1. INTRODUCTION

This document reports on the Warm Short Functional Tests carried out on the SPIRE FM instrument on the 4th July 2006 during the PFM3 test campaign.

1.1 SCOPE

To judge the success or failure of a warm functional test by checking that:

- The telecommand sequence generated for a particular functional test is correctly received and executed on board by the SPIRE DPU.
- No error/event reports or command failures are generated during the execution of these commands.
- Telemetry is generated by the instrument as a result of telemetry requests to its different subunits.
- Particular telemetry parameters for each functional test change in an expected manner.
- A particular success criterion/criteria (specified in this document) is/are met.

1.2 REFERENCE DOCUMENTS

Ref	Document	Name	Version/Issue Nb.
RD01	SPIRE-RAL-DOC-001652	SPIRE Functional Tests Specification	Issue 1.4
RD02	SPIRE-RAL-DOC-001630	SPIRE EGSE-ILT Start-Up Procedures	Issue 0.7
RD03	SPIRE-RAL-PRC-002222	DRCU Switch ON Procedure	Issue 1.0
RD04	SPIRE-RAL-PRJ-001078	SPIRE Data ICD	Issue 2.0
RD05	Sap-SPIRE-CCa-076-02	DRCU/DPU Interface Control Document	Issue 1.2
RD06	LAM.PJT.SPI.NOT.011011	MCU/DPU Command List ICD	Issue 5.0
RD07	SPIRE-IFS-PRJ-001391	SPIRE OBS User Manual	Issue 2.1
RD08		SPIRE ILT Functional Testing Overview	

1.3 CHANGE RECORD

Document	Change date	Changes
Issue 1.0	27/02/06	Document created from the WFT Procedure.

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2. FUNCTIONAL TEST CONFIGURATION

2.1 Software Configuration

Annotate in the table the current EGSE software configuration for the tests:

EGSE component	Version/Build number	Comment
SCOS2000	**2.3eP5**	
HCSS	**#812**	
QLA	**#242**	
QLA scripts	**#242**	
Test Control scripts	**--->**	See annexe A
CUS Scripts	**--->**	See annexe B

2.2 EGSE Configuration Checks

To check for the success of failure of a functional test, the real time telemetry of the instrument has to be monitored. The following applications must be running to do so. Before the test sequence starts, make the following checks:

Workstation	EGSE component	Status	Check
Lichfield	EGSE router	Started	✓
Lichfield	EGSE Gateway	Started	✓
Lichfield	Telemetry Ingestion	Started	✓
Lichfield	Packet Display	Started	✓
Lincoln	SCOS2000	Started	✓
Lincoln	EXIF + TOPE	Started	✓
Lincoln	Manual Stack	Started	✓
Gordon	CDMS Simulator	Started	✓
Lincoln	Test Control Server	Started	✓

2.3 SPIRE Instrument Configuration

The functional test flow is such that at a given time during the procedure is possible that the instrument configuration does not conform to any nominal configuration as specified in Annexe 1. Nevertheless the configuration prior and after a test is specified for each functional test, and were applicable and the instrument configuration is in accordance to Anexe1, this will be denoted by showing the main configuration in blue bold font and any additional subsystems configuration in black.
The **initial** instrument configuration for Short WFT does conform to a 'known' configuration and should be SPIRE **DRCU_ON or REDY**.
Perform the following actions to ensure that the instrument is in the correct configuration for the tests.

Step#	Action	Comments	Check
1	In SCOS open **DPU_AND_OBS_PARAMETERS display** Check if : TM2N is incrementing by one @1Hz. TM1N is incrementing by one @0.5Hz. - If they are, go to step 5. - If they are not, go to step 2.	**In SCOS Main Window start either MON1 or MON2 tasks.**	**NA**
2	Check if the DPU is powered ON: - If ON, the DPU power supply LCD will show ~ 28V and 0.40A, go to step 4. - If not ON, power ON DPU see comments on the right, then go to step 3.	**To power ON the DPU press the main switch on the front bottom left of the DPU power supply, wait for the LCD display to show 28 V reading and then press the secondary switch on the front bottom right labelled *Input 1*.**	**NA**
3	In SCOS open **Boot_ROM_Memory_Check display** and check no errors are reported: - If no errors are reported, execute DPU_ON from HCSS Test Procedures. Then repeat step 1. - If the (5,2) contains errors: Check the error code in RD07. Then switch OFF the DPU and repeat step 2	**As soon as DPU is powered ON, the boot software performs some internal checks and generates:** • **A (5,1) event for the CFM model and further ones** **This packet contains the number of errors at check time.**	**NA**
4	Execute **define_new_HK_report.tcl** HCSS Test procedure. Repeat step 1.		**NA**
5	In SCOS open **SCU_PARAMETERS display** - If SCUP5V/P9V/M9V are jittering and **BIAS_PARAMETERS display** - If BIAS1TEMP,BIAS2TEMP,… show ambient temperature, the DRCU is ON.Go to step 6. - If DRCU is not ON, refer to RD03 on how to start up the DRCU.		**NA**
6	**In SCOS open** DPU_AND_OBS_PARAMETERS display **and check that the MODE housekeeping parameter is DRCU_ON.**	**MODE (RAW)= 0x100** **MODE (ENG) = DRCU_ON**	**REDY mode**

Table 1. Initial configuration check

3. TEST PROCEDURE

The following two sections describe general pass/fail criteria (Section 3.1), the general test procedure layout (Section 3.1) and the detailed procedure for each functional test (Section 3.2).

3.1 GENERAL PASS/FAIL CRITERIA

The general criterion for declaring a single test failed is the repeated failure of 2 consecutive runs of this test. In that case the functional test procedure should be aborted and the overall functional testing declared FAILED.
In the case of a 'first run' failure followed by a successful execution a third run of the same test should be performed and in the unlikely event of this third run being a failure the test procedure should be also aborted and the overall functional testing declared FAILED, as this would imply a not reliable operability of the instrument.
As a general remark ANY failure should be closely analyzed.

Note: If the functional test is declared FAILED refer to section 4.1 for instrument switch OFF.

3.2 GENERAL TEST PROCEDURE LAYOUT

The table below shows the general Short WFT sequence as it should be performed. In each step of this procedure the operator should refer to the detailed procedure in Section 3.2 .Test Control TCL scripts are available to invoke the correspondent CUS script stored in the HCSS database for each functional test. These CUS scripts will generate the appropriate command sequence for the particular functional test.

Step	Subsystem tested	Test Id	Test Purpose
1	SCU	FUNC-SCU-01	SCU Nominal Science Generation Check
2		FUNC-SCU-03	FPU DC Thermometry Check
3		FUNC-SCU-06	FPU AC Thermometry Check
4		FUNC-SCU-07	Sorption Cooler Check
5		FUNC-SCU-04	Photometer Calibrator Check
6		FUNC-SCU-05	Spectrometer Calibrators Check
9	MCU	FUNC-MCU-01	MCU Boot Check
10		FUNC-MCU-02	MCU Nominal Science Generation Check
11	BSMm	FUNC-BSM-01	BSM Switch ON Check
12		FUNC-BSM-03	BSM Open Loop dynamics Check
13	SMECm	FUNC-SMEC-02A/B*	SMEC Launch Latch Open/Close Check
14		FUNC-SMEC-01	SMECm Switch ON Check
15		FUNC-SMEC-03	SMEC LED Integrity Check
16		FUNC-SMEC-04	SMEC Positioning Test (Open Loop)
17	DCU	FUNC-DCU-01	DCU Nominal Science Generation Check
18	Photometer LIAs	FUNC-DCU-04P	Photometer LIAs Check
19	Spectrometer LIAs	FUNC-DCU-04S	Spectrometer LIAs Check

Table 2. General Short WFT sequence

3.3 DETAILED TEST PROCEDURE

The following is a detailed (test by test) procedure including the steps required to perform each functional test individually.

Step#	Action	Comments
0	Open **SCU_PARAMETERS** display on SCOS Alpha Numeric Displays.	

