1. Introduction

This document reports on the WARM FUNCTIONAL TESTS carried out on the SPIRE Flight Instrument Model at the start of the PFM5 ILT tests campaign to verify the correct functioning of each of its subsystems prior to cool down. The test cryostat chamber was fully pumped down.

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 2.2
RD08	SPIRE-IFS-PRJ-000650	SPIRE DPU Interface Control Document	Issue 1.1

1.3 Change Record

Document	Change date	Changes
Issue 1.0	3rd January 2007	First version of the document created.

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2. Functional Tests Configuration

2.1 SPIRE Instrument Configuration (MAIN)

SPIRE FPU:

- FPU In Tank.
- DRCU to Cryostat harnesses connected (Grounding pins not connected)
- Cryostat open
- Cryo-harness connected to FPU

SPIRE FM DPU:

- DPU Power supply connected on DPU Power MAIN (J01) connector (DPU side).
- 1553 Mil Bus connected on Main Connector Bus A (J03) connector (DPU side).
- DPU-DRCU MAIN interfaces connected:
  - DPU J07 to DCU J01 (*DPU PRIME to DCU PRIME)*
  - DPU J08 to FCU J01 (*DPU PRIME to MCU PRIME)*
  - DPU J09 to FCU J03 (*DPU PRIME to SCU PRIME)*

SPIRE FM DRCU:

- DRCU Power supply connected on DRCU Power MAIN (J05) connector (DRCU side on FCU) via the external DRCU switch box.
- FCU to DCU PRIME power connector J7 (FCU) to J03 (DCU) via the external DPU switch box.

2.2 Software Configuration (MAIN)

The current EGSE software configuration for the MAIN side tests:

EGSE component	Version/Build number	Comment
SCOS2000	SCOS2.3e Patch 5	SCOS archives PFM4_TEST3_PRIME under /spired/hfiles and /spired/TMD SCOS MIB is PFM4_Issue2.2.D1_Prime
CDMS Simulator	v2.5	
HCSS	v0.3.6 Build #1043	
QLA	3.2.3 Build #438	
QLA scripts	?	
Test Control scripts	Create TAGS	
CUS Scripts	Create TAGS	
Versant	7.0.0.1	
TFCS	MIB v1.9 Code	

TFTS	MIB v1.6 Server code v1.6	

2.3 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	Comments
Lichfield	EGSE router	Started	✓	Running in the background – no dedicated console on lichfield
Lichfield	EGSE Gateway	Started	✓	Running in the background – no dedicated console on lichfield
Lichfield	Telemetry Ingestion	Started	✓	Running
Lichfield	Packet Display	Started	✓	Running
Lincoln	SCOS2000	Started	✓	Running
Lincoln	EXIF + TOPE	Started	✓	Running
Lincoln	Manual Stack	Started	✓	Running
Gordon	CDMS Simulator	Started	✓	Running
Lichfield	Test Control Server	Started	✓	Running

The following checks were performed to verify the correct initial instrument 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.	**Both TM1N and TM2N are incrementing at their nominal rates. Will go to step 5.**	✓ TM1N was not incrementing because critical HK report had been cleared.
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.		
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 (5,1) contains errors: Check the error code in RD07. Then switch OFF the DPU and repeat step 2		
4	Execute **define_new_HK_report.tcl** HCSS Test procedure.		
5	In SCOS open **SCU_PARAMETERS display** - If SCUP5V/P9V/M9V are jittering and **BIAS_PARAMETERS display** - If BIASTEMP 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.	**ALL SCU VOLTAGES LOOKING GOOD.** SCUP5V = 5.24V SCUP9V =9.09V SCUM9V = -9.09V **ALL BIAS VOLTAGES LOOKING GOOD.** BIASP5V = 5.12V BIASP9V = 8.98V BIASM9V= -9.04V	✓
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**	✓

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 Sequence

The table below shows the general WFT as it was performed.

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-02	SCU Nominal Science Contents Check
5		FUNC-SCU-08	SCU Test Pattern Check
6		FUNC-SCU-07	Sorption Cooler Check
7		FUNC-SCU-04	Photometer Calibrator Check
8		FUNC-SCU-05	Spectrometer Calibrators Check
9	MCU	FUNC-MCU-01	MCU Boot Check
10		FUNC-MCU-02	MCU Nominal Science Generation Check
11		FUNC-MCU-03	MCU Nominal Science Contents Check
12		FUNC-MCU-04	MCU Test Pattern Check
13	BSMm	FUNC-BSM-01	BSM Switch ON Check
14		FUNC-BSM-02c	BSM Chop Sensor Polarity Check
15		FUNC-BSM-02j	BSM Jiggle Sensor Polarity Check
16		FUNC-BSM-03	BSM Open Loop dynamics Check
17		BSM_INIT	Close loop on chop/jiggle axis.
18		FUNC-BSM-06	BSM Operational Mode Check
19	DCU	FUNC-DCU-01	DCU Nominal Science Generation Check
20		FUNC-DCU-02	DCU Nominal Science Contents Check
21		FUNC-DCU-03	DCU Test Pattern Check
22	Photometer LIAs	FUNC-DCU-04P	Photometer LIAs Check
23		FUNC-DCU-05P	Photometer Manual Offset Setting Check
24		FUNC-DCU-11P	Photometer Detectors Switch ON Check

25	Photometer BDAs	FUNC-DCU-013P	Photometer Detectors Check
26	Spectrometer LIAs	FUNC-DCU-04S	Spectrometer LIAs Check
27		FUNC-DCU-05S	Spectrometer Manual Offset Setting Check
28		FUNC-DCU-11S	Spectrometer Detectors Switch ON Check
29	Spectrometer BDAs	FUNC-DCU-013S	Spectrometer Detectors Check
18	SMECm	FUNC-SMEC-02A	SMEC Launch Latch Open/Close Check
19		FUNC-SMEC-01	SMECm Switch ON Check
20		FUNC-SMEC-03	SMEC LED Optical Encoder LED Check
21		FUNC-SMEC-04	SMEC Positioning Test (Open Loop)

Table 2. General WFT sequence

4. Detailed Test Results on MAIN instrument.

The following is a detailed (test by test) procedure including the steps performed on each test and the results obtained.

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

4.1 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	Comments
1	Write the initial value of SCUFRAMECNT parameter located in SCU_PARAMETERS display and the initial value of TM1N located in DPU_AND-OBS_PARAMETERS display.	SCUFRAMCNT = 0
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	Write the final value of SCUFRAMECNT and TM1N.	SCUFRAMCNT = 31
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 TM5N**	**n/ n+ 31 0x3FFF/1**	0/ 31 0x3FFF/1	31	**Success**

Start time @: 13:37
End time @: 13:38
OBSID: 0x30011A54
Comments:

QLA produces QLA-SCU-01_30011A54.txt file:

```
**********************************************************************
SCU: OBSID = 30011A54, BBTYPE = 0x8000, APID = 0x508, SID  = 0xa20
_____________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

SCUFRAMECNT    0          31         31         31           Packet type = 0x15
TM5N           16383      1          49153      2            subtype = 0x1
FrameTime      12.4960    12.4960                            Frame ID  = 0x20
                                                             Frame Len = 0x1E
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 12.49792 ms
sigma = 0.02144 ms
```

4.2 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:** For some parameters the calibration curve above 75K has only 2 points, thus the linearly interpolated temperature reading given by SCOS is usually not correct at T > 75K.

Test Procedure:

Step#	Action	Comments
1	Run FUNC-SCU-03 test procedure from the HCSS Test Procedure window on TOPE	
2	When the test is finished Write 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**	**0/0xffff**	**N/A**	**Success**

Start time @: 13:46
End time @: 13:46
OBSID:0x30011A55
Comments:

QLA script produced the raw values in hex format, which are displayed in decimal format below.

```
SCU-03 Thermometry Check
OBSID = 0x30011a55

PUMPHTRTEMP  54.11    -32768
PUMPHSTEMP   37.26    -32768
EVAPHSTMP    36.90    -32768
SHUNTTEMP    18.71    -32768
EMCFILTMP    283.55   -29646
SL0TEMP      19.72    -32768
PL0TEMP      20.33    -32768
OPTTEMP      154.06   -32768
BAFTEMP      181.37   -32768
BSMIFTEMP    98.86    -32768
SCAL2TEMP    161.08   -32768
SCAL4TEMP    156.52   -32768
SCALTEMP     83.34    -32768
SMECIFTEMP   94.97    -32768
SMECTEMP     8.43     -32768
BSMTEMP      12.80    -32768
```

4.3 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	Comments
1	Run FUNC-SCU-06 test procedure from the HCSS Test Procedure window on TOPE.	
2	When the test is finished Write 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 :	

	Send manual command: SEND_DRCU_COMMAND Parameter1 = 0xA0860000 Parameter2 = 0 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**	0/1	**N/A**	**Success**

Start time @: 13:55
End time @: 13:55
OBSID:0x30011A56
Comments:

SUBKTEMP:
Before: RAW = 32757
After : RAW = 32752

4.4 FUNC-SCU-02

Test Id:	**FUNC-SCU-02**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Success Criteria:	Test passed if : 1. Parameters in the SCU Nominal science packets and the same parameters in the Nominal HK packet have similar RAW/converted values to within 10%. 2. The SPIRE HK parameter SCUFRAMECNT located in **SCU_PARAMETERS** display increments by 31. 3. No events are generated during the frame generation. QLA to give the go ahead.

Test Procedure:

Step#	Action	Comments
1	Write the current value of SCUFRAMECNT located in SCU_PARAMETERS display.	
2	Run QLA script FUNC-SCU-02.py on QLA console.	
3	Run FUNC-SCU-02 test procedure from the HCSS Test Procedure window on TOPE	
4	When the test is finished Write the current value of SCUFRAMCNT.	
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-02	**SCUFRAMECNT** **TM5N**	**n+31/n+62** **1/3**	31/62 1/3	31	**Success**

Start time @: 13:56
End time @: 13:56
OBSID: 0x30011A57

Comments:

All SCU parameters within the Nominal HK and the Nominal SCU Science Report agree.

QLA produces QLA-SCU-02_30011A57.txt file:

```
FUNC-SCU-02 version: 1.4

Housekeeping @  Thu Jan 25 13:55:57 GMT 2007
SCU Science @ Thu Jan 25 13:55:51 GMT 2007

 Name           HSK value  SCU value     Equal (within 10%)?
TCHTRV          22.0       22.0          True
PCALCURR        13.0       13.0          True
SCAL4CURR       13.0       11.0          False
SCAL2CURR       13.0       13.0          True
PCALV           10.0       11.0          True
SCAL4V          12.0       13.0          True
SCAL2V          14.0       13.0          True
PUMPHTRTEMP     32768.0    32768.0       True
PUMPHSTEMP      32768.0    32768.0       True
EVAPHSTEMP      32768.0    32768.0       True
SHUNTTEMP       32768.0    32768.0       True
EMCFILTEMP      35891.0    35887.0       True
SL0TEMP         32768.0    32768.0       True
PL0TEMP         32768.0    32768.0       True
OPTTEMP         32768.0    32768.0       True
BAFTEMP         32768.0    32768.0       True
BSMIFTEMP       32768.0    32768.0       True
SCAL2TEMP       32768.0    32768.0       True
SCAL4TEMP       32768.0    32768.0       True
SCALTEMP        32768.0    32768.0       True
SMECIFTEMP      32768.0    32768.0       True
SMECTEMP        32768.0    32768.0       True
BSMTEMP         32768.0    32768.0       True
SUBKTEMP        32750.0    32749.0       True

The discrepancy is not significant.
```

4.5 FUNC-SCU-08

Test Id:	**FUNC-SCU-08**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Success Criteria:	Test passed if : 1. Two SCU Diagnostic Science Report telemetry packets are received with the following characteristics:

APID	**Type**	**Subtype**	**SID**	**FrameID**	**Frame length**
0x508	21	3	0x1121	0x21	0x1E

	2. The SCU Test Pattern agrees with the reference test pattern. QLA to give go ahead.

Test Procedure:

Step#	Action	Comments
1	Write the current values of SCUFRAMECNT located in SCU_PARAMETERS display.	
2	Run QLA script FUNC-SCU-08.py on QLA console.	
3	Run FUNC-SCU-08 test procedure from the HCSS Test Procedure window on TOPE	
4	When the test is finished Write the current value of SCUFRAMCNT.	
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-08	**SCUFRAMECNT and SCU test pattern frame parameters**	**n+62/n+93**	62/93 93/124	31 31	**Success**

Start time @: 14:00
End time @: 14:01
OBSID:0x3001197F

Comments:

QLA has written file FUNC-SCU-08_30011A58_8A07.txt:

```
SCU Test Pattern @ Thu Jan 25 13:59:59 GMT 2007
..compared with data from SCU Test Pattern @ Thu Jan 04 16:53:09 GMT 2007, OBSID=0x300119AC

Name                New Value[0]       New Value[20]      Comp Value[0]            Comp
Value[20]
SCUTSTOBSID         8.05378648E8       0.0                8.05378476E8    <--BAD   0.0
--> OK
SCUTSTBBID          2.315714561E9      0.0                2.315714561E9   --> OK   0.0
--> OK
SCUTSTBLKLEN        30.0               30.0               30.0            --> OK   30.0
--> OK
SCUTSTFRAMEID       33.0               33.0               33.0            --> OK   33.0
--> OK
SCUTST001           43690.0            31181.0            43690.0         --> OK   31181.0
--> OK
SCUTST002           21844.0            62363.0            21844.0         --> OK   62363.0
--> OK
SCUTST003           43688.0            59190.0            43688.0         --> OK   59190.0
--> OK
SCUTST004           21840.0            52844.0            21840.0         --> OK   52844.0
--> OK
SCUTST005           43680.0            40153.0            43680.0         --> OK   40153.0
--> OK
SCUTST006           21825.0            14771.0            21825.0         --> OK   14771.0
--> OK
SCUTST007           43650.0            29543.0            43650.0         --> OK   29543.0
--> OK
SCUTST008           21765.0            59086.0            21765.0         --> OK   59086.0
--> OK
SCUTST009           43530.0            52637.0            43530.0         --> OK   52637.0
--> OK
SCUTST010           21524.0            39739.0            21524.0         --> OK   39739.0
--> OK
SCUTST011           43048.0            13943.0            43048.0         --> OK   13943.0
--> OK
SCUTST012           20560.0            27887.0            20560.0         --> OK   27887.0
--> OK
SCUTST013           41120.0            55774.0            41120.0         --> OK   55774.0
--> OK
SCUTST014           16705.0            46012.0            16705.0         --> OK   46012.0
--> OK
SCUTST015           33411.0            26489.0            33411.0         --> OK   26489.0
--> OK
SCUTST016           1287.0             52978.0            1287.0          --> OK   52978.0
--> OK
SCUTST017           2574.0             40420.0            2574.0          --> OK   40420.0
--> OK
SCUTST018           5149.0             15304.0            5149.0          --> OK   15304.0
--> OK
SCUTST019           10298.0            30608.0            10298.0         --> OK   30608.0
--> OK
SCUTST020           20597.0            61216.0            20597.0         --> OK   61216.0
--> OK
SCUTST021           41194.0            56896.0            41194.0         --> OK   56896.0
--> OK
SCUTST022           16852.0            48257.0            16852.0         --> OK   48257.0
--> OK
SCUTST023           33705.0            30978.0            33705.0         --> OK   30978.0
--> OK
SCUTST024           1874.0             61956.0            1874.0          --> OK   61956.0
--> OK
SCUTSTADCFLGS       0.0                0.0                0.0             --> OK   0.0
--> OK
SCUTSTFRAMETIME     4228894.0          4307006.0          4311432.0       <--BAD   4389544.0
<--BAD
SCUTSTCHECKWORD     58523.0            13059.0            43532.0         <--BAD   29078.0
<--BAD
```

4.6 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	Comments
1	Write 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 Write 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/After	Nb. of frames received	Test Result
FUNC-SCU-04	**PCALCURR** **PCALV**	**0/0.1mA** **0/0.02V**	0 / 0.1015 mA 0 / 0.0217 V	**N/A**	**Success**

