axel | AED312 | | **Instruments:** | |
| X | Kroeker Jürgen | AED65 | | MPE (PACS) | MPE |
| | La Gioia Valentina | Terma | X | RAL (SPIRE) | RAL |
| | Lang Jürgen | ASE252 | | SRON (HIFI) | SRON |
| | Langenstein Rolf | AED15 | | | |
| | 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 |
| | 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 |