3.3.1 FUNC-SCU-01

Test Id:	FUNC-SCU-01
Initial Configuration:	DRCU_ON
Final Configuration:	DRCU_ON
Success Criteria:	Test passed if : 1. Two SCU Nominal Science Report telemetry packets are received on QLA with the following characteristics:

APID	Type	Subtype	SID	FrameID	Frame length
0x508	21	1	0xA20	0x20	0x1E

2. The frame time difference between consecutive SCU frames within these packets corresponds to the sampling rate. Nominal SCU sampling rate is 80Hz ➔ $\Delta t = 12.5$ ms
3. The SPIRE HK parameter SCUFRAMECNT increments by 31.
4. No events are generated during the frame generation.

QLA to give go ahead.

Test Procedure:

Step#	Action
1	**Annotate the initial value of SCUFRAMECNT parameter located in SCU_PARAMETERS display.**
2	**Run QLA script FUNC-SCU-01.py on QLA console.**
3	**Run FUNC-SCU-01 test procedure from the HCSS Test Procedure window on TOPE**
4	**Annotate the final value of SCUFRAMECNT.**
5	Contingency: If test fails repeat steps 1 to 4.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SCU-01	**SCUFRAMECNT**	**n/ n+ 31**	58290/58321	31	PASS

Start time @: 14:49
End time @: 14:50
OBSID: 0x3000E7B0
Comments: QLA script created file QLA-SCU-01_3000E7B0.txt in directory /home/hcssbld/data/FuncTestData:

****
SCU: OBSID = 3000E7B0, BBTYPE = 0x8000, APID = 0x508, SID = 0xa20

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.
SCUFRAMECNT	58290	58321	31	31	Packet type = 0x15
TM5N	7949	7951	2	2	subtype = 0x1
FrameTime	12.4960	12.4992			Frame ID = 0x20
					Frame Len = 0x1E

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 12.49793 ms
sigma = 0.00159 ms

3.3.2 FUNC-SCU-03

Test Id:	FUNC-SCU-03
Initial Configuration:	DRCU_ON
Final Configuration:	DRCU_ON + DC thermometry ON
Success Criteria:	Test passed if all FPU DC thermometry sensors show temperature values indicating a correct functioning of the sensor, not open/short-circuited. If ANY reading is anomalous check RAW sensor reading. **Open Circuit Criterion:** **RAW reading in the range [0, -100]** **Short Circuit Criterion:** **RAW reading of -32768** **Note:** At warm temperature most of the FPU thermometers should be short circuited.

Test Procedure:

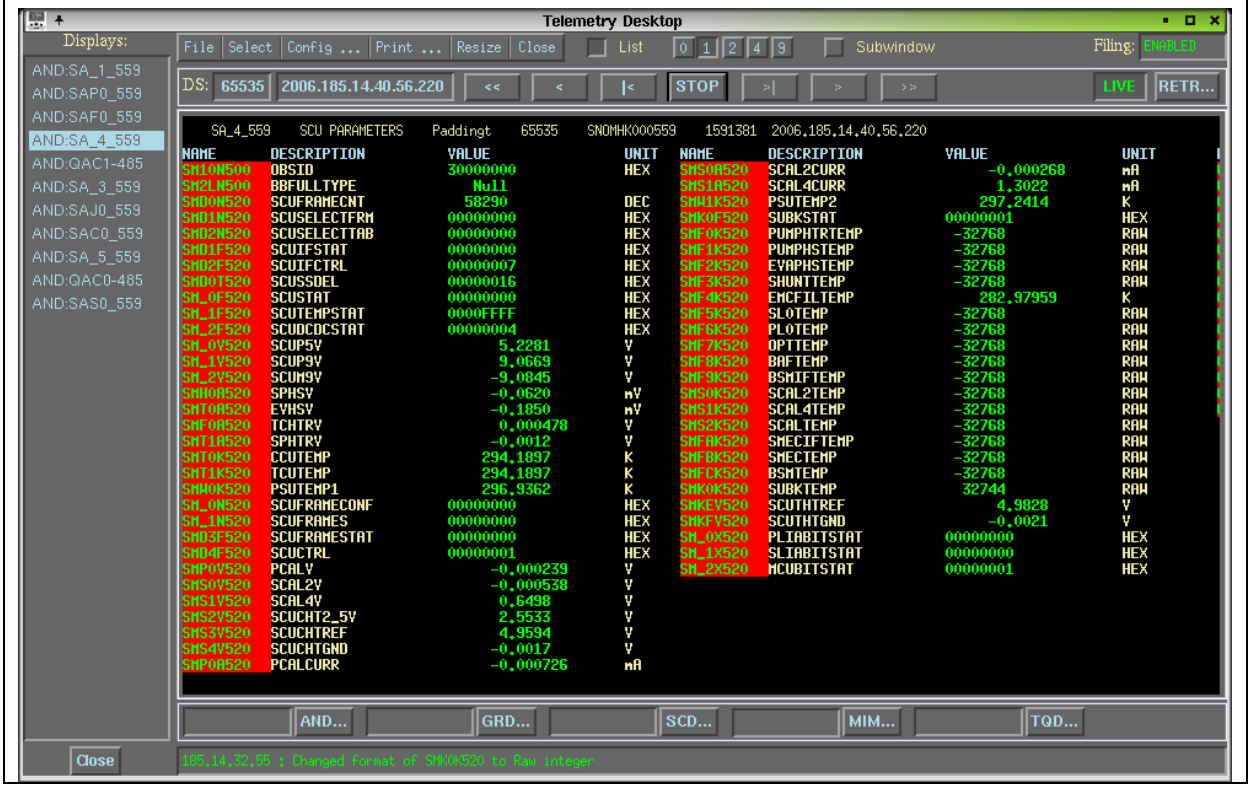
Step#	Action
1	**Run FUNC-SCU-03 test procedure from the HCSS Test Procedure window on TOPE**
2	**When the test is finished annotate the current value of SCUTEMPSTAT and the RAW/converted values of the 16 FPU temperatures located in SCU_PARAMETERS display.**
3	**Contingency:** **If test fails execute SCU_OFF procedure from HCSS Test Procedure window on TOPE and then repeat steps 1 and 2.**

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SCU-03	**SCUTEMPSTAT**	**0/0xFFFF**		**N/A**	**PASS**

Start time @:
End time @:
OBSID:
Comments:

Script not executed as DC thermometry already on – snapshot of raw thermometer channel values:



3.3.3 FUNC-SCU-06

Test Id:	FUNC-SCU-06
Initial Configuration:	**DRCU_ON** + DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Success Criteria:	Test passed if SUBKSTAT parameter went from 0 to 1. **Open Circuit Criterion:** **RAW reading in the range 0 -100** **Short Circuit Criterion:** **RAW reading of ~32768**

Test Procedure:

Step#	Action
1	**Run FUNC-SCU-06 test procedure from the HCSS Test Procedure window on TOPE.**
2	**When the test is finished annotate the current value of SUBKSTAT located in SCU_PARAMETERS display. Also write down the RAW value of the SUBKTEMP parameter.**

3	Contingency: If test fails : 1. Send manual command: SEND_DRCU_COMMAND Parameter1 = 0xA0860000 Parameter2 = 0 2. Then repeat steps 1 and 2.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SCU-06	**SUBKSTAT**	**0/1**		**N/A**	**PASS**

Start time @:
End time @:
OBSID:
Comments:

Script not executed as AC thermometry already on – raw SUBKTEMP channel value: 32744

3.3.4 FUNC-SCU-07

Test Id:	**FUNC-SCU-07**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Success Criteria:	Test passed if during the execution of the test the following SCU HK parameters give correspondent readings of:

SCU HK parameter	RAW	Converted
SPHSV	**~12715**	**~323mV**
EVHSV	**~12715**	**~323mV**
SPHTRV	**~14390**	**~ 8 V**

Test Procedure:

Step#	Action
1	**Run FUNC-SCU-07 test procedure from the HCSS Test Procedure window on TOPE.**