Start time @: 14:05
End time @: 14:05
OBSID:0x30011A59
Comments:

Test Successful

4.7 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	Write the current value of SCAL2V ,SCAL2CURR,SCAL4V,SCAL4CURR located in SCU_PARAMETERS display.	
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	**SCAL4CURR** **SCAL4V** **SCAL2CURR** **SCAL2V**	**0/0.1mA** **0/0.05V** **0/0.1mA** **0/0.05V**	0 / 0.1021 mA 0 / 0.0510 V 0 / 0.1003 mA 0 / 0.0503 V	**N/A**	**Success**

Start time @: 14:07
End time @: 14:07
OBSID:0x30011A5A
Comments:

Test Successful

4.8 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	Comments
1	Run FUNC-SCU-07 test procedure from the HCSS Test Procedure window on TOPE.	Pending
2	While the test is running Write 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**	0.1554mV / 324.6 mV 0.1853 / 324.38 mV 0.0042V / 8.86 V	**N/A**	**Success**

Start time @: 14:16
End time @: 14:20
OBSID:0x30011A5B

Comments:
Used all the default parameters when running the TOPE script. The commanded currents were as follows:

EVHS current: 0.804mA
SPHS current: 0.804mA
SPHTR current: 21.85mA

Test Successful

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

4.9 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, SMEC and BSM board temperatures 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 Write 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** **MCUSMECTEMP** **MCUBSMTEMP**	**N/A/ ~ 5V** **N/A / ~15V** **N/A / ~ 14V** **N/A / ~ -14V** **N/A / ~ -15V** **N/A / ~ 300K** **N/A / ~ 300K** **N/A / ~ 300K**	- / 5.01V - / 15.54V - / 14.15V - / -14.47 V - / -15.63 V - / 289.35K - / 294.54K - / 294.13K	**N/A**	**Success**

Start time @: 14:33
End time @: 14:35
OBSID:0x30011A5C

Comments:

SCUDCDCSTAT went from 0 to 4 as expected

DRCU Power Supply LCD reading = (I = 0.87 A)

Test Successful

4.10 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	Write 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 Write 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/ ~ 6600**	0 / 6550		**Success**

Start time @: 14:36
End time @: 14:39
OBSID:0x30011A5D
Comments:

Used all the default parameters when running the TOPE script

QLA generated file QLA-MCU-02_30011A5D.txt :

```
**************************************************************************
MCUENG: OBSID = 30011A5D, BBTYPE = 0x8901, APID = 0x508, SID  = 0x814
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

MCUFRAMECNT    0          609        609        609          Packet type = 0x15
TM5N           5          32         27         27           subtype = 0x3
FrameTime      16.4225    16.4223                            Frame ID  = 0x14
                                                             Frame Len = 0x15
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 16.42244 ms
sigma = 0.00104 ms


**************************************************************************
BSM: OBSID = 30011A5D, BBTYPE = 0x8903, APID = 0x508, SID  = 0x612
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

MCUFRAMECNT    609        1250       641        609          Packet type = 0x15
TM5N           32         49         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  = 15.58026 ms
sigma = 0.00121 ms


**************************************************************************
SMEC: OBSID = 30011A5D, BBTYPE = 0x8902, APID = 0x508, SID  = 0x410
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

MCUFRAMECNT    1250       3681       2431       2375         Packet type = 0x15
TM5N           49         109        60         58           subtype = 0x1
FrameTime      4.2112    4.2112                             Frame ID  = 0x10
                                                             Frame Len = 0xC
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 4.21088 ms
sigma = 0.00096 ms


**************************************************************************
SMEC+BSM: OBSID = 30011A5D, BBTYPE = 0x8904, APID = 0x508, SID  = 0x612
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

MCUFRAMECNT    3681       6550       2869       2850         Packet type = 0x15
TM5N           109        180        71         71           subtype = 0x1
FrameTime SMEC 4.2081    4.2081                          Frame ID = 0x10, Len = 0xC
FrameTime BSM  20.2112    20.2112                           Frame ID = 0x12, Len = 0xD

STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 4.21088 ms (SMEC), 20.21224 ms (BSM)
sigma = 0.00096 ms (SMEC), 0.00150 ms (BSM)
```

4.11 FUNC-MCU-03

Test Id:	**FUNC-MCU-03**
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 99 frames of each type of frames requested 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.
3. QLA analysis results are correct.

QLA to give go ahead.

Test Procedure:

Step#	Action	Comments
1	Write the current value of MCUFRAMECNT located MCU_PARAMETERS display.	
2	Run QLA script FUNC-MCU-03.py on QLA console.	
3	Run FUNC-MCU-03 test procedure from the HCSS Test Procedure window on TOPE	
4	When test is finished Write 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-03	**MCUFRAMECNT**	**n/ n+297** **n~6600**	6550 / 6847		Success

Start time @: 14:40
End time @: 14:42
OBSID:0x30011A5E

Produced 99 frames instead of 100 as expected for each type of MCU frame

QLA produced three files: QLA-MCU-03_30011A5E_8901.txt (SMEC), QLA-MCU-03_30011A5E_8902.txt (MCU Eng) and QLA-MCU-03_30011A5E_8903.txt (BSM). Files are in folder Q:\Test Team Area\Reports\PFM\PFM5\FuncTestData.

No discrepancies between HK and science parameter values.

4.12 FUNC-MCU-04

Test Id:	**FUNC-MCU-04**
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 100 frames of Test Pattern with the following characteristics: 2. MCU Test pattern produced is the same as the previous time this test was run. QLA to give go ahead.

Frame	APID	Type	Subtype	SID	FrameID	Frame length
Test	**0x508**	**21**	**3**	**0x915**	**0x15**	**0x15**

Test Procedure:

Step#	Action	Comments
1	Write the current value of MCUFRAMECNT located in MCU_PARAMETERS display.	
2	Run QLA script FUNC-MCU-04.py on QLA console.	
3	On Lincoln run FUNC-MCU-04 test procedure from the HCSS Test Procedure window on TOPE	
4	When test is finished Write 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-04	**MCUFRAMECNT**	**m/ m+99 m~6600**	6847 / 6946		**Success**

Start time @: 14:48
End time @: 14:49
OBSID: 0x30011A5F

Comments:

Produced 99 frames instead of 100 as expected.

QLA generated file QLA-MCU-04_30011ª5F_8905.txt:

```
MCU Test Pattern @ Thu Jan 25 14:47:41 GMT 2007
 ..compared with data from MCU Test Pattern @ Thu Jan 04 17:41:13 GMT 2007, OBSID=0x300119B3

Name              New Value[0]      New Value[20]     Comp Value[0]           Comp
Value[20]
MCUTSTBBID        2.298806273E9     0.0               2.298806273E9   --> OK  0.0
--> OK
MCUTSTBLKLEN      21.0              21.0              21.0            --> OK  21.0
--> OK
MCUTSTFRAMEID     21.0              21.0              21.0            --> OK  21.0
--> OK
MCUTST001         21845.0           21845.0           21845.0         --> OK  21845.0
--> OK
MCUTST002         43690.0           43690.0           43690.0         --> OK  43690.0
--> OK
MCUTST003         21844.0           21844.0           21844.0         --> OK  21844.0
--> OK
MCUTST004         43688.0           43688.0           43688.0         --> OK  43688.0
--> OK
MCUTST005         21840.0           21840.0           21840.0         --> OK  21840.0
--> OK
MCUTST006         43680.0           43680.0           43680.0         --> OK  43680.0
--> OK
MCUTST007         21825.0           21825.0           21825.0         --> OK  21825.0
--> OK
MCUTST008         43650.0           43650.0           43650.0         --> OK  43650.0
--> OK
MCUTST009         21765.0           21765.0           21765.0         --> OK  21765.0
--> OK
MCUTST010         43530.0           43530.0           43530.0         --> OK  43530.0
--> OK
MCUTST011         21524.0           21524.0           21524.0         --> OK  21524.0
--> OK
MCUTST012         43048.0           43048.0           43048.0         --> OK  43048.0
--> OK
MCUTST013         20560.0           20560.0           20560.0         --> OK  20560.0
--> OK
MCUTST014         41120.0           41120.0           41120.0         --> OK  41120.0
--> OK
```

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

4.13 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
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** **3/3** **0x8000/0x8000** **0xBEB/0xBEB** **~0x8000/?** **0/1** **3/3** **0x8000/0x8000** **0xBEB/0xBEB** **~0x8000/?**	0/1 3/3 0x8000/0x8000 0xBEB/**0x770** 0x7FFD/0x8EEC 0/1 3/3 0x8000/0x8000 0xBEB/**0xF6E** 0x7FF2/ ~ 0x8FFD	**N/A**	**Success**

Start time @: 16:09
End time @: 16:10
OBSID: 0x30011A60
Comments:

The BSM was switched ON correctly. The highlighted Chop and Jiggle FF gains are consistent with the latest BSMNominalSettings.txt table in the CUS.

4.14 FUNC-BSM-02c

Test Id:	FUNC-BSM-02c
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)

Test Procedure:

Step#	Action	Comments
1	On QLA open up a time series display of HK parameter CHOPDACVAL and CHOPSENSSIG	
2	Run FUNC-BSM-02c test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1.	

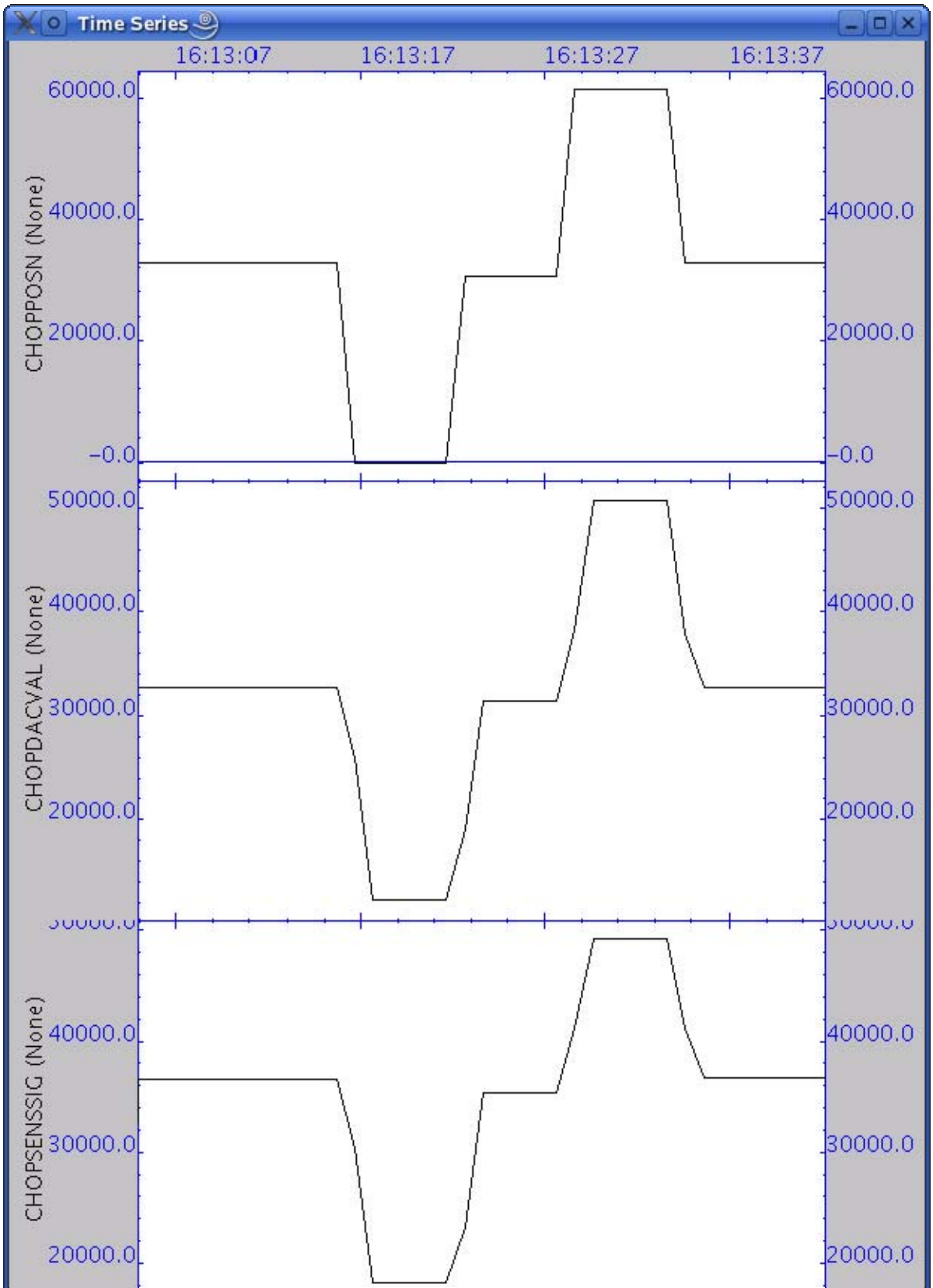
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-BSM-02c	CHOPDACVAL CHOPSENSSIG		See below	N/A	Success

Start time @: 16:13
End time @: 16:15
OBSID: 0x30011A61

Comments:

The BSM moved along the chop axis in the same direction as expected.



4.15 FUNC-BSM-02j

Test Id:	FUNC-BSM-02j
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 jiggle sensor signal evolves in the same way as the positions set.(i.e if (pos1 > pos2 ➔ sig1 > sig2)

Test Procedure:

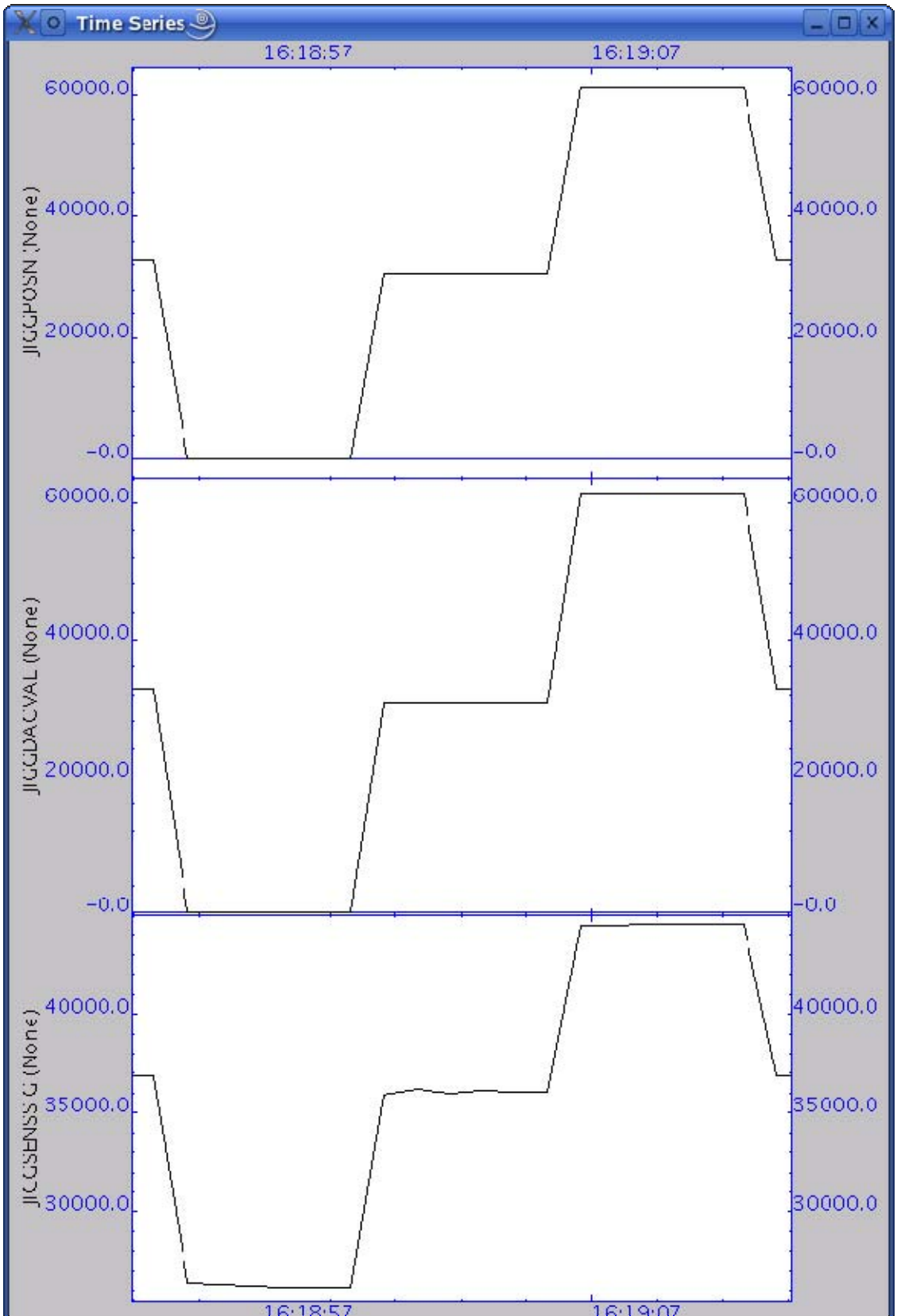
Step#	Action	Comments
1	On QLA open up a time series display of HK parameter JIGGDACVAL and JIGGSENSSIG	
2	Run FUNC-BSM-02j test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat steps 1.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-BSM-02j	**JIGGDACVAL** **JIGGSENSSIG**		See below	**N/A**	**Success**

Start time @: 16:19
End time @: 16:21
OBSID: 0x30011A62
Comments:

The BSM moved along the jiggle axis in the same direction as expected.



4.16 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 CHOPMOTORVOLT JIGGPOSN JIGGDACVAL JIGGMOTORCURR JIGGSENSSIG JIGGMOTORVOLT	
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**	**Success**

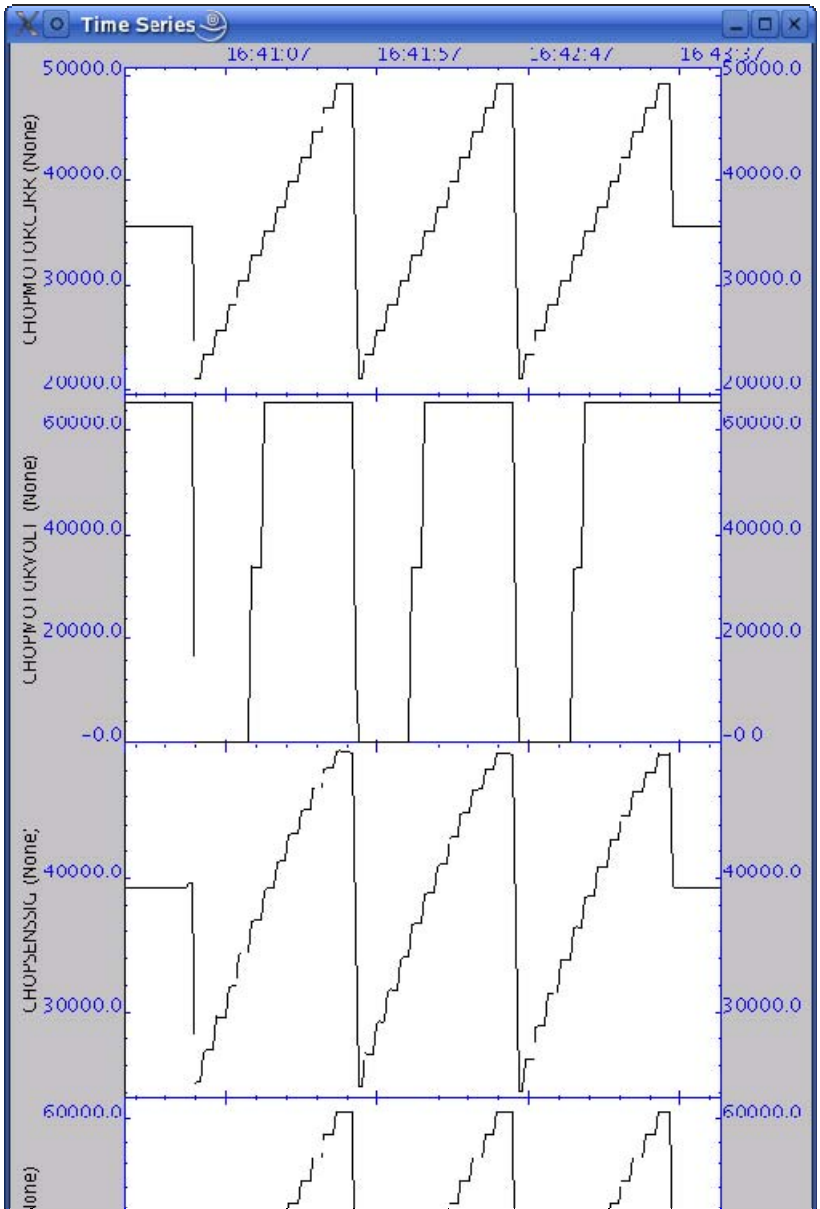
Start time @: 16:27
End time @: 16:32
OBSID:0x30011A63

Test repeated because the Chop and Jiggle input parameters were swapped.

Start time @: 16:41
End time @: 16:45
OBSID:0x30011A64

Comments:
Ran TOPE script with input parameters:
Jiggle Start = 0x4000
Jiggle End = 0xC000
Jiggle Step = 0x4000
Chop Start = 0x3000
Chop End = 0xF000
Chop Step = 0x1000

3 seconds per step



4.17 FUNC-BSM-06

Step#	Action	Comments
0	Execute BSM_INIT from HCSS Test Procedures	Started at 16:49 **OBSID: 0x30011A65**

4.18

Test Id:	**FUNC-BSM-06**
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:	**Note:** The purpose of this test is to check the correctness of the BSM close loop initialisation procedure and the default PID parameters If the dynamical behaviour of the BSM during chopping with these PID parameters is close or within requirements this indicates that the PID parameters used can be applied to cold testing with certain adjustment. If NOT these indicates that the PID parameters need further tuning **BUT NOT TO BE DONE DURING THESE TEST.** In any case the success/fail criteria are NOT applicable for this test.

Test Procedure

Step#	Action	Comments
1	On QLA open up a time series display of HK parameters: BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT BSMJIGGSENSSIG BSMJIGGMOTORCURR BSMJIGGMOTORVOLT	
2	Run FUNC-BSM-06 test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: None contemplated.	

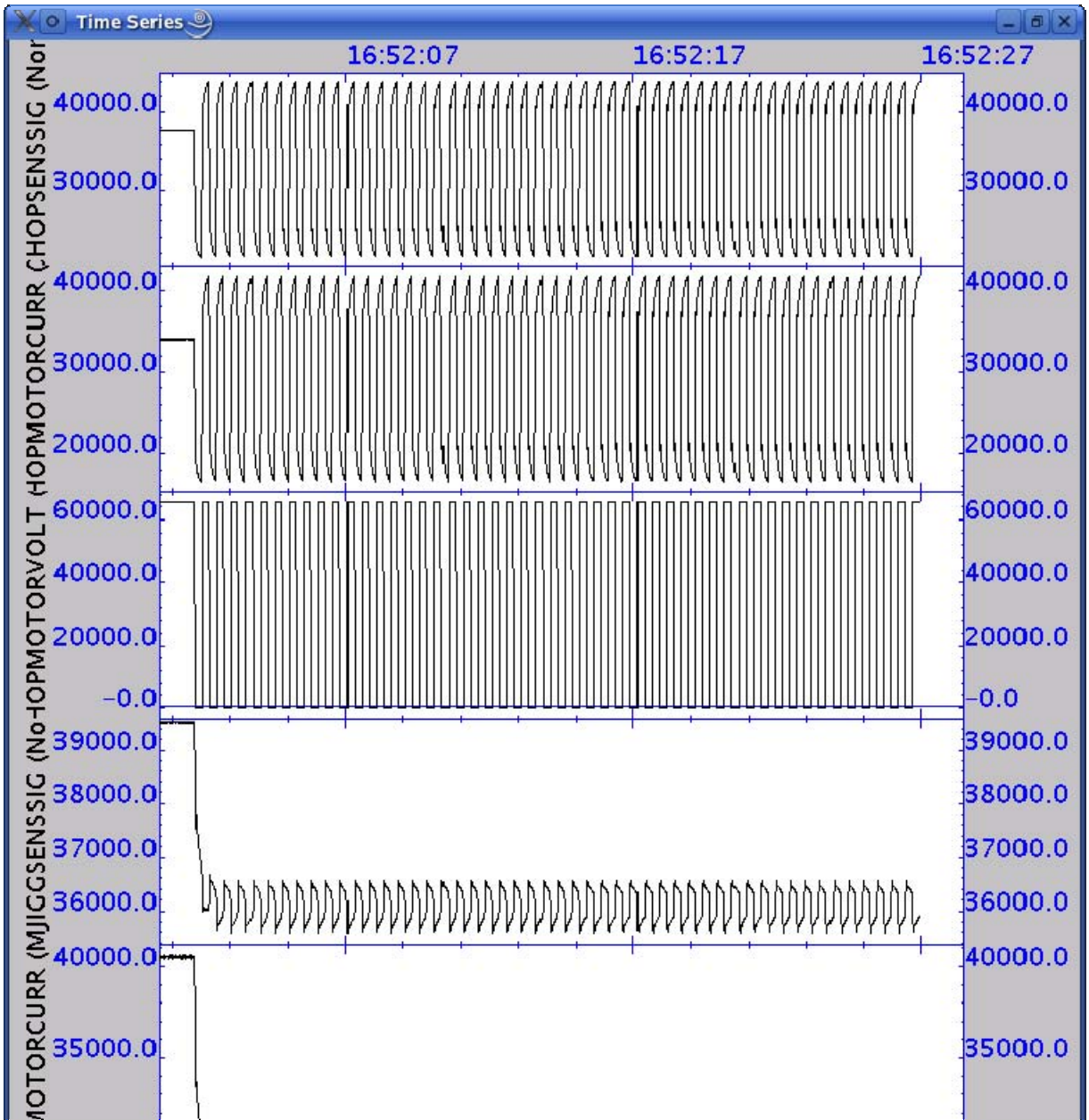
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-BSM-06	**CHOPSENSSIG** **CHOPMOTORCURR** **CHOPDACVAL**	**?/?** **?/?** **?/?**		**N/A**	**N/A**

Start time @: 16:52
End time @: 16:17
OBSID:0x30011A66
Comments:
Ran TOPE script with default values that the input parameters have:

Input Parameter	Value
Frame rate	125 Hz
On source chop	0x5279
On source jiggle	0x8D00
Off source chop	0xAD87
Off source chop	0x8D00
Number of cycles	50
Chop cycle period	500000 (us)
DCU frame type	0
Number of DCU frame per half cycle	4
DCU delay to start sampling	34959 (us)
Number of BSM samples	65535 = continuous sampling

Output plot from QLA script FUNC-BSM-06:



Step#	Action	Comments
4	Execute BSM_OFF from HCSS Test Procedures	Switched OFF the BSM @ 16:56 **Obsid: 0x30011A67**

Manually set the MODE HK parameter to REDY: SET_OBS_MODE(0x200)

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

4.19 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 ID	Frame type	Nb. Of frames	Nb. of 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	Write 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	Write 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**	**n/n+700 n depends on the BSM chop operations on FUNC-BSM-06**	400 / 1100	700	**Success**

Start time @: 17:00
End time @: 17:03

OBSID: 0x30011A68

Comments:
Ran TOPE script with default values

QLA created file QLA-DCU-01_30011A68.txt:

```
**************************************************************************
PHOTF: OBSID = 30011A68, BBTYPE = 0x8800, APID = 0x504, SID  = 0x200
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    400        500        100        100          Packet type = 0x15
TM3N           399        499        100        100          subtype = 0x1
FrameTime      53.7600    53.7600                            Frame ID  = 0x0
                                                             Frame Len = 0x126
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 53.75945 ms
sigma = 0.00122 ms


**************************************************************************
PHOTSW: OBSID = 30011A68, BBTYPE = 0x8802, APID = 0x504, SID  = 0x102
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    500        600        100        100          Packet type = 0x15
TM3N           499        533        34         34           subtype = 0x2
FrameTime      53.7600    53.7600                            Frame ID  = 0x2
                                                             Frame Len = 0x96
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 53.75945 ms
sigma = 0.00122 ms


**************************************************************************
PHOTMW: OBSID = 30011A68, BBTYPE = 0x8803, APID = 0x504, SID  = 0x103
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    600        700        100        100          Packet type = 0x15
TM3N           533        558        25         25           subtype = 0x2
FrameTime      53.7600    53.7600                            Frame ID  = 0x3
                                                             Frame Len = 0x66
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 53.75945 ms
sigma = 0.00121 ms


**************************************************************************
```

```
PHOTLW: OBSID = 30011A68, BBTYPE = 0x8804, APID = 0x504, SID  = 0x104
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    700        800        100        100          Packet type = 0x15
TM3N           558        570        12         12           subtype = 0x2
FrameTime      53.7600    53.7600                            Frame ID  = 0x4
                                                             Frame Len = 0x36
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 53.75945 ms
sigma = 0.00121 ms


*****************************************************************************
SPECF: OBSID = 30011A68, BBTYPE = 0x8801, APID = 0x506, SID  = 0x201
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    800        900        100        100          Packet type = 0x15
TM4N           16383      16         49168      17           subtype = 0x1
FrameTime      12.4928    12.4928                            Frame ID  = 0x1
                                                             Frame Len = 0x4E
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 12.49267 ms
sigma = 0.00064 ms


*****************************************************************************
SPECSW: OBSID = 30011A68, BBTYPE = 0x8805, APID = 0x506, SID  = 0x105
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    900        1000       100        100          Packet type = 0x15
TM4N           16         28         12         12           subtype = 0x2
FrameTime      12.4928    12.4928                            Frame ID  = 0x5
                                                             Frame Len = 0x36
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 12.49267 ms
sigma = 0.00064 ms


*****************************************************************************
SPECLW: OBSID = 30011A68, BBTYPE = 0x8806, APID = 0x506, SID  = 0x106
_____________________________________________________________________________
Parameter      Initial    Final     Increment Expect Incre. Packet Chars.

DCUFRAMECNT    1000       1100       100        100          Packet type = 0x15
TM4N           28         35         7          7            subtype = 0x2
FrameTime      12.4928    12.4928                            Frame ID  = 0x6
                                                             Frame Len = 0x1E
STATISTICS ON TIME BETWEEN RECEPTION OF 2 CONSECUTIVE FRAMES:
mean  = 12.49267 ms
sigma = 0.00065 ms
```

4.20 FUNC-DCU-02

Test Id:	FUNC-DCU-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 DCUFRAMECNT goes from 700 to 1400 and the frametime difference between consecutive frames computed by QLA script is in agreement with the expected differences based on commanded sampling rate: 1. Photometer Sampling rate is 15.3Hz → Δt ~ 65.5 ms 2. Spectrometer Sampling rate is 80Hz → Δt = 12.5 ms

Test Procedure:

Step#	Action	Comments
1	Write the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
2	Run QLA script FUNC-DCU-02.py on QLA console.	
3	Run FUNC-DCU-02 test procedure from the HCSS Test Procedure window on TOPE	
4	Write the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
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-DCU-02	**DCUFRAMECNT**	**m/m+1400**	1100 / 1800	700	**Success**

Start time @: 17:05
End time @: 17:08
OBSID: 0x30011A69

Comments:

Contents of QLA created files show sampling times to be consistent with input parameters entered for sampling frequencies of photometer 18Hz (Δt ~ 53.3 ms) **and spectrometer 80Hz** Δt ~ 12.5 ms**.**

4.21 FUNC-DCU-03

Test Id:	FUNC-DCU-03
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 100 frames of Full Photometer Test Pattern and 100 frame of Full Spectrometer Test Pattern test. 2. QLA analysis shows that phot/spec test patterns are the same as the reference phot/spec test patterns.