2	**While the test is running annotate the values of current values of SPHSV, EVHSV, SPHTRV located in SCU_PARAMETERS display. (RAW and CONVERTED)**
3	Contingency: If test fails repeat steps 1 and 2.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SCU-07	**SPHSV** **EVHSV** **SPHTRV**	**0/ ~ 323 mV** **0/ ~ 323 mV** **0/ ~ 8 V**	0/323.91mV/0 0/323.05mV/0 0/8.3V/0	**N/A**	**PASS**

Start time @: 14:55
End time @:14:58
OBSID: 0x3000E7B1
Comments:

3.3.5 FUNC-SCU-04

Test Id:	**FUNC-SCU-04**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Success Criteria:	Test passed if PCALCURR/PCALV SCU HK parameters show the following values: • PCALCURR HK parameter which shows the measured PCAL current is ~ 0.1 mA. • PCALV HK parameter which shows the measured PCAL voltage is ~ 0.02V

Test Procedure:

Step#	Action
1	**Annotate the current value of PCALV and PCALCURR located in SCU_PARAMETERS display.**
2	**Run FUNC-SCU-04 test procedure from the HCSS Test Procedure window on TOPE**
3	**While the test is running Annotate the values of PCALV and PCALCURR.**
4	Contingency: If test fails repeat steps 1 to 3.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/ During test	Nb. of frames received	Test Result
FUNC-SCU-04	**PCALCURR** **PCALV**	**0/0.1mA** **0/0.02V**	0/0.0488mA/0.0 0/0.01V/0.0	**N/A**	**PASS**

Start time @: 14:59
End time @: 15:00
OBSID: 0x3000E7B2
Comments:

3.3.6 FUNC-SCU-05

Test Id:	FUNC-SCU-05
Initial Configuration:	DRCU_ON + AC/DC thermometry ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON
Success Criteria:	Test passed if : • SCAL2CURR ,SCAL4CURR HK parameters which show the measured current read ~ 0.1 mA • SCAL2V, SCAL4V parameters which show the measured voltage read ~ 0.05V.

Test Procedure

Step#	Action	Comments
1	Annotate the current value of SCAL2V ,SCAL2CURR,SCAL4V,SCAL4CURR located in SCU_PARAMETERS display.	SCAL4V was reading 1.3mA before starting the test. Further investigation showed that the 4% calibrator had been left on by mistake after the latest SCAL PID test performed
2	Run FUNC-SCU-05 test procedure from the HCSS Test Procedure window on TOPE	
3	While the test is running write the values of SCAL2V ,SCAL2CURR,SCAL4V,SCAL4CURR.	
4	Contingency: If test fails repeat steps 1 to 3.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SCU-05	**SCAL2CURR** **SCAL2V** **SCAL4CURR** **SCAL4V**	**0/0.1mA** **0/0.05V** **0/0.1mA** **0/0.05V**	0/0.045mA/0 0/0.0248V/0 0/0.05mA/0 0/0.0246V/0	**N/A**	**PASS**

Start time @: 15:12, 15:16
End time @:15:14, 15:18
OBSID: 0x3000E7B3/4
Comments:

Test repeated at SCAL2/SCAL4 currents of 0.1mA - OK

Step#	Action	Comments
0	Open **MCU_PARAMETERS** display on SCOS Alpha Numeric Displays.	

3.3.7 FUNC-MCU-01

Test Id:	**FUNC-MCU-01**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON
Success Criteria:	Test passed if: 1. MCU boots. 2. MCU voltages show expected values. 3. MAC Board Temperature Reading shows ambient temperature.

Test Procedure:

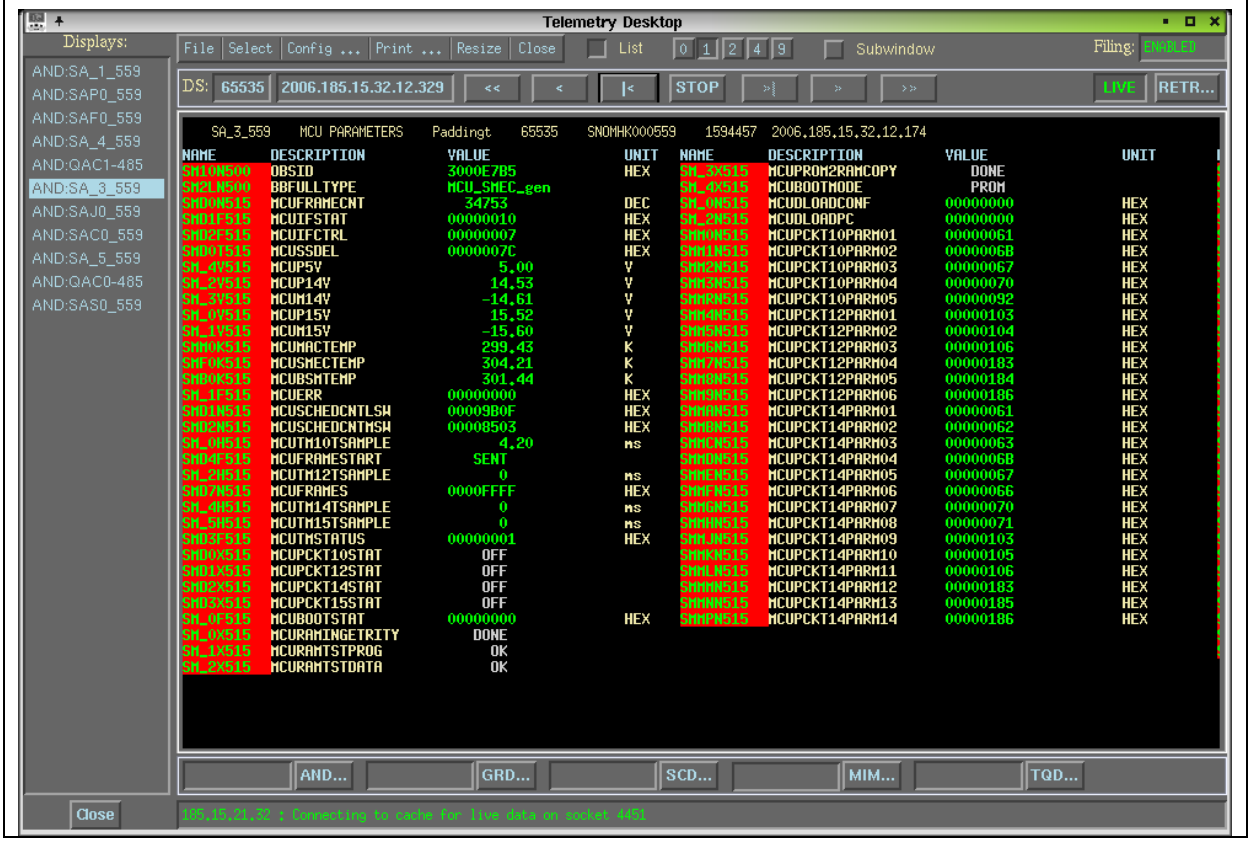
Step#	Action	Comments
1	Run **FUNC-MCU-01** test procedure from the HCSS Test Procedure window on TOPE	
2	When procedure is finished Annotate the values of the MCU voltages.	
3	Contingency: If test fails repeat steps 1 and 2.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-MCU-01	**MCUP5V** **MCUP15V** **MCUP14V** **MCUM14V** **MCUM15V** **MCUMACTEMP**	**N/A/ ~ 5V** **N/A / ~15V** **N/A / ~ 14V** **N/A / ~ -14V** **N/A / ~ -15V** **N/A / ~ 300K**		**N/A**	**PASS**

Start time @:
End time @:
OBSID:
Comments:

MCU already on. Snapshot of MCU voltages and temperatures:



3.3.8 FUNC-MCU-02

Test Id:	FUNC-MCU-02
Initial Configuration:	DRCU_ON + AC/DC thermometry ON +MCU ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON +MCU ON
Success Criteria:	Test passed if : 1. MCU produces each type of the frames requested and with the following characteristics.