Test Procedure:

Step#	Action	Comments
1	Write the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
2	Run QLA script FUNC-DCU-03.py on QLA console.	
3	Run FUNC-DCU-03 test procedure from the HCSS Test Procedure window on TOPE	
4	Write the current value of DCUFRAMECNT located d in DCU PARAMETERS AND	
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-DCU-03	**DCUFRAMECNT**	**j/j+200**	1800 / 2000	200	**Success**

Start time @: 17:09
End time @: 17:12
OBSID: 0x30011A6A

Comments:

Files produced by QLA:
QLA-DCU-03_30011A6A_8807.txt
QLA-DCU-03_30011A6A_8808.txt
Test pattern files show agreement with reference DCU test pattern files from OBSID 0x300119BF.

4.22 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	
5	Contingency: If test fails repeat steps 1 and 2.	

Test Log:

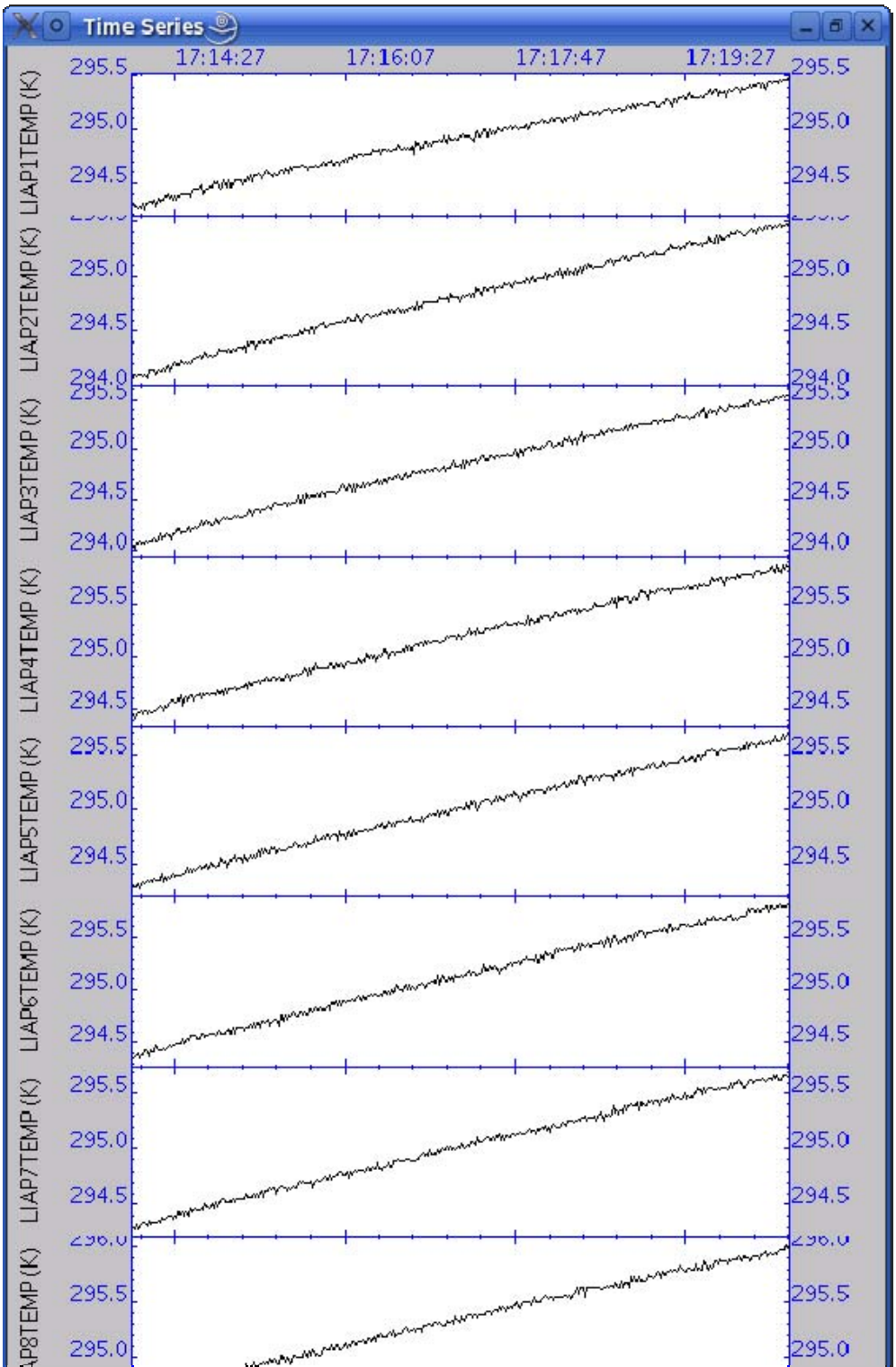
Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-04-P	**SCUDCDCSTAT** **PLIAP5V** **PLIAP9V** **PLIAM9V** **LIAP1TEMP to LIAP9TEMP**	**4/5** **0/~ +5V** **0/~+11V** **0/~-11V** **N/A/ [290-300]K**	**4/1** 0/+5.17V 0/+11.53V 0/-11.53V ~294/warming up		**Success**

Start time @: 17:13
End time @: 17:14
OBSID: 0x30011A6B

Comments: TOPE script is called FUNC-DCU-04-PHOT
Photometer LIAs switched on OK

The script switched off the MCU while switching on the Photometer LIAs

Output plot from QLA script:



4.23 FUNC-DCU-05P

Test Id:	FUNC-DCU-05P
Initial Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON
Success Criteria:	Test passed if : 1. The first channel of the 32 on each photometer LIA card (16 bit word in the photometer offset packet) shows the commanded offset variation 0x1,0x3,0x6,0x9,0xc,0xf

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the Photometer Offset Frame parameters: PHOTOFF001 PHOTOFF033 PHOTOFF055 PHOTOFF087 PHOTOFF119 PHOTOFF151 PHOTOFF183 PHOTOFF215 PHOTOFF247 PHOTOFF279	
2	Run FUNC-DCU-05P test procedure from the HCSS Test Procedure window on TOPE	
5	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-05P					Pass

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

WAS NOT EXECUTED AS THE SENDING OF THE SET OFFSET COMMAND CAN TRIGGER (ON OBS 2.2D) THE DPU TO GO INTO SAFE MODE AS THIS COMMAND IS NOT ACKNOWLWDGED BY THE DRCU FPGA.

4.24 FUNC-DCU-11P

Test Id:	FUNC-DCU-11P
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON + Photometer BIAS ON +Photometer JFETs ON
Success Criteria:	Test passed if Photometer JFET source and drain voltages are correct: 1. PSWJFETVSS1/2/3/4/5/6 (RAW: 0x4C CONVERTED ~ -1.5V). 2. PMLWJFETVSS1/2/3/4 (RAW: 0x4C CONVERTED ~ -1.5V). 3. PSWJFETSTAT = 0x3F 4. PMLWJFETSTAT = 0x1F

Test Procedure:

Step#	Action	Comments
1	Run FUNC-DCU-11P test procedure from the HCSS Test Procedure window on TOPE	
2	After the test Write the values RAW and converted values of: PSWJFETSTAT,PMLWJFETSTAT, PSWJFET1/2/3/4/5/6V PMWJFET1/2/3/4V PLWJFET1/2V located in DCU PARAMETERS AND	
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-11P	**PSWJFETSTAT** **PMLWJFETSTAT** **PSWJFET1/2/3/4/5/6V** **PMWJFET1/2/3/4V** **PLWJFET1/2V**	**0/0x3f** **0/0x7f** **0V/-1.5V** **0V/-1.5V** **0V/-1.5V**	0/0x03f 0/0x07f See comments	**N/A**	**Pass**

Start time @: 17:30
End time @: 17:32
OBSID: 0x30011A6D

Comments:

The Vss values for the JFETs were the same as for the PFM4 cold test campaign, i.e.

PSWJFET1V: -1.68V
PSWJFET2V: -1.59V
PSWJFET3V: -1.37V
PSWJFET4V: -1.59V
PSWJFET5V: -1.78V
PSWJFET6V: -1.59V

PMWJFET1V: -1.68V
PMWJFET2V: -1.59V
PMWJFET3V: -1.59V
PMWJFET4V: -1.88V

PLWJFET1V: -1.59V
PLWJFET2V: -1.37V

PSW G13 appears to be dead (no signal before or after, only during the JFET switch on did it show a spike). A10 is OK, unlike during the WFT before cooldown.

PMW C8, D7, DP1 and T2 also appear to be dead

PLW seems to be fine.

4.25 FUNC-DCU-13P

Test Id:	FUNC-DCU-13P
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON + Photometer BIAS ON +Photometer JFETs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON + Photometer BIAS ON +Photometer JFETs ON
Success Criteria:	Test passed if : The photometer detectors show a small linear variation on the output voltage when different bias is applied through the load curve.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of a couple of pixels on each of the photometer BDAs	
2	Run FUNC-DCU-13P test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency:	

	If test fails repeat step 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-13P				**N/A**	**Success**

Start time @: 17:34
End time @: 17:
OBSID: 0x30011A6E

Comments: TOPE script is called FUNC-DCU-13-PHOT

Parameter for LC:
Array: PF
Bias frequency: 130 Hz
Sampling frequency: 18 Hz
PSW phase: 180.71 deg
PMW phase: 180.71 deg
PLW phase: 180.71 deg
Time at each level: 5 s

Quick look on QLA in playback mode shows the LC data to be OK, except the PTC channel P1 signal v bias plot is flat. Need to check P2 and P3 as well. See Annexe 2 for detailed results.

DKG has confirmed that the PTC channel harness in not connected – will need to be connected and the test repeated tomorrow.

Step#	Action	Comments
1	From TOPE HCSS Test Procedures run **PDET-OFF**	**Executed @ 17:48** **OBSID 0x30011A6F**

4.26 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	
5	Contingency: If test fails repeat steps 1 and 2.	

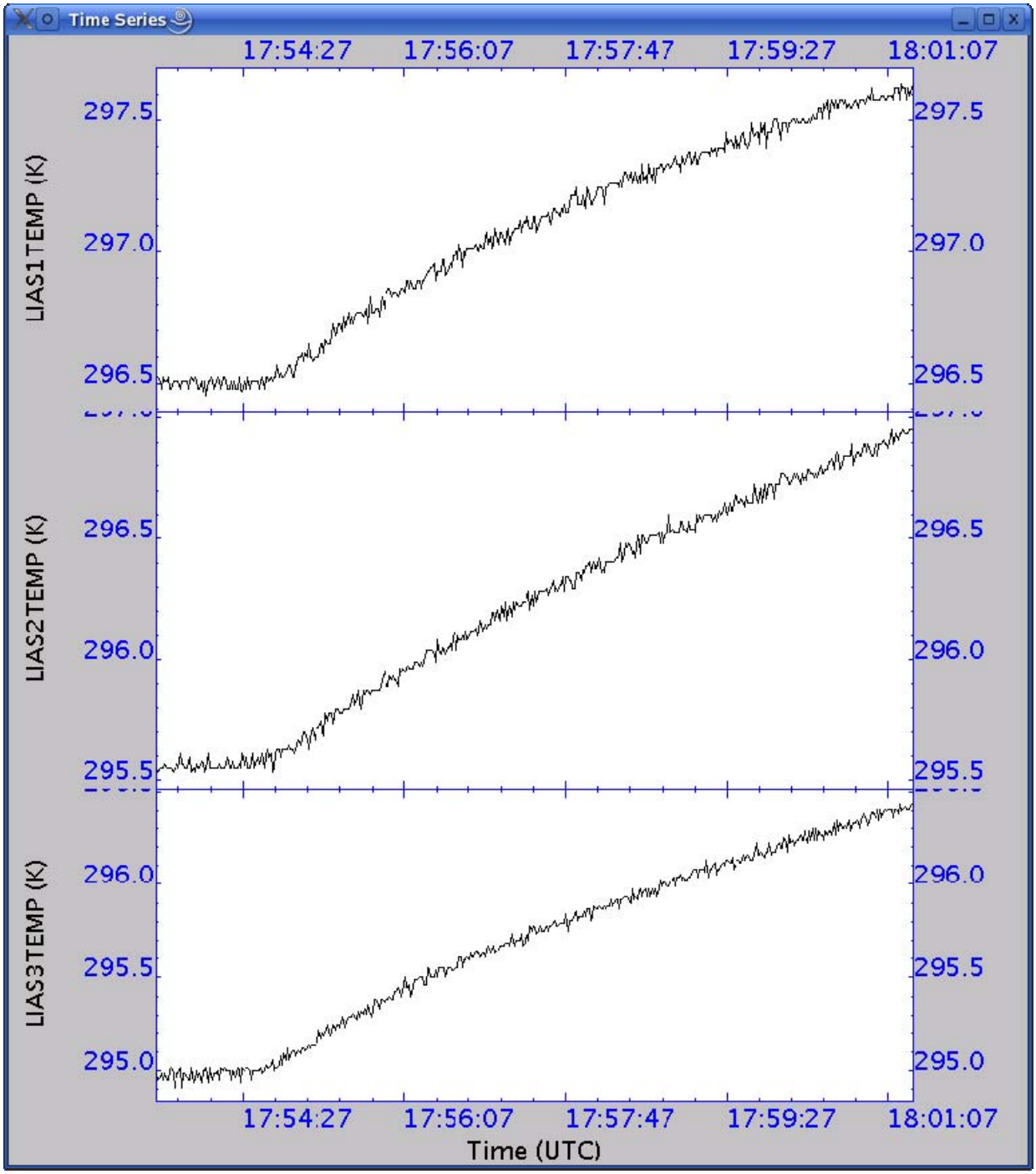
Test Log:

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/~+11V** **0/~-11V** **N/A/ [290-300]K**	4/6 0.17 / 5.23 0.003/ 11.57 0.003/-11.54 /~295Kwarming up		**Success**

Start time @: 17:54
End time @: 17:55
OBSID: 0x30011A70

Comments: TOPE script is called FUNC-DCU-04-SPEC

Spectrometer LIAs switched ON correctly



4.27

4.28 FUNC-DCU-05S

Test Id:	FUNC-DCU-05S
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON
Success Criteria:	Test passed if : 1. The first channel of the 12 on each spectrometer LIA card (16 bit word in the photometer offset packet) shows the commanded offset variation 0x1,0x3,0x6,0x9,0xc,0xf

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of the Photometer Offset Frame parameters: SPECOFF01 SPECOFF13 SPECOFF25 SPECOFF37 SPECOFF49 SPECOFF61	
2	Run FUNC-DCU-05S test procedure from the HCSS Test Procedure window on TOPE	
5	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-05S					Pass

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

WAS NOT EXECUTED AS THE SENDING OF THE SET OFFSET COMMAND CAN TRIGGER (ON OBS 2.2.D) THE DPU TO GO INTO SAFE MODE AS THIS COMMAND IS NOT ACKNOWLWDGED BY THE DRCU FPGA.

4.29

4.30

4.31 FUNC-DCU-11S

Test Id:	FUNC-DCU-11S
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Success Criteria:	Test passed if SCUDCDCSTAT goes from 4 to 6, Spectrometer LIAs voltages are correct and SJFET voltages are also correct.

Test Procedure:

Step#	Action	Comments
1	Run FUNC-DCU-11S test procedure from the HCSS Test Procedure window on TOPE	
2	After the test Write the values RAW and converted values of: LIASTAT SLIAP5V, SLIAP9V, SLIAN9V, SSWJFETSTAT,SLWJFETSTAT, SSWJFET1V,SLWJFET2V located in DCU PARAMETERS AND	
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-11S	**SCUDCDCSTAT** **LIASTAT** **SLIAP5V** **SLIAP9V** **SLIAM9V** **SPECJFETSTAT** **SSWJFET1/2V** **SLWJFET1/2V**	**6/6** **0/0** **0V/ ~ 5V** **0V/~11V** **0V/-11V** **0/7** **0V/-1.5V** **0V/-1.5V**	6/6 0/0 /5.23 /11.57 /-11.55 0/0x7 See comments below	**N/A**	**Success**

Start time @: 18:04
End time @: 18:06
OBSID: 0x30011A71

Comments: TOPE script is called FUNC-DCU-11-SPEC

The Vss values for the JFETs were the same as for the PFM4 cold test campaign, i.e.

SSWJFET1V: -2.07V
SSWJFET2V: -1.59V
SLWJFET1V: -1.68V

Note:
SSW: R1, D5 and D7 start at one level and step to another level after JFET switch on (TBC).

SLW: DP1, DP2 not responsive after switch on, they jump to zero. T2 remains at zero.
R1, C2, C4 and B3 start at one level and step to another level after JFET switch on (TBC).

4.32

4.33 FUNC-DCU-13S

Test Id:	FUNC-DCU-13S
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Success Criteria:	Test passed if : The spectrometer detectors show a small linear variation on the output voltage when different bias is applied through the load curve.

Test Procedure:

Step#	Action	Comments
1	Run FUNC-DCU-13S test procedure from the HCSS Test Procedure window on TOPE	
2	Contingency: If test fails repeat step 1.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-13S				N/A	Success

Start time @: 18:18
End time @: 13:06
OBSID: 0x30011A72

Comments: TOPE script is called FUNC-DCU-11-SPEC

Array: SF
Bias frequency: 160 Hz
Sampling frequency: 80 Hz
SSW phase shift: 180.71deg
SLW phase shift: 179.295 deg
Time at each level: 5 s

SSW D5 shows different behaviour than the rest of the pixels (TBC).

Generally all (SSW/SLW) pixels looking responsive (TBC). See Annexe 2 for detailed results.

4.34 ILT_PERF_DNA_S

Test Id:	FUNC-DCU-13S
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Success Criteria:	Test passed if : The spectrometer detectors show a signal with some noise.

Test Procedure:

Step#	Action	Comments
1	Run FUNC-DCU-13S test procedure from the HCSS Test Procedure window on TOPE	
2	Contingency: If test fails repeat step 1.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
ILT_PERF_DNA_S				**N/A**	**Success**

Start time @: 18:34
End time @: 18:40
OBSID: 0x30011A73

Comments:

Test run in order to collect noise data at nominal spectrometer settings:

Array: SF
Bias frequency: 160 Hz
Sampling frequency: 80 Hz
SSW phase shift: 180.71deg
SLW phase shift: 179.29 deg

Duration of test: 5 minutes

QLA script needed to report the RMS values for all Spectrometer detectors.

Step#	Action	Comments
1	From TOPE HCSS Test Procedures run **SDET_OFF**	**18:45** **OBSID 0x30011A74**

4.35 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
0	Open **SMEC PARAMETERS display** on SCOS Alpha Numeric Displays.	
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.	

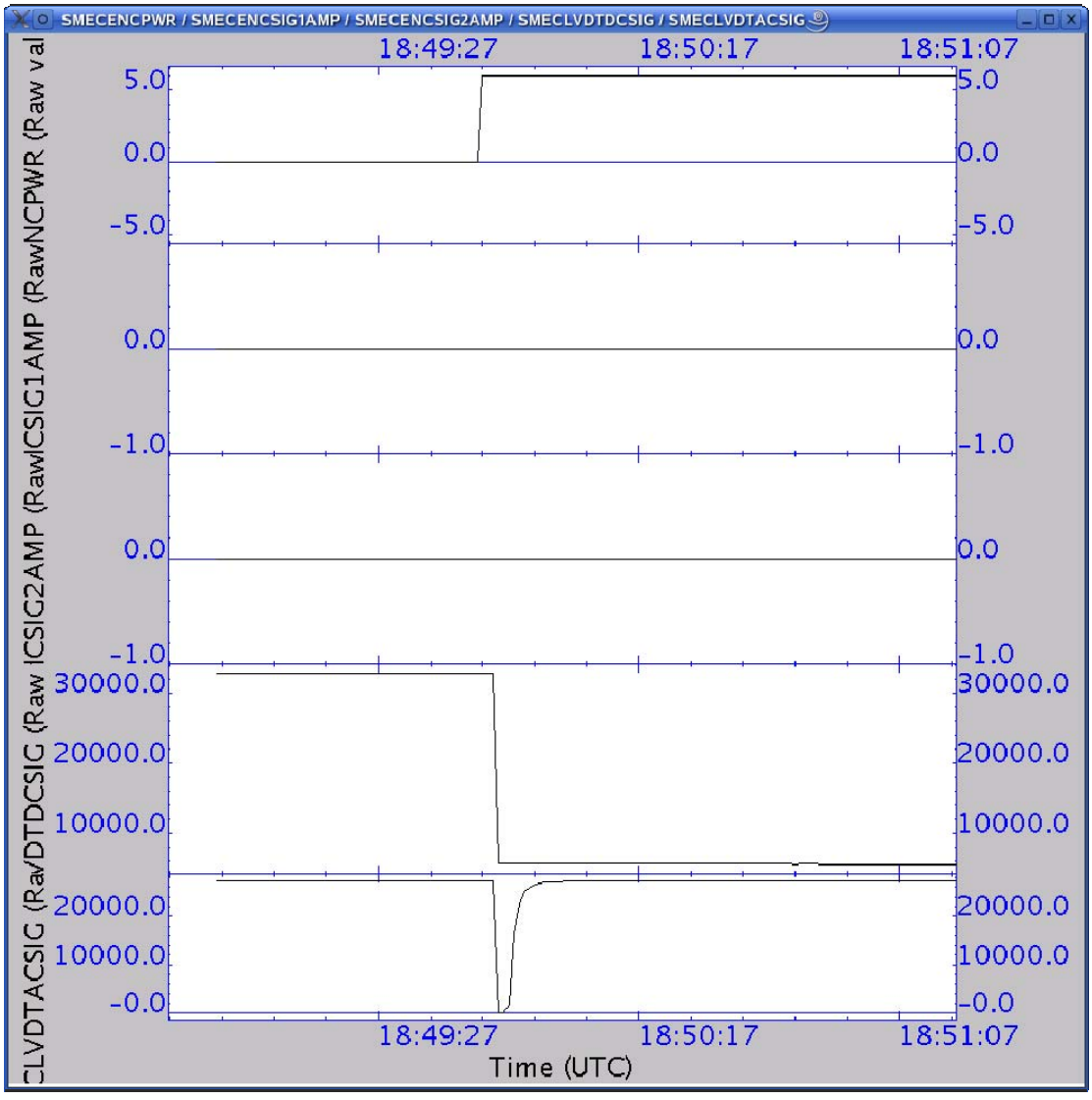
Test Log:

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** **SMECENCSIG1AMP** **SMECENCSIG1OFF** **SMECENCSIG2** **SMECENCSIG2AMP** **SMECENCSIG2OFF**		0/6 0/1 0x3077/~0x5000x6000 0/0 0xCE20/0xDEA8 0x4E68/~0x6300-0x6600 0/0 0xCE20/0xAFC8	**N/A**	

Start time @: 18:50
End time @: 18:51
OBSID: 0x30011A75

Comments:

Encoder signals 1 and 2 did change. The corresponding signal amplitudes remained at 0.



4.36 FUNC-SMEC-04a

Test Id:	FUNC-SMEC-04a
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ SMEC ON (open loop) **LATCHED**
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ SMEC ON (open loop) **LATCHED**
Success Criteria:	Test passed if only the SMECMOTORCURR shows a variation meaning that the mechanism has not moved.

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**		13A4/		

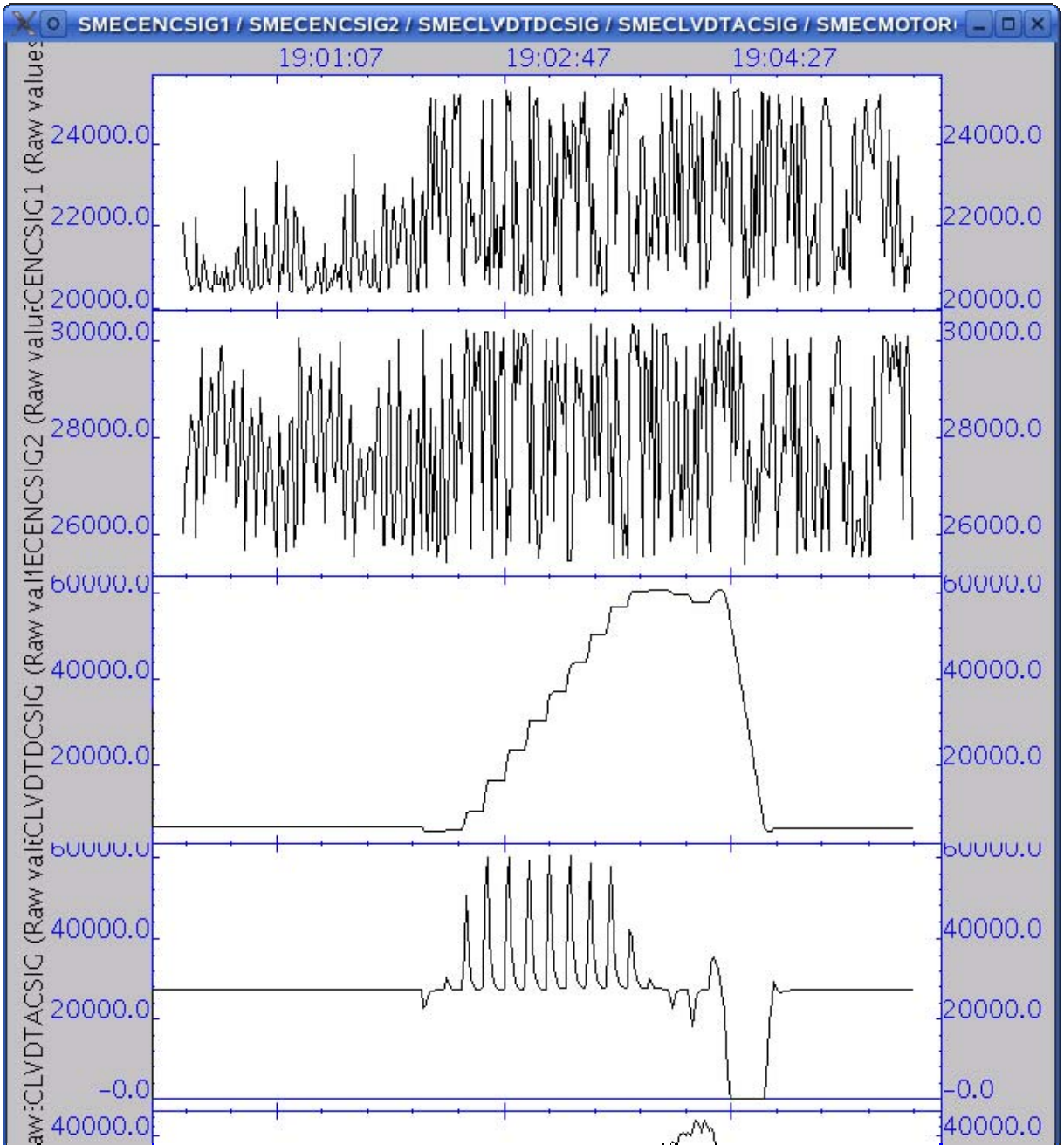
Start time @: 19:02
End time @: 19:06
OBSID:0x30011A76

Comments:

Used the following input parameters to the TOPE script:

Scan Start = 1000 um
Scan End = 15000 um
Scan Step = 1000 um
Scan F speed = 500 um/s
Scan R speed = 1000 um/s
Time at each position = 5 s

The test procedure specifies HK parameters should be displayed when the SMEC science parameters are needed.



4.37 FUNC-SMEC-02A/B

Test Id:	FUNC-SMEC-02A/B
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + SMEC ON **If WFT prior to cooldown** : Smec Latched **If WFT after warm up** : Smec Unlatched
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + SMEC ON **If WFT prior to cooldown** : Smec Unlatched **If WFT after warm up** : Smec Latched
Success Criteria:	Test passed if : Prior to un-latching the resistance across pins 7 and 8 of the launch latch is ~ 368 Ohms. After un-latching the resistance is 483 Ohms. **Note:** These resistance values were recorded for the CQM SMEC model, for the flight SMEC, these values are expected to vary.

Step#	Action	Comments
1	Measure the resistance across pins 7 and 8 of the launch latch.	This step is not applicable anymore
2	If WFT prior to cooldown: Run FUNC-SMEC-02A test procedure from the HCSS Test Procedure window on TOPE If WFT after warm up: Run FUNC-SMEC-02B test procedure from the HCSS Test Procedure window on TOPE	
3	Measure the resistance across pins 7 and 8 of the launch latch.	
4	Contingency: If test fails repeat steps 1.	

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SMEC-02A/B				**N/A**	Passed

Start time:
End time :
OBSID:

Test not performed as the SMEC is already unlatched.

4.38 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 on their amplitudes 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: SMECENCSIGAMP1 SMECENCSIGAMP2	
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:

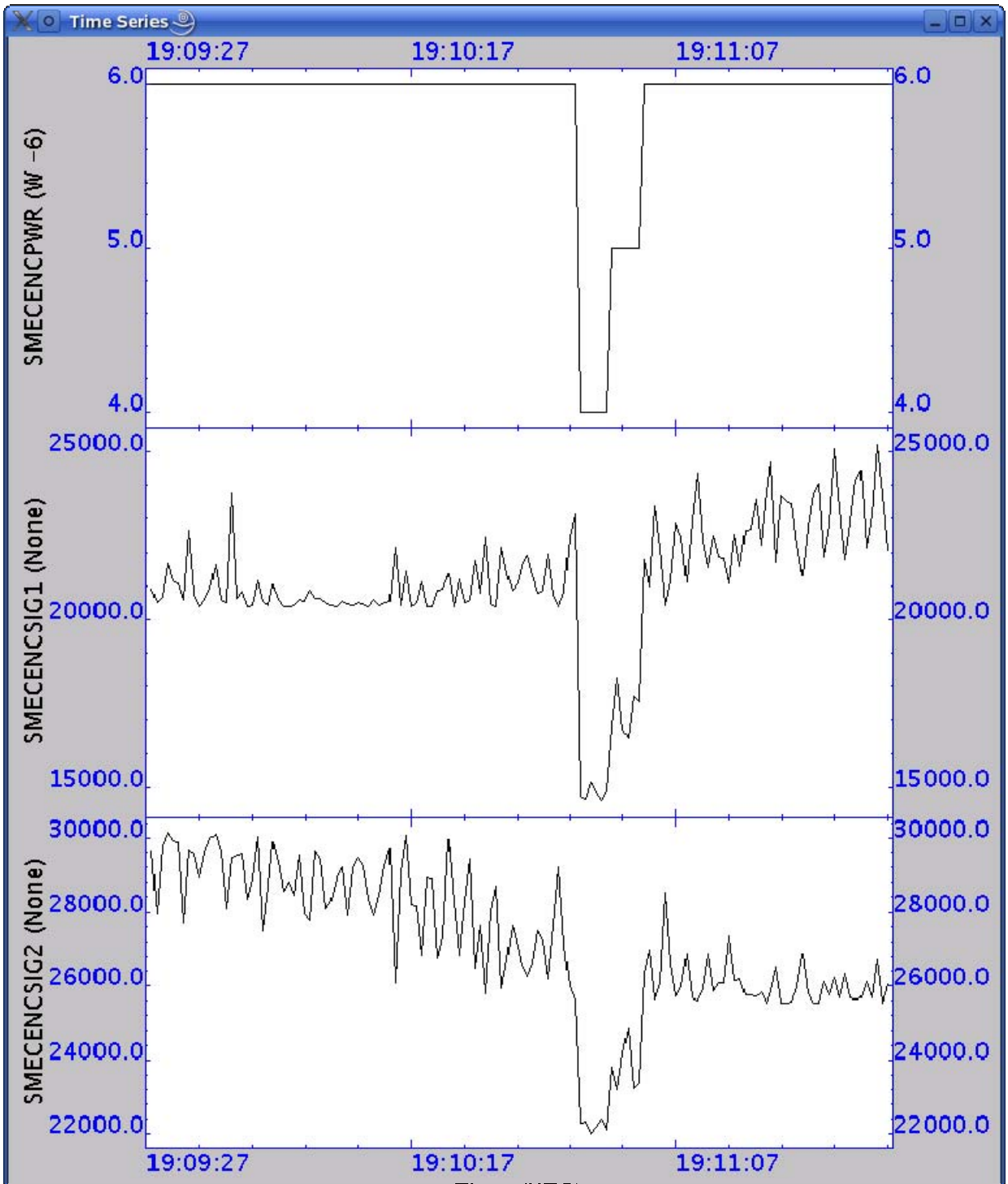
Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-SMEC-03	SMECENCSIG1 SMECENCSIG2				Success

Start time @: 19:11
End time @: 19:12
OBSID: 0x30011A77

Comments:
Using default i/p parameters:
SMEC LED power level from 4 to 6 in steps of 1. Duration at each level: 5 seconds.