Frame	APID	Type	Subtype	SID	FrameID	Frame length
Eng.	**0x508**	**21**	**3**	**0x814**	**0x14**	**0x15**
BSM	**0x508**	**21**	**1**	**0x612**	**0x12**	**0xD**
SMEC	**0x508**	**21**	**1**	**0x410**	**0x10**	**0xC**
BSM +SMEC						

2. No events are generated during the different frames generation.

Test Procedure:

Step#	Action	Comments
1	Annotate the current value of MCUFRAMECNT located in MCU_PARAMETERS display	
2	Run QLA script FUNC-MCU-02.py on QLA console.	
3	Run FUNC-MCU-02 test procedure from the HCSS Test Procedure window on TOPE	
4	When test is finished annotate the current value of MCUFRAMECNT.	
5	Contingency: If test fails repeat steps 1 to 4.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-MCU-02	**MCUFRAMECNT**	**0/ ~ 3300**	33470/40063	6594	**PASS**

Start time @: 15:31
End time @: 15:32
OBSID: 0x3000E7B5
Comments:

QLA script produced file QLA-MCU-02_3000E7B5.txt:

****
MCUENG: OBSID = 3000E7B5, BBTYPE = 0x8901, APID = 0x508, SID = 0x814

Parameter Initial Final Increment Expect Incre. Packet Chars.

MCUFRAMECNT 33470 34112 642 609 Packet type = 0x15
TM5N 7951 7979 28 27 subtype = 0x3
FrameTime 15.5809 15.5776 Frame ID = 0x14
Frame Len = 0x15
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 15.58045 ms
sigma = 0.00119 ms

****
BSM: OBSID = 3000E7B5, BBTYPE = 0x8903, APID = 0x508, SID = 0x612

Parameter Initial Final Increment Expect Incre. Packet Chars.

MCUFRAMECNT 34112 34753 641 609 Packet type = 0x15
TM5N 7979 7996 17 17 subtype = 0x1
FrameTime 15.5807 15.5809 Frame ID = 0x12
Frame Len = 0xD
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 15.58045 ms
sigma = 0.00101 ms

****
SMEC: OBSID = 3000E7B5, BBTYPE = 0x8902, APID = 0x508, SID = 0x410

Parameter Initial Final Increment Expect Incre. Packet Chars.

MCUFRAMECNT 34753 37127 2374 2375 Packet type = 0x15
TM5N 7996 8054 58 58 subtype = 0x1
FrameTime 4.2114 4.2112 Frame ID = 0x10
Frame Len = 0xC
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 4.21093 ms
sigma = 0.00089 ms

****
SMEC+BSM: OBSID = 3000E7B5, BBTYPE = 0x8904, APID = 0x508, SID = 0x612

Parameter Initial Final Increment Expect Incre. Packet Chars.

MCUFRAMECNT 37127 40063 2936 2850 Packet type = 0x15
TM5N 8054 8128 74 71 subtype = 0x1
FrameTime SMEC 4.2112 4.2112 Frame ID = 0x10, Len = 0xC
FrameTime BSM 20.2143 20.2143 Frame ID = 0x12, Len = 0xD

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 4.21093 ms (SMEC), 20.21248 ms (BSM)
sigma = 0.00089 ms (SMEC), 0.00157 ms (BSM)

3.3.9 FUNC-BSM-01

Test Id:	FUNC-BSM-01
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + BSM ON (open loop)
Success Criteria:	Test passed if: 1. CHOPSENSPWR HK parameter goes from 0 to 1 2. CHOPDACVAL HK parameter goes from 0 to 0x8000 3. CHOPSENSIG HK parameter shows variation from off to on 4. JIGGSENSPWR HK parameter goes from 0 to 1 5. JIGGDACVAL parameter goes from 0 to 0x8000 6. JIGGSENSSIG HK parameter shows variation from off to on

Test Procedure

Step#	Action	Comments
0	Open **CHOP PARAMETERS and JIGGLE PARAMETERS displayS** on SCOS Alpha Numeric Displays.	
1	On QLA bring up a time series display of the following HK parameters: CHOPSENSPWR CHOPDACVAL CHOPSENSIG JIGGSENSPWR JIGGDACVAL JIGGSENSSIG	
2	Run FUNC-BSM-01 test procedure from the HCSS Test Procedure window on TOPE	
3	When the test is finished record all the Key parameters noted bellow	
	Contingency: If test fails repeat steps 1 and 2.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-BSM-01	**CHOPSENSPWR** **CHOPLOOPMODE** **CHOPDACVAL** **CHOPFFGAIN** **CHOPSENSSIG** **JIGGSENSPWR** **JIGGLOOPMODE** **JIGGDACVAL** **JIGGFFGAIN** **JIGGSENSSIG**	**0/1** **0/3** **0/0x8000** **0/0xBEB** **0/?** **0/1** **0/3** **0/0x8000** **0/0xBEB** **0/?**	0/1 3/3 0x8000/0x800D 0x708/0x708 0x8000/0x8E92 0/1 3/3 0x8000/0x8000 0xF6E/0xF6E 0x7FE5/0x91BC	**N/A**	

Start time @: 15:38
End time @: 15:38
OBSID: 0x3000E7B6
Comments:

The JIGGPOSN is still set to 0xFFFF while the CHOPPOSN is 0x8000. Both were commanded to go to 0x8000.

3.3.10 FUNC-BSM-03

Test Id:	FUNC-BSM-03
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + BSM ON (open loop)
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + BSM ON (open loop)
Success Criteria:	Test passed if the chop sensor signal evolves in the same way as the positions set.(i.e if (pos1 > pos2 ➔ sig1 > sig2) for each jiggle position. **Note:** During warm tests the voltages on both chop and jiggle motors are likely to be saturated (CHOP/JIGGMOTORVOLT RAW values of ~ 0xFFFF) due to the high resistance of the motor coil at ambient temperature.

Test Procedure

Step#	Action	Comments
1	On QLA open up a time series display of HK parameters: CHOPPOSN CHOPDACVAL CHOPMOTORCURR CHOPSENSSIG CHOPMOTORBEMF JIGGPOSN JIGGDACVAL JIGGMOTORCURR JIGGSENSSIG JIGGMOTORBEMF	
2	Run FUNC-BSM-03 test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat step 2.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-BSM-03				N/A	PASS

Start time @: 15:50
End time @: 15:51
OBSID: 0x3000E7B7
Comments:

Jiggle Start/End/Step: 0x7000, 0x9000, 0x1000
Chop Start/End/Step: 0x6000, 0xA000, 0x2000

BSM moves along both Chop and Jiggle axes but the JIGGPOSN parameter remains fixed at 0xFFFF. All other chop and jiggle TM parameters change as expected.

Step#	Action	Comments
4	Execute BSM_OFF from HCSS Test Procedures	16:01 OBSID: 0x3000E7B8 - OK

Step#	Action	Comments
0	Open **SMEC PARAMETERS display** on SCOS Alpha Numeric Displays.	

3.3.11 FUNC-SMEC-01

Test Id:	**FUNC-SMEC-01**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON+ SMEC ON (open loop)
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON+ SMEC ON (open loop)
Success Criteria:	Test passed if : 1. SMECENCPWR HK parameter changes from 0 to 6. 2. SMEC encoder signals 1 and 2 amplitude show variation when encoder is switched ON. 3. SMEC LVDT is switched ON. 4. SMEC LVDT DC and AC signals show variation when LVDT is switched ON.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a display of the following HK parameters: SMECENCPWR SMECENCSIG1AMP SMECENCSIG2AMP SMECLVDTDCSIG SMECLVDTACSIG	
2	Run FUNC-SMEC-01 test procedure from the HCSS Test Procedure window on TOPE	
	Contingency: If test fails repeat steps 1.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SMEC-01	**SMECENCPWR** **SMECLVDTPWR** **SMECENCSIG1** **SMECENCSIG2**		0/6 0/1 0x3060/0x4074 0x4E66/0x537E	**N/A**	**PASS**

Start time @: 16:04
End time @: 16:05
OBSID: 0x3000E7B9
Comments:

3.3.12 FUNC-SMEC-03

Test Id:	FUNC-SMEC-03
Initial Configuration:	DRCU_ON + AC/DC thermometry ON +MCU ON+ SMEC ON (open loop)
Final Configuration:	DRCU_ON + AC/DC thermometry ON +MCU ON+ SMEC ON (open loop)
Success Criteria:	Test passed if: SMEC encoder signals 1 and 2 show a variation from one LED illumination level to another.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the following Nominal HK parameters: SMECENCPWR SMECENCSIG1 SMECENCSIG1	
2	Run FUNC-SMEC-03 test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1 and 2.	