Also plotted SMECENCPWR.

The level of the encoder signals 1 and 2 changed as the level of the power changed:



Step#	Action	Comments
4	Execute SMEC_OFF from HCSS Test Procedures	**0x30011A78** **Start/End Time: 19:14** **SMEC is Off**

4.39 FUNC-DCU-13P (Repetition with the PTC harness now connected)

Test Id:	FUNC-DCU-13P
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON + Photometer BIAS ON +Photometer JFETs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ Photometer LIAs ON + Photometer BIAS ON +Photometer JFETs ON
Success Criteria:	Test passed if : The photometer detectors show a small linear variation on the output voltage when different bias is applied through the load curve.

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of a couple of pixels on each of the photometer BDAs	
2	Run FUNC-DCU-13P test procedure from the HCSS Test Procedure window on TOPE	
3	Contingency: If test fails repeat step 1 and 2.	

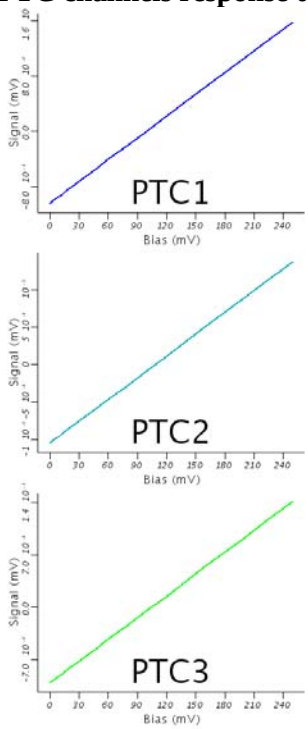
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
FUNC-DCU-13P				**N/A**	**Success**

Start time @: 10:56
End time @: 11:08
OBSID: 0x30011A83

Parameter for LC:
Array: PF
Bias frequency: 130 Hz
Sampling frequency: 18.6 Hz
PSW phase: 180.71 deg
PMW phase: 180.71 deg
PLW phase: 180.71 deg
TC phase : 180.71 deg
Time at each level: 5 s

PTC channels response to increased bias looks nominal



Followed by noise measurement at nominal detector settings:
ILT_PERF_DNA_P (input parameters= PF frames, 300 seconds)
OBSID: 0x30011A84

Step#	Action	Comments
4	Execute PDET_OFF from HCSS Test Procedures	**0x30011A85** **Start/End Time: 11:55**

Further SMEC Tests were performed on 29/01/2007 after the Redundant WFTs were completed.

4.40 FUNC-SMEC-09

Test Id:	FUNC-SMEC-09
Test Purpose:	SMEC Open Loop Scan Test.
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 position of the SMEC along the scan.

Test Procedure:

Step#	Action
1	**On QLA bring up a time series display of the following SMEC nominal science parameters:** SMECENCSIG1 SMECENCSIG2 SMECLVDTDCSIG SMECLVDTACSIG SMECMOTORCURR
2	**Run FUNC-SMEC-09 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	No. of frames received	Test Result
FUNC-SMEC-09	**All above mentioned in step 2**	**N/A**	**N/A**	**N/A**	**Success**

Start time @: 15:44
End time @: 15:47
OBSID: 0x30011AC5
Comments:

ALL SMEC FUNCTIONAL TESTS PRODUCE ENGINEERING FRAMES NOT SMEC SCIENCE AND THIS SHOULD BE NOTED IN THE PROCEDURES

Start point = 1 mm,
End point = 38 mm
Forward speed = 0.5 mm/s
Reverse speed = 0.5 mm/s
Number of scan = 2

Encoder not counting

Reset manually
SMECEMCSIGOFF1 = 23000
SMECEMCSIGOFF2 = 28000

Manually set the encoder signal 1/2 offsets to :
SMECEMCSIGOFF1 = 23000 (0x59D8)
SMECEMCSIGOFF2 = 28000 (0x6D60)
as the SMEC_ON script still does not incorporate a PRIME/REDUNDANT switch

Step#	Action	Comments
0	Execute SMEC_INIT from HCSS Test Procedures	OBSID: 0x30011AC6

4.41 FUNC-SMEC-07

Test Id:	FUNC-SMEC-07
Test Purpose:	SMEC Close Loop Scan Test.
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ SMEC ON (close loop)
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON+ SMEC ON (close loop)
Success Criteria:	Test passed if: SMECENCPOS HK parameter shows identical values as those of the SMECTRAJPOSN HK parameter during the scan.

Test Procedure:

Step#	Action
1	**On QLA bring up a time series display of the following SMEC nominal science parameters:** SMECENCSIG1 SMECENCSIG2 SMECLVDTDCSIG SMECLVDTACSIG SMECMOTORCURR
2	**Run FUNC-SMEC-07 test procedure from the HCSS Test Procedure window on TOPE**
3	Contingency: If test fails repeat steps 1.

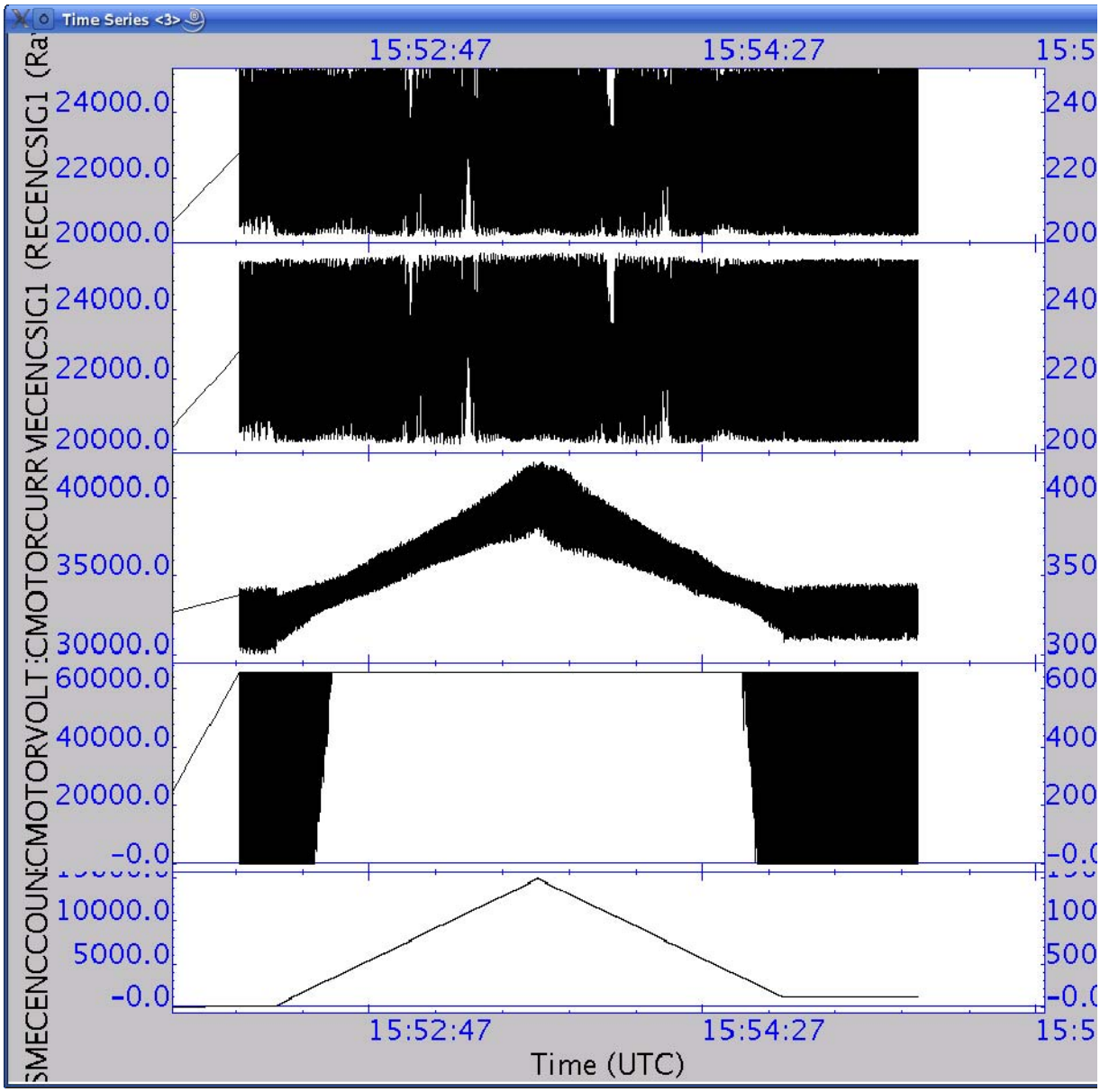
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
FUNC-SMEC-07	**All above mentioned in step 1**	**N/A**	**N/A**	**N/A**	**Success**

Start time @: 15:52
End time @: 15:57
OBSID: 0x30011AC7
Comments:

Start point = 1 mm,
End point = 15 mm
Forward speed = 0.2 mm/s
Reverse speed = 0.2 mm/s
Number of scan = 2

The loop remained closed.
But note the much larger scatter on the SMEC motor current during the close loop scan which most probably indicates a wrong set of PID parameters for redundant SMEC warm operation. Nevertheless this test proves that the Prime SMEC can be operated in close loop.



4.42 FUNC-SMEC-04B

Test Id:	FUNC-SMEC-04B
Test Purpose:	SMEC Close Loop Position Test. SMEC close loop operation check.
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 : SMECENCPOS HK parameter shows identical values as those of the SMECTRAJPOSN HK parameter for the different commanded SMEC positions.(1mm to 25mm in steps of 1mm)

Test Procedure:

Step#	Action
1	**On QLA bring up 2 time series displays:** **Display 1 of the following MCU Engineering block parameters:** MCUENGSMECENCSIG1 MCUENGSMECENCSIG2 MCUENGSMECLVDTDCSIG MCUENGSMECLVDTACSIG MCUENGSMECMOTORCURR **Display 1 of the following SMEC HK parameters:** SMECENCPOSN SMECTRAJPOSN
2	**Run FUNC-SMEC-04B test procedure from the HCSS Test Procedure window on TOPE**
3	Contingency: If test fails repeat steps 1.

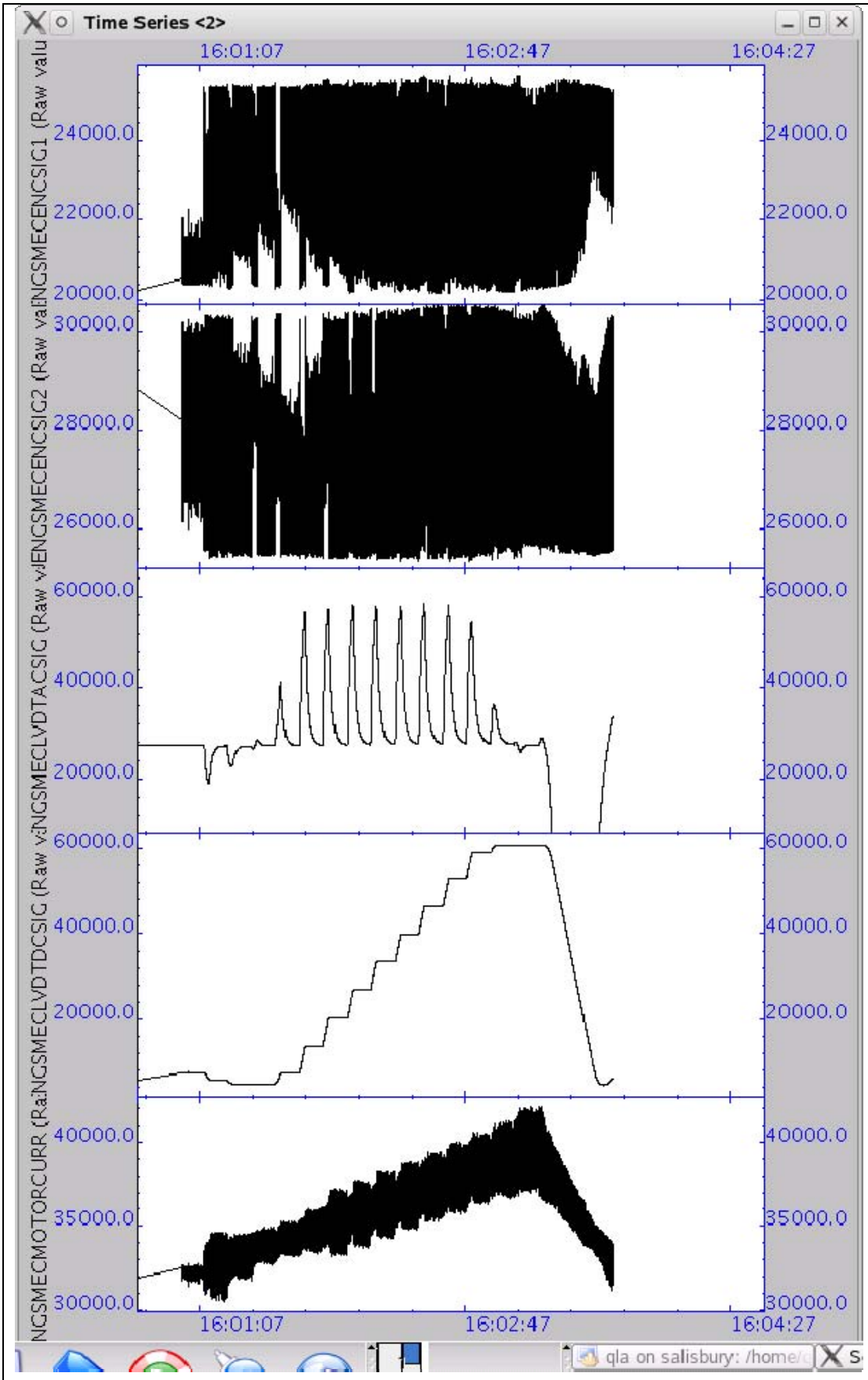
Test Log:

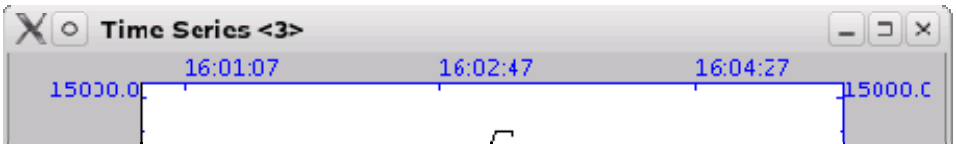
Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
FUNC-SMEC-04B	**All above mentioned in step 1**	**N/A**	**N/A**	**N/A**	**Success**

Start time @: 16:37
End time @: 16:41
OBSID: 0x30011AC8

Comments:

Start point = 1 mm
End point = 15 mm
Steps = 1 mm
Forward speed = 0.5 mm/s
Reverse speed = 1.0 mm/s
Time at each position = 5 s


Time Series <2>
16:01:07
16:02:47
16:04:27
NGSMECMOTORCURR (Ra:NGSMECLVDTDCSIG (Raw vi:NGSMECLVDTACSIG (Raw vi:ENGSMECENCSIG2 (Raw va:ENGSMECENCSIG1 (Raw valu
24000.0
22000.0
20000.0
30000.0
28000.0
26000.0
60000.0
40000.0
20000.0
60000.0
40000.0
20000.0
40000.0
35000.0
30000.0
qla on salisbury: /home/


Time Series <3>
16:01:07
16:02:47
16:04:27
15000.0

Step#	Action	Comments
4	Execute SMEC_OFF from HCSS Test Procedures	Done at 16:07, 29/01/2007 **OBSID:0x30011AC9**

-

PRIME side Switch OFF sequence:

MCU_OFF
SCU_OFF
DRCU_OFF

DRCU Power OFF
DPU Power OFF

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		

6. ANNEXE 2 (RESULTS OF LOAD CURVES)

The following graphs (1-12) show the response of the 288 Photometer detectors to the input voltage during the Load Curve (FUNC-DCU-13). The graph (13) shows the response of the 3 PTC channels to the input voltage during the Load Curve. The graphs (14-16) show the spectrometer 78 detectors output voltage during the load curve performed on the spectrometer side. These plots are for the original test before connecting the PTC harness (30011A83 for phot and 30011A72 for spec).