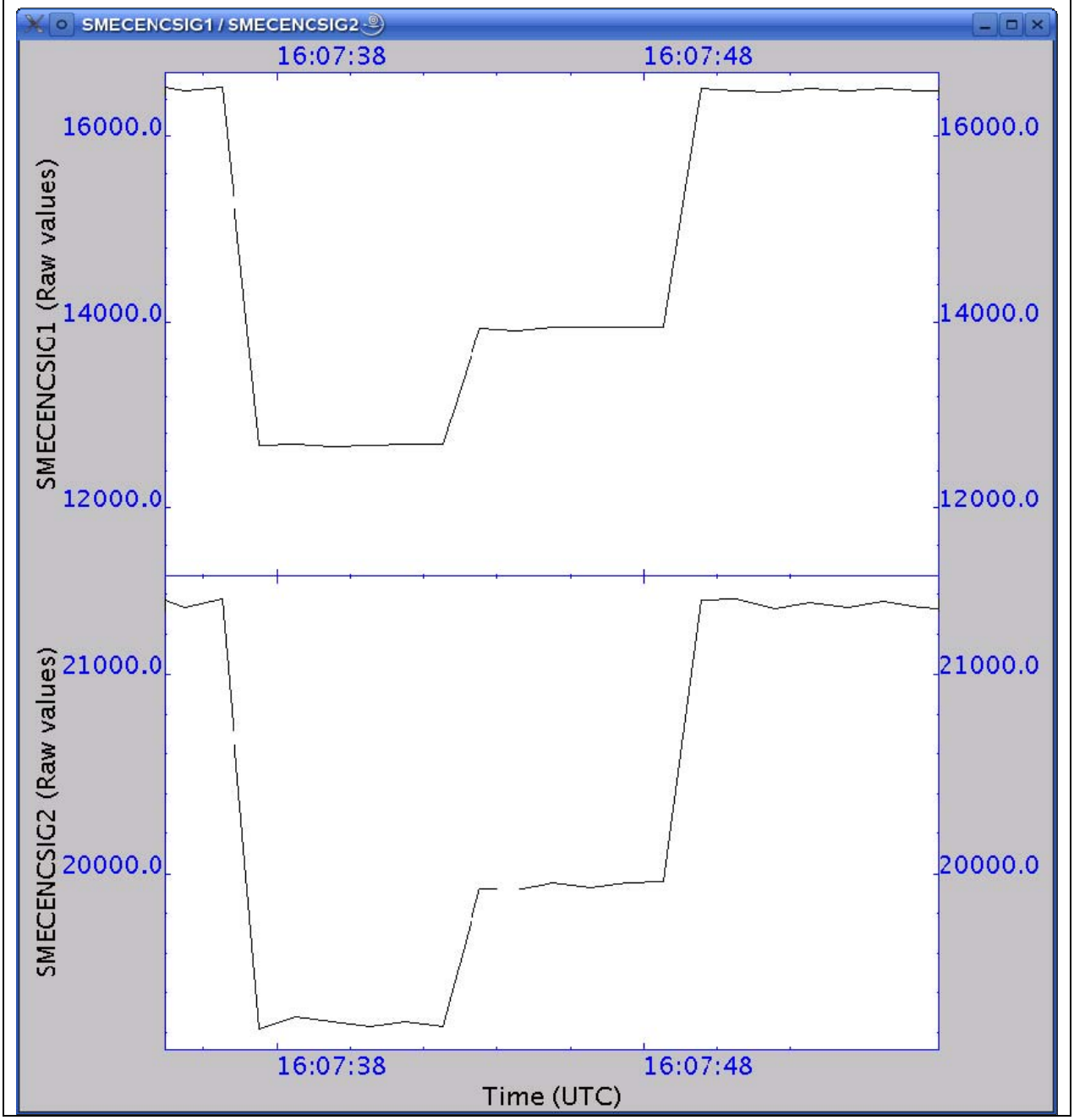
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SMEC-03	SMECENCPWR SMECENCSIG1 SMECENCSIG2				PASS

Start time @: 16:11
End time @: 16:12
OBSID: 0x3000E7BA
Comments:

LED power from 4 to 6 in steps of 1. 5 seconds at each level.

The encoder signals changed in response to the changing LED level:



3.3.13 FUNC-SMEC-04a

Test Id:	FUNC-SMEC-04a
Initial Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON+ SMEC ON (open loop)
Final Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON+ SMEC ON (open loop)
Success Criteria:	Test passed if SMECLVDTDCSIG parameter shows a variation according to the different positions set.

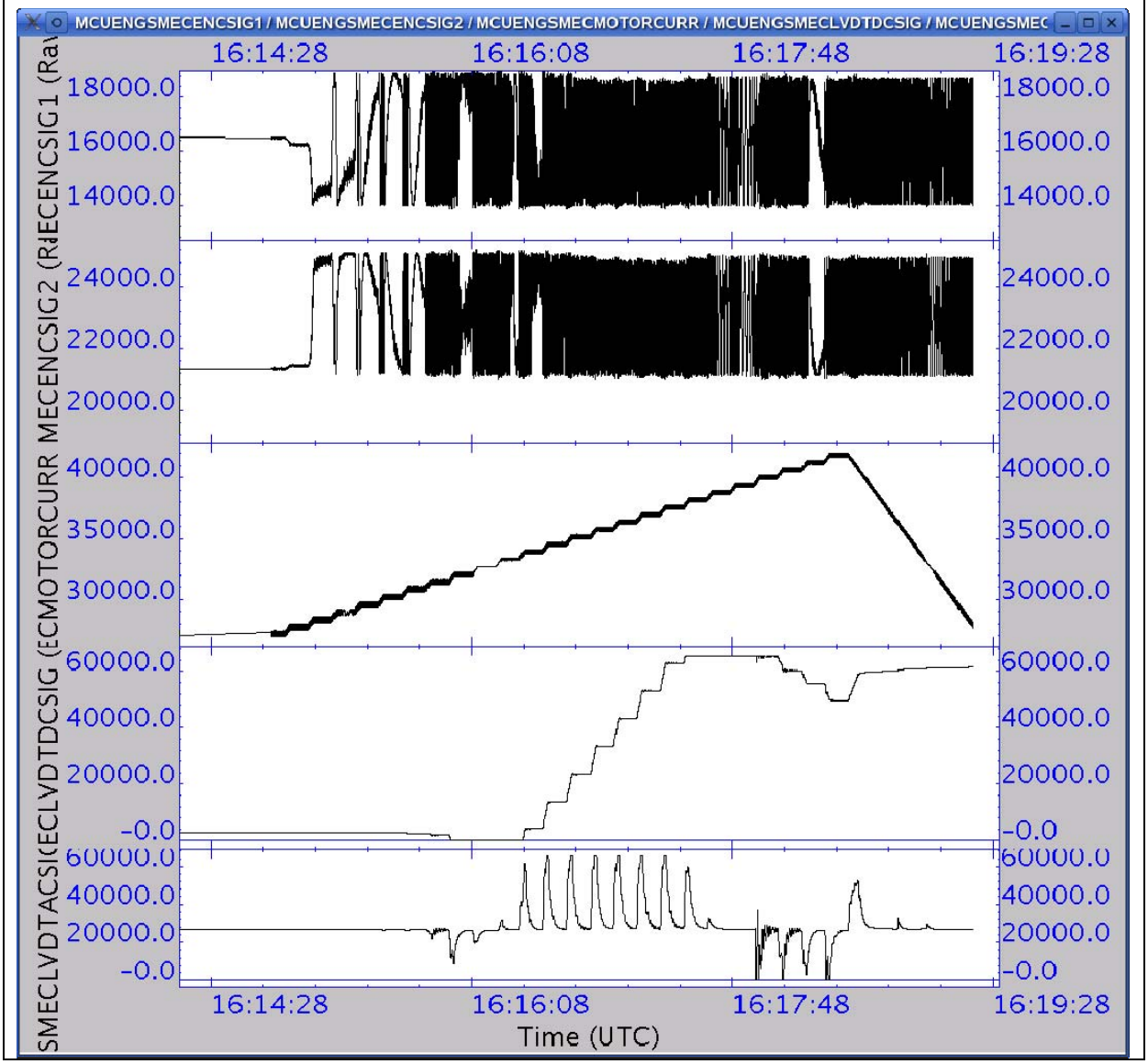
Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the following Nominal HK parameters: SMECENCSIG1 SMECENCSIG2 SMECLVDTDCSIG SMECLVDTACSIG SMECMOTORCURR	
2	Run FUNC-SMEC-04a test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1.	

Test Log:

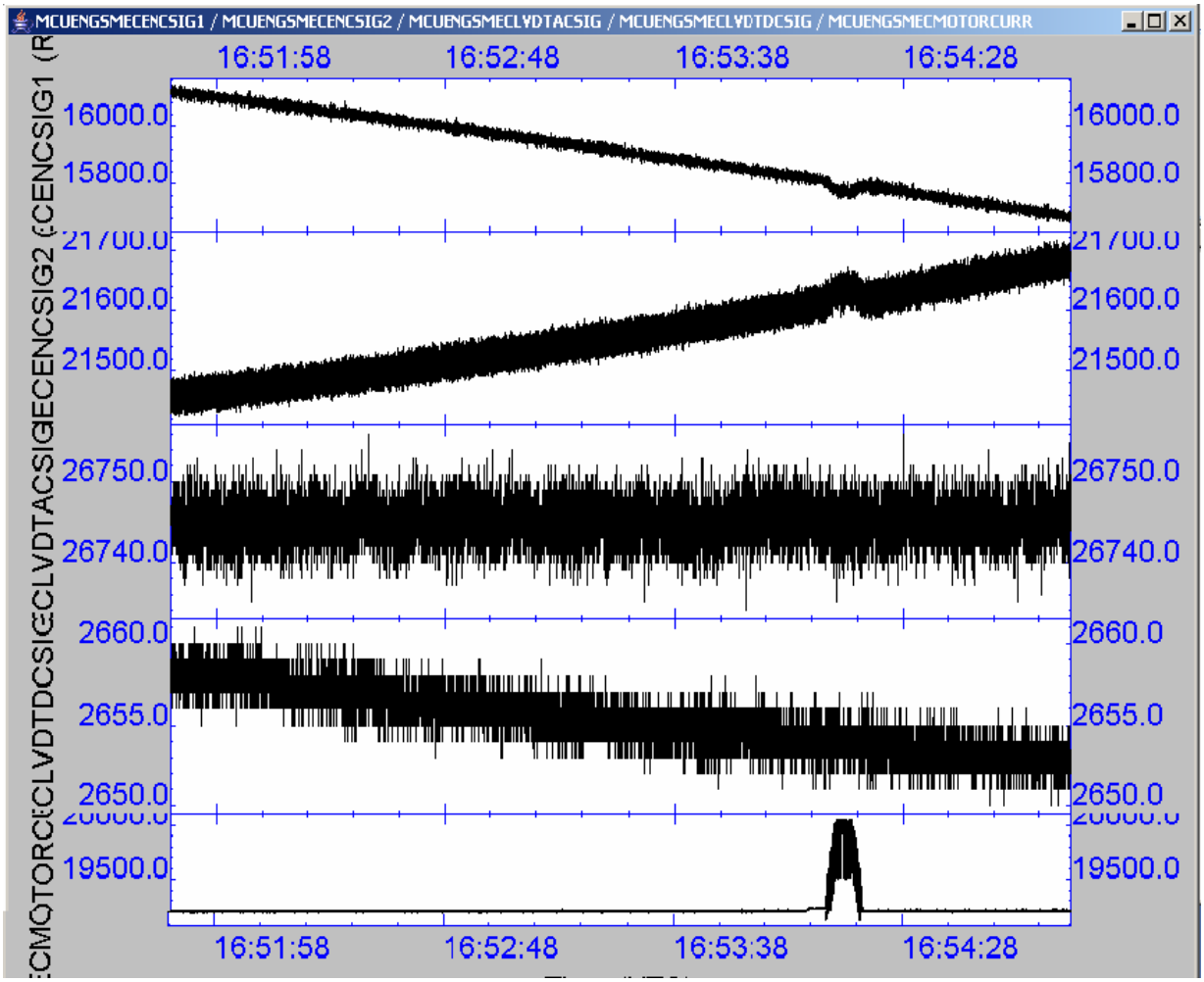
Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SMEC-04a	**SMECLVDTDCSIG**				**PASS**

Start time @: 16:19
End time @: 16:24
OBSID: 0x3000E7BB
Comments:



Step#	Action	Comments
4	Execute SMEC_OFF from HCSS Test Procedures	The SMEC was moved to mechanical stop and latched using **FUNC-SMEC-02B and a FUNC-SMEC-04A positioning test was repeated to verify that the SMEC had been effectively latched. See below the result :**

Repetition of the SMEC position test after latching it:



Step#	Action	Comments
0	Open **DCU PARAMETERS** SCOS Alpha Numeric Display	

3.3.14 FUNC-DCU-01

Test Id:	**FUNC-DCU-01**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON
Success Criteria:	Test passed if: 1. DCU produces each type of DCU nominal science frame with the following characteristics.

APID	Type	S.type	SID	Frame	Frame	Nb. Of	Nb. of

				ID	type	frames	pkts.
0x504	**21**	**1**	**0x200**	**0**	**PF**	**100**	**100**
0x506	**21**	**1**	**0x201**	**1**	**SF**	**100**	**17**
0x504	**21**	**2**	**0x102**	**2**	**PSW**	**100**	**34**
0x504	**21**	**2**	**0x103**	**3**	**PMW**	**100**	**25**
0x504	**21**	**2**	**0x104**	**4**	**PLW**	**100**	**12**
0x506	**21**	**2**	**0x105**	**5**	**SSW**	**100**	**12**
0x506	**21**	**2**	**0x106**	**6**	**SLW**	**100**	**7**

2. The frame time difference between consecutive DCU frames of each type corresponds to the sampling rate.
   Photometer Sampling rate is 15.3Hz → $\Delta t \sim 65.5$ ms
   Spectrometer Sampling rate is 80Hz → $\Delta t = 12.5$ ms
3. The SPIRE HK parameter DCUFRAMECNT increments by 700.
4. No events are generated during the frames generation.