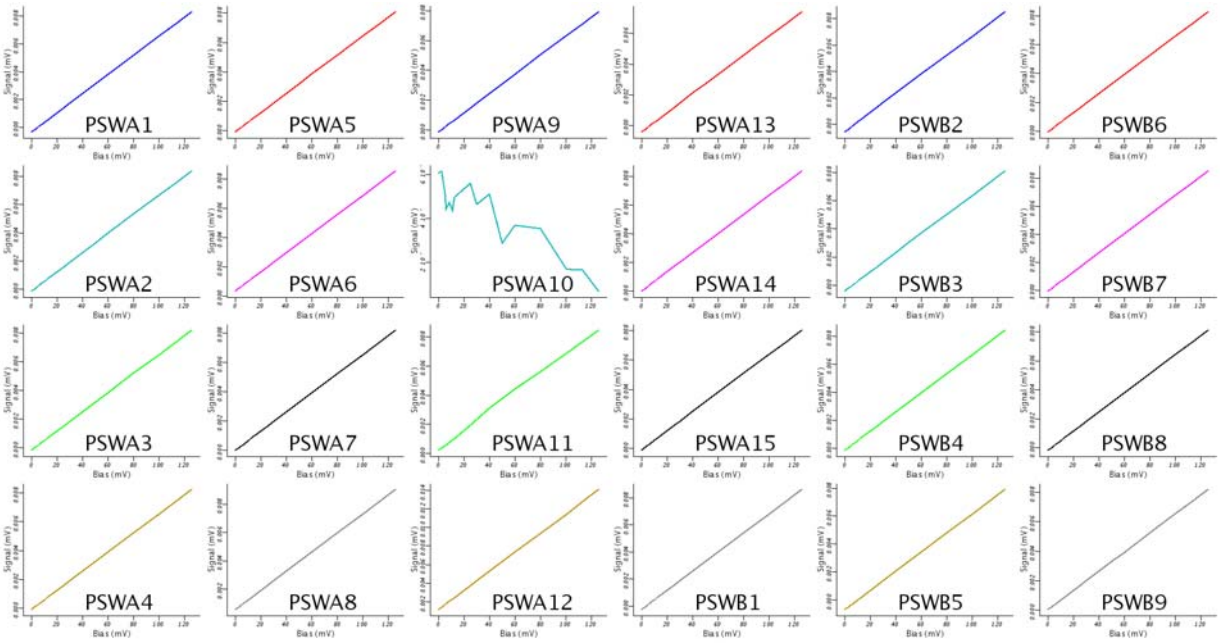


Figure 1. PSW Detectors (1)

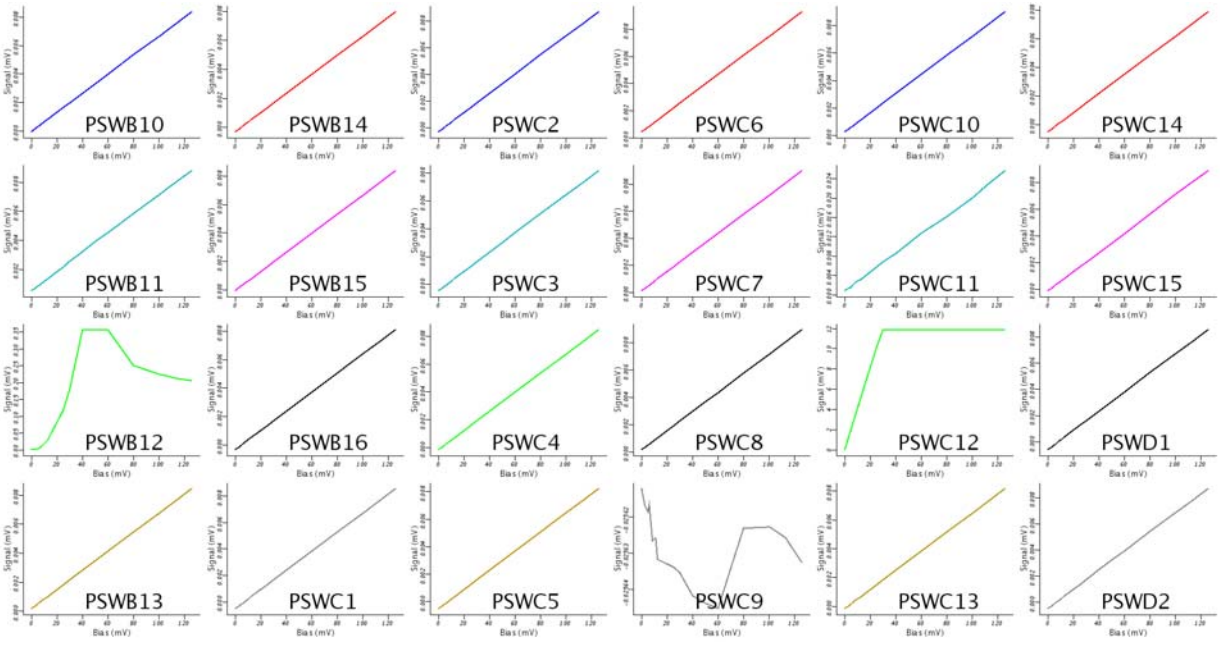


Figure 2. PSW Detectors (2)

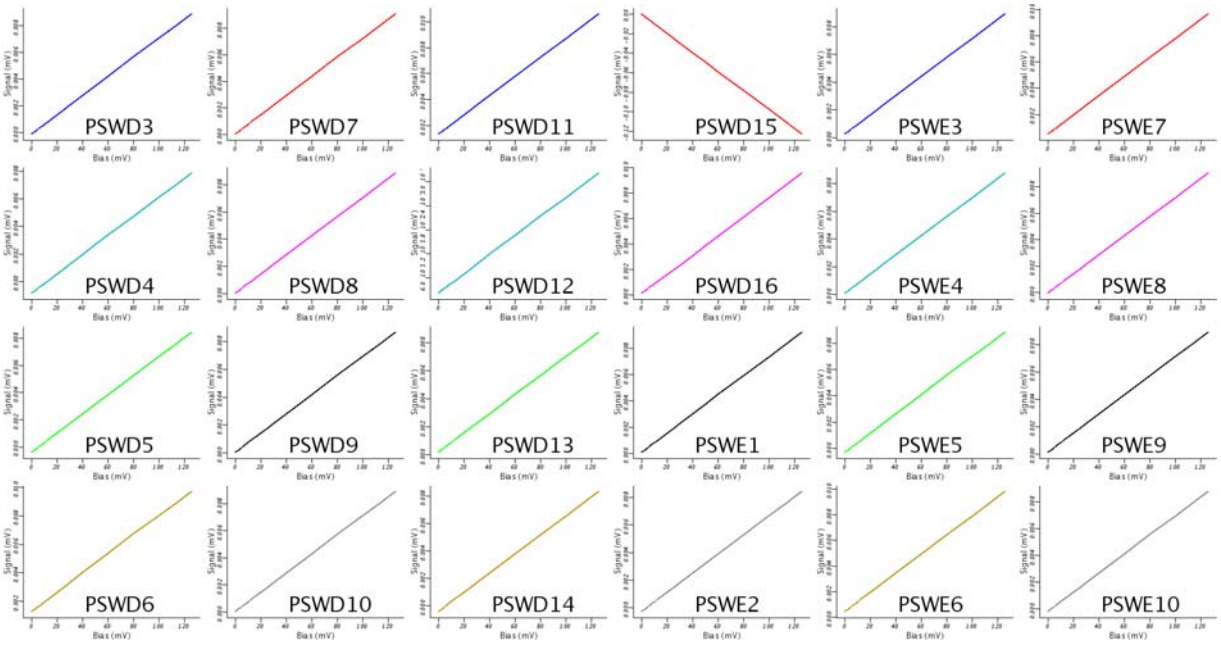


Figure 3. PSW Detectors (3)

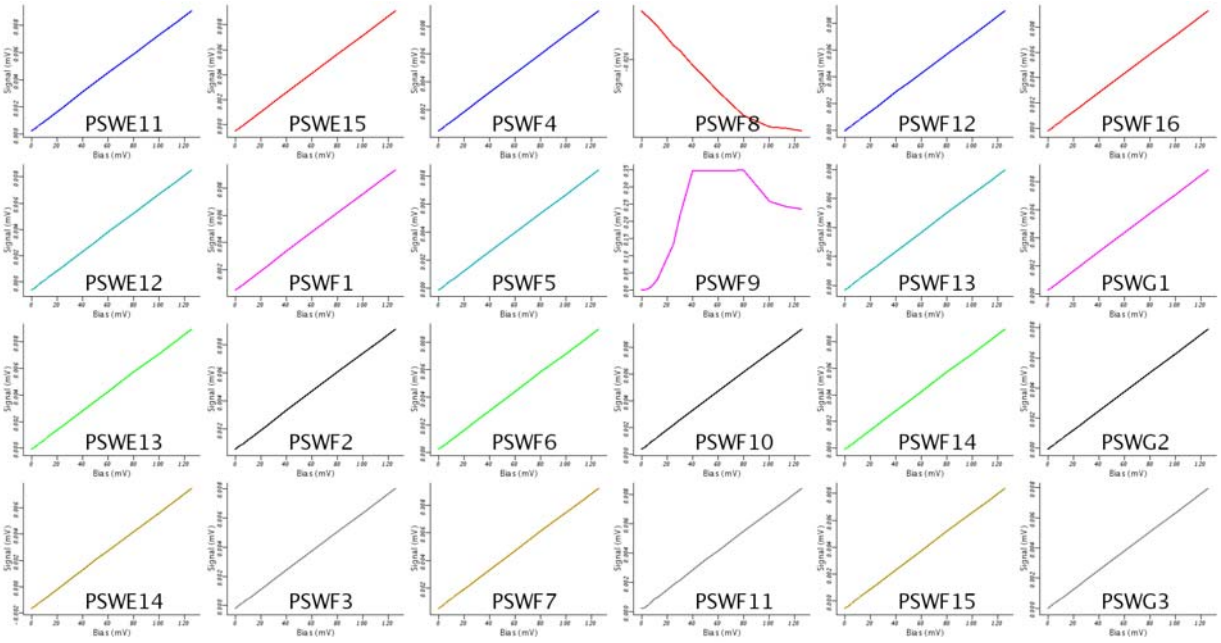


Figure 4. PSW Detectors (4)

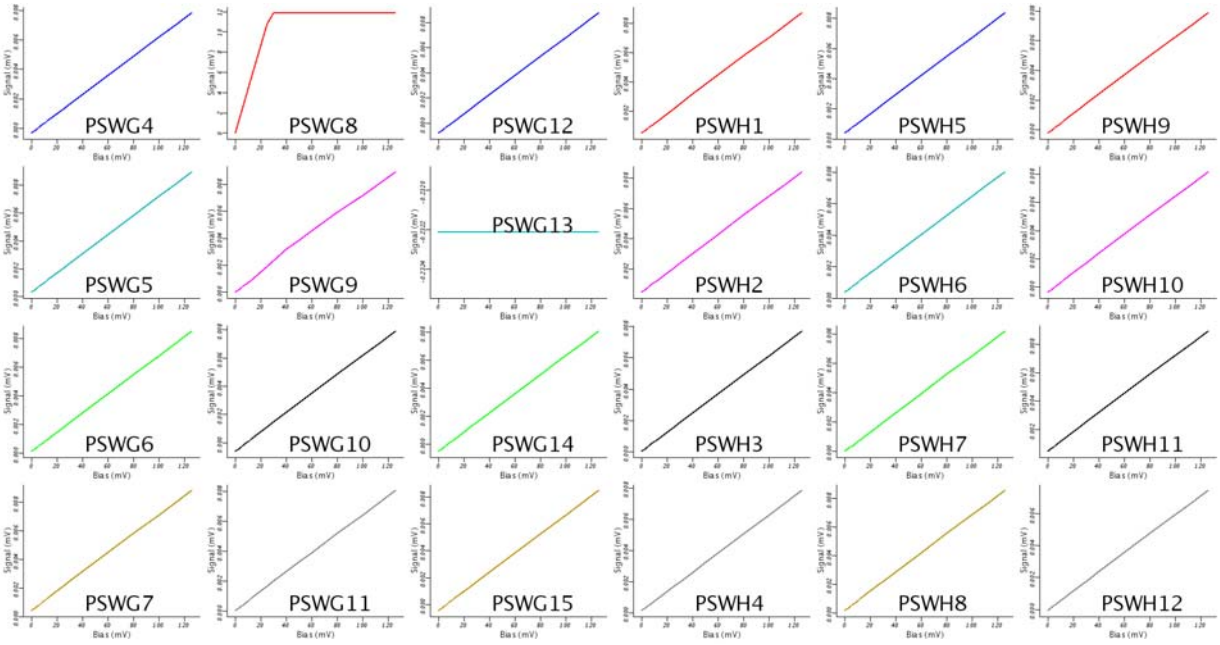


Figure 5. PSW Detectors (5)

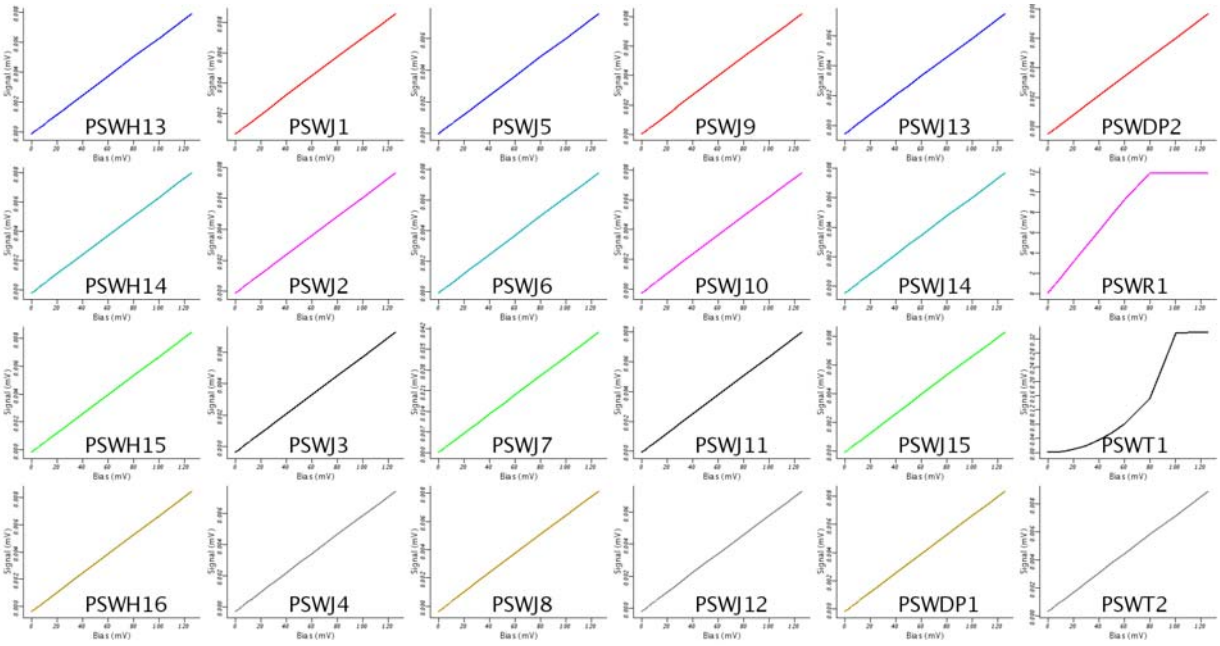


Figure 6. PSW Detectors (6)