Test Procedure:

Step#	Action	Comments
1	Annotate the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
2	Run FUNC-DCU-01 test procedure from the HCSS Test Procedure window on TOPE	
3	Annotate the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
4	Contingency: If test fails repeat steps 1 to 3.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-01	**DCUFRAMECNT**	**0/700**	58538/59238	700	**PASS**

Start time @: 17:07
End time @: 17:09
OBSID: 0x3000E7BF
Comments:

QLA script produced file

****
PHOTF: OBSID = 3000E7BF, BBTYPE = 0x8800, APID = 0x504, SID = 0x200

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.
DCUFRAMECNT	58538	58638	100	100	Packet type = 0x15
TM3N	10541	10641	100	100	subtype = 0x1
FrameTime	53.7600	53.7568			Frame ID = 0x0
					Frame Len = 0x126

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 53.75861 ms
sigma = 0.00159 ms

****
PHOTSW: OBSID = 3000E7BF, BBTYPE = 0x8802, APID = 0x504, SID = 0x102

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.
DCUFRAMECNT	58638	58738	100	100	Packet type = 0x15
TM3N	10641	10675	34	34	subtype = 0x2
FrameTime	53.7568	53.7600			Frame ID = 0x2
					Frame Len = 0x96

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 53.75861 ms
sigma = 0.00160 ms

****
PHOTMW: OBSID = 3000E7BF, BBTYPE = 0x8803, APID = 0x504, SID = 0x103

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.
DCUFRAMECNT	58738	58838	100	100	Packet type = 0x15
TM3N	10675	10700	25	25	subtype = 0x2
FrameTime	53.7600	53.7568			Frame ID = 0x3
					Frame Len = 0x66

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 53.75861 ms
sigma = 0.00160 ms

****
PHOTLW: OBSID = 3000E7BF, BBTYPE = 0x8804, APID = 0x504, SID = 0x104

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.
DCUFRAMECNT	58838	58938	100	100	Packet type = 0x15
TM3N	10700	10712	12	12	subtype = 0x2
FrameTime	53.7568	53.7600			Frame ID = 0x4
					Frame Len = 0x36

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean = 53.75861 ms
sigma = 0.00159 ms

****
SPECF: OBSID = 3000E7BF, BBTYPE = 0x8801, APID = 0x506, SID = 0x201

Parameter	Initial	Final	Increment	Expect Incre.	Packet Chars.

3.3.15 FUNC-DCU-04P

Test Id:	FUNC-DCU-04P
Initial Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON + Photometer LIAs ON
Success Criteria:	Test passed if : 1. SCUDCDCSTAT parameter goes from 4 to 5. 2. Photometer LIA card voltages are showing correct readings of +5V,+9V,-9V. 3. Photometer LIA temperatures show an increase indicating that they are ON.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the HK parameters: PLIAP5V PLIAP9V PLIAM9V LIAP1/2/3/4/5/6/7/8/9TEMP	
2	Run FUNC-DCU-04P test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1 and 2.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-04P	**SCUDCDCSTAT** **PLIAP5V** **PLIAP9V** **PLIAM9V** **LIA1/2/3/4/5/6/7/9TEMP**	**4/5** **0/~ +5V** **0/~+9V** **0/~-9V** **N/A/ [290-300]K**	4/5 0/5.2V 0/11.55V 0/-11.55V ~293 and warming up		**PASS**

Start time @: 17:14
End time @: 17:15
OBSID: 0x3000E7C0
Comments:

Step#	Action	Comments
4	Execute PLIA_OFF from HCSS Test Procedures	17:16 Manually switched off the P-LIAs: 0xA0870004

3.3.16 FUNC-DCU-04S

Test Id:	FUNC-DCU-04S
Initial Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON
Success Criteria:	Test passed if : 1. SCUDCDCSTAT parameter goes from 4 to 6. 2. Spectrometer LIA card voltages are showing correct readings of +5V,+9V,-9V. 3. Spectrometer LIA temperatures show an increase indicating that they are ON.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the HK parameters: SLIAP5V SLIAP9V SLIAM9V LIAS1/2/3TEMP	
2	Run FUNC-DCU-04S test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1 and 2.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-04S	**SCUDCDCSTAT** **SLIAP5V** **SLIAP9V** **SLIAM9V** **LIA1/2/3TEMP**	**4/6** **0/~ +5V** **0/~+9V** **0/~-9V** **N/A/ [290-300]K**	4/6 0/5.23V 0/11.55V 0/-11.54V ~294.5K and warming up		PASS

Start time @: 17:17
End time @: 17:18
OBSID: 0x3000E7C1
Comments:

3.3.17 FUNC-DCU-13-S

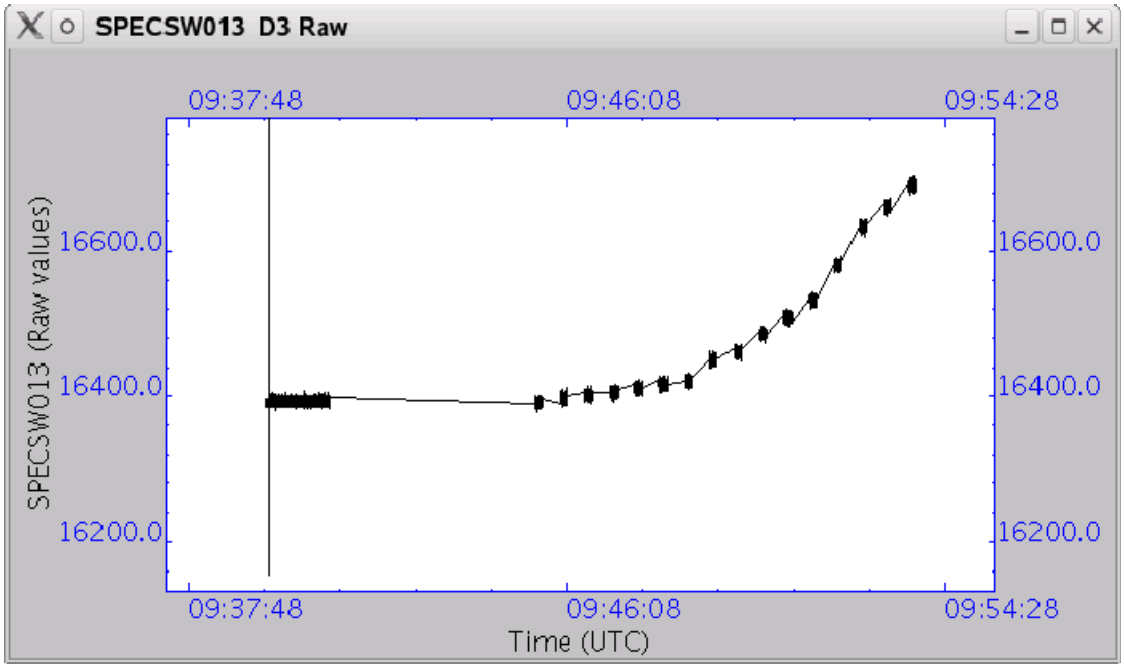
Included this functional test to diagnose the failure of part the part of SSW array related to SSW JFET1.

Executed FUNC-DCU-13-SPEC (Short Spectrometer LC)
OBSID: 0x3000E03D

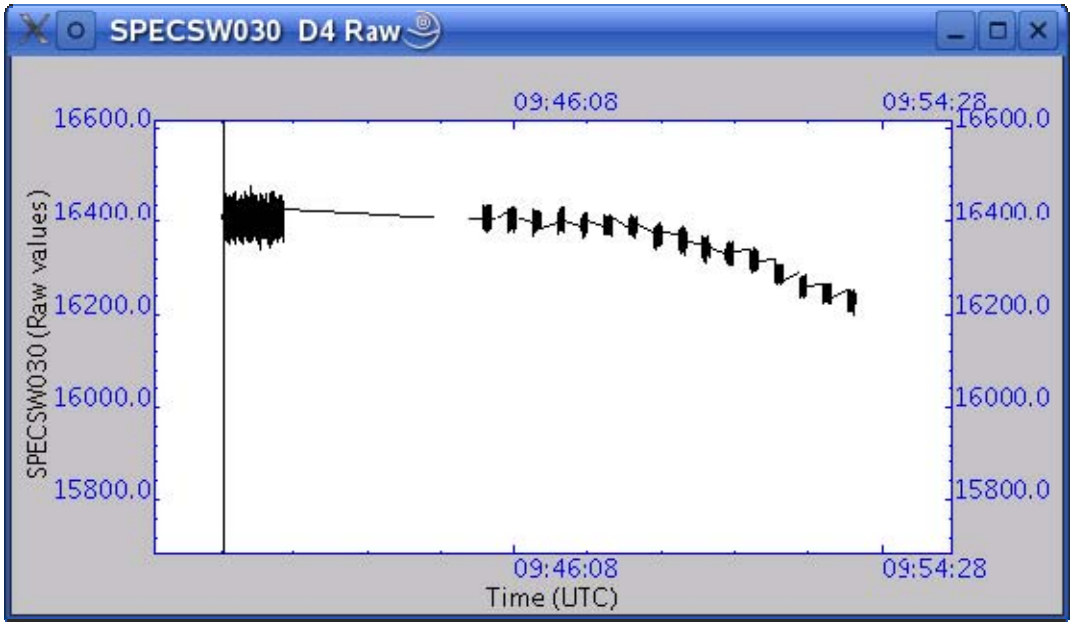
Spec Bias Freq = 160 Hz
Spec Bias Samp = 80 Hz
SSW Phase = 180.71 deg
SLW Phase = 179.29 deg
Time at each level: 10 s

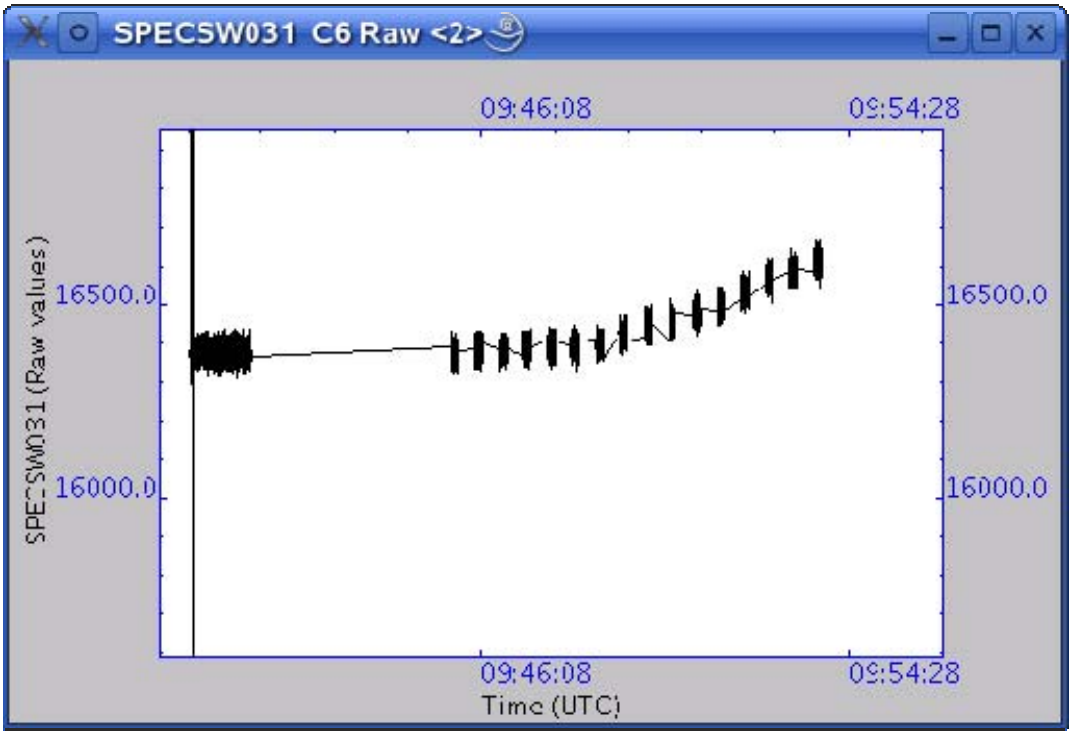
Comments:
The response to the different bias amplitudes does not vary significantly from pixel to pixel between the 'working' pixels, all showing a full raw signal variation of ~ 800 ADUs.
The 'non-working' pixels in show a different behaviour , some 'non-working' pixels whose response is very similar to working ones..., and some others which seem to be biased in the opposite way as the others. (See below)

'Working' detector:



'Non working' ones:





Conclusion:
There is actual variation of the output for different bias which would indicate that these bolometers are actually connected to the LIA amplifier and there is no harness problem.

Step#	Action	Comments
4	Execute SLIA_OFF from HCSS Test	17:16 Manually switched off the P-LIAs:

	Procedures	0xA0870004

4. END TEST SEQUENCE

4.1 NORMAL END TEST SEQUENCE

The following table shows the necessary steps to be followed to end the warm functional test sequence.

Step#	Action	HK parameters	Expected Value	Comments	Check
1	Check BSM is OFF	CHOPSENSPWR JIGGSENSPWR	0 0		✓ ✓
2	Check SMEC is OFF	SMECENCPWR	0		✓
3	5th July 2005: Completed the switch OFF sequence as specified in the procedure after finishing the spectrometer diagnosis tests. Run MCU-OFF from the HCSS Test Procedure window on TOPE	SCUDCDCSTAT	0		✓
4	Check Instrument Configuration	MODE	0x100/ DRCU_ON		✓
5	Run SCU_OFF from the HCSS Test Procedure window on TOPE	SCUDCDCSTAT SUBKSTAT	0 0		✓ ✓
6*	Run DRCU_OFF from the HCSS Test Procedure window on TOPE	MODE	0/ DPU_ON		0

FINAL INSTRUMENT CONFIGURATION IN THE CASE STEPS 1 to 4 are executed is DRCU_ON
FINAL INSTRUMENT CONFIGURATION IN THE CASE STEPS 1 to 6 are executed is DPU_ON

4.2 END TEST SEQUENCE WHEN THE FUNCTIONAL TEST HAS FAILED

The following table shows the necessary steps to be followed to end the warm functional test sequence when this has been declared failed.

Step#	Action	HK parameters	Expected Value	Comments	Check
1	Check BSM is OFF	CHOPSENSPWR JIGGSENSPWR	0 0		
2	Check SMEC is OFF	SMECENCPWR	0		
3	Run MCU-OFF from the HCSS Test Procedure window on TOPE	SCUDCDCSTAT	0		
4	Check Instrument Configuration	MODE	0x100/ DRCU_ON		
5	Run SCU_OFF from the HCSS Test Procedure window on TOPE	SCUDCDCSTAT SUBKSTAT	0 0		
6	Run DRCU_OFF from the HCSS Test Procedure window on TOPE	MODE	0/ DPU_ON		

FINAL INSTRUMENT CONFIGURATION IN THE CASE STEPS DPU_ON

5. ANNEXE1 (INSTRUMENT NOMINAL CONFIGURATION/MODES)

	OFF	INIT	DPU_ON	DRCU_ON	REDY	PHOT STBY	SPEC STBY	CREC	SAFE
DPU		**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
Essential Hsk packets			0.5Hz	0.5Hz	0.5Hz	0.5Hz	0.5Hz	0.5Hz	0.5Hz
Normal Hsk packets			1.0Hz	1.0Hz	0.25Hz	0.25Hz	0.25Hz	1.0Hz	0.25Hz
TC Acceptance		TBC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Event packets		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Science packets									
VM								Cooler_Recycle	
VM1						Det_Temp_Ctrl			
VM2									
VM3									
MODE			0x0000	0x0100	0x0200	0x0300	0x0400	0x0600	0x0900
DRCU			**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	
SCU									
Temp Channels powered					Yes	Yes	Yes	Yes	
SubK Channel powered					Yes	Yes	Yes	Yes	
PCAL source powered									
SCAL sources powered							TBD		
TC Heater powered						Yes			
Cooler SP Heater powered								Yes	
Cooler EV HS powered								Yes	
Cooler SP HS powered					Yes	Yes	Yes	Yes	
DCU									
Photometer BIAS						Yes			
Photometer JFETS						Yes			
Photometer LIAs						Yes			
TC BIAS						Yes			
TC JFETS						Yes			
TC LIAs						Yes			
Spectrometer BIAS							Yes		
Spectrometer JFETS							Yes		
Spectrometer LIAs							Yes		
MCU									

DSP					On	On	On	On	
BSM						Hold	Hold		
SMEC							Hold		