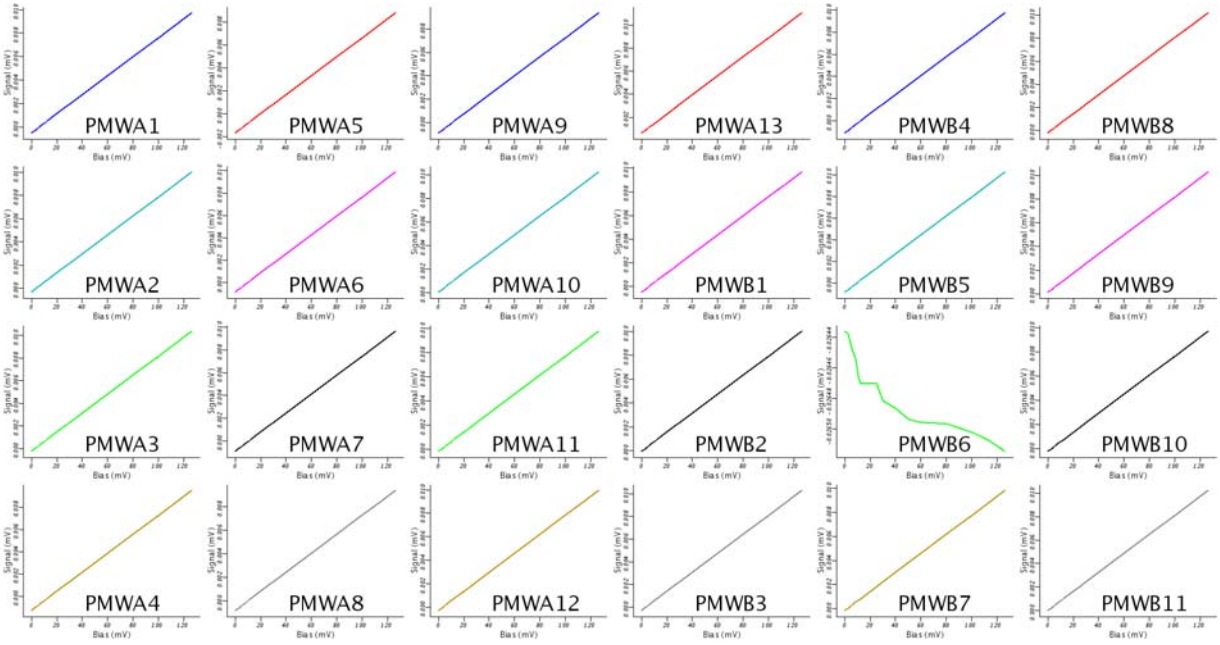


Figure 7. PMW Detectors (1)

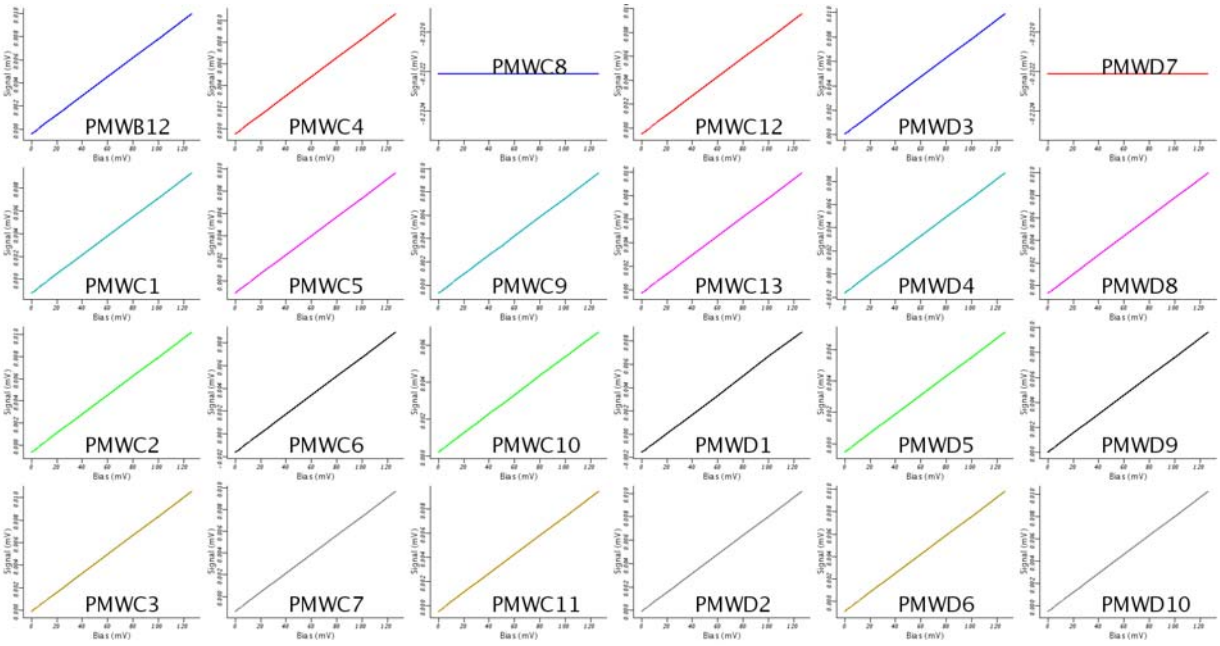


Figure 8. PMW Detectors (2)

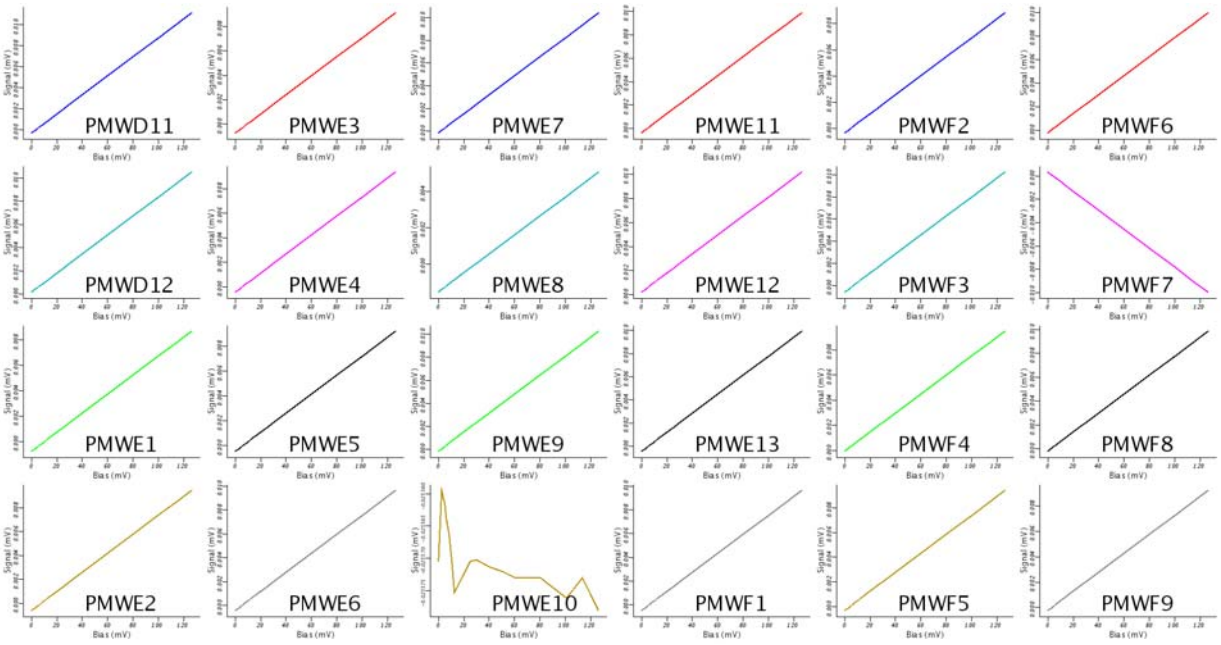


Figure 9. PMW Detectors (3)

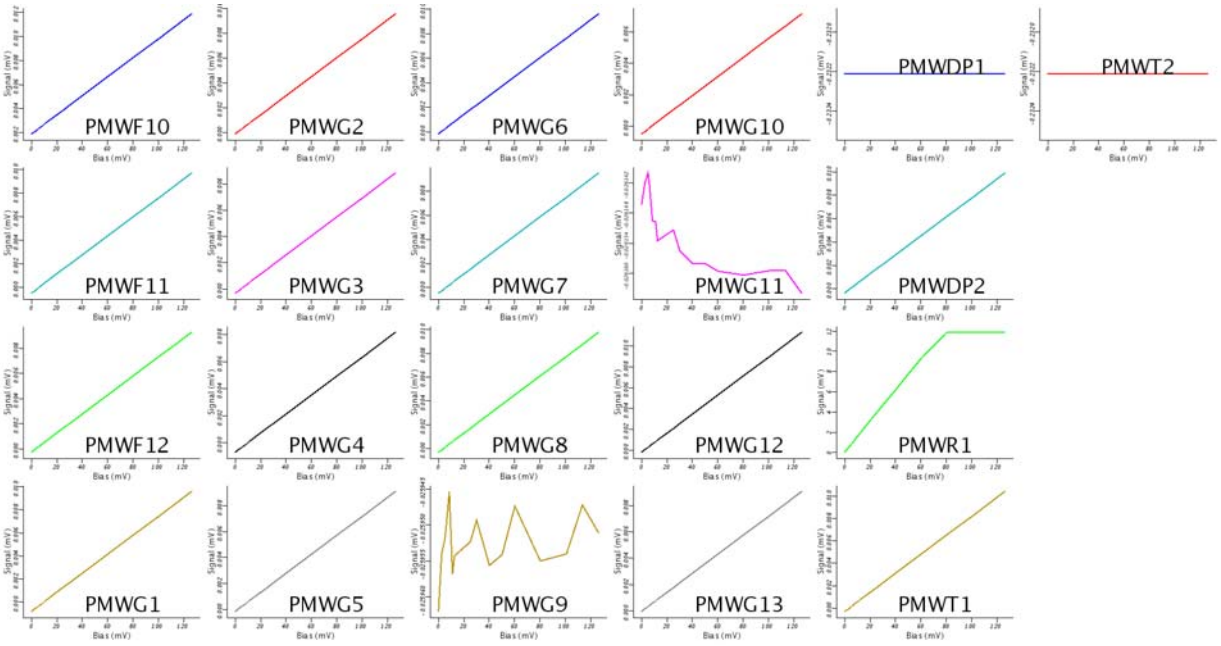


Figure 10. PMW Detectors (4)

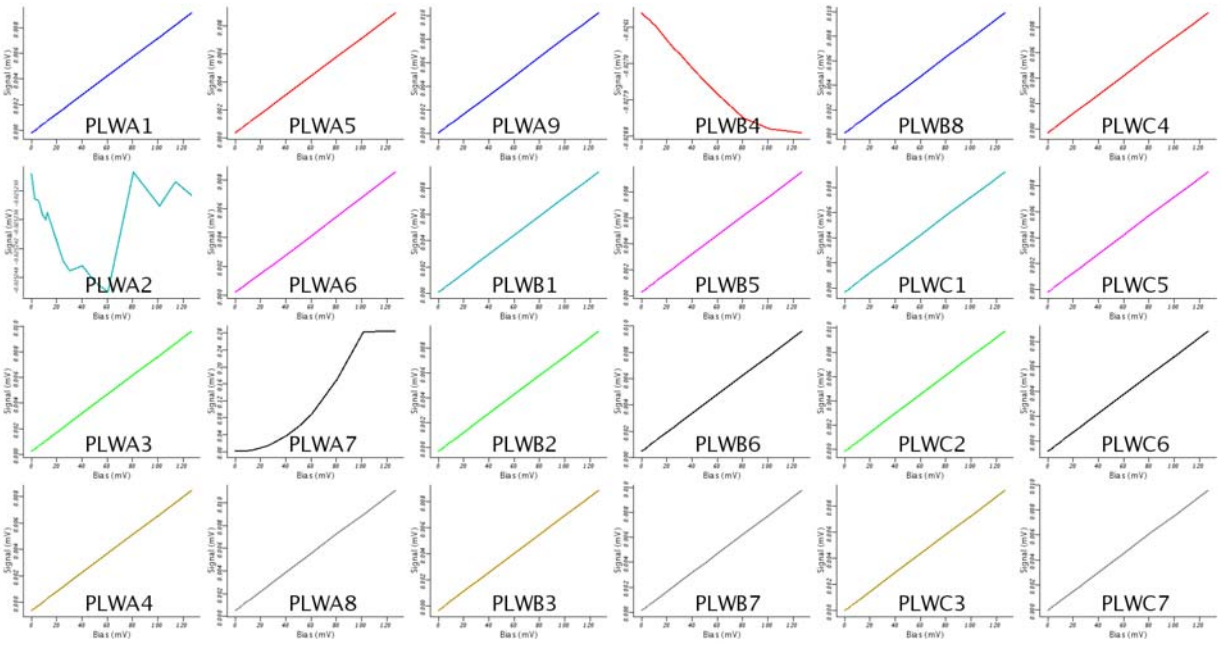


Figure 11. PLW Detectors (1)

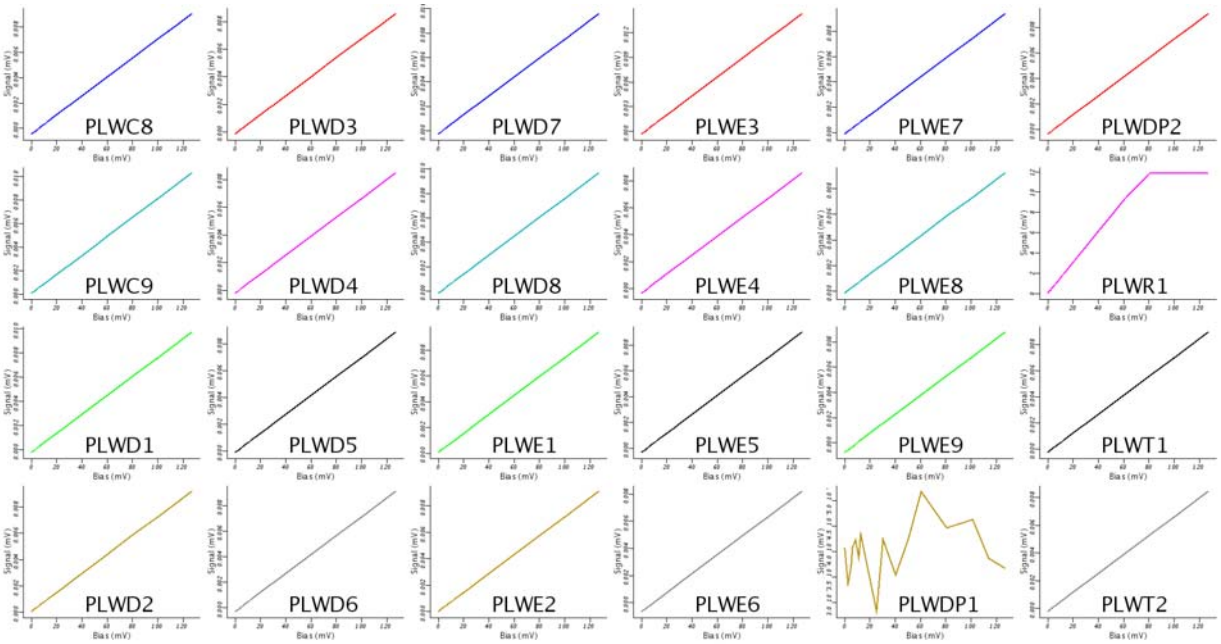


Figure 12. PLW Detectors (2)

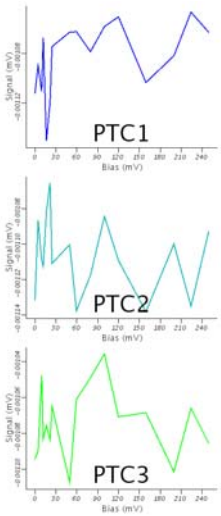


Figure 13. PTC Detectors (1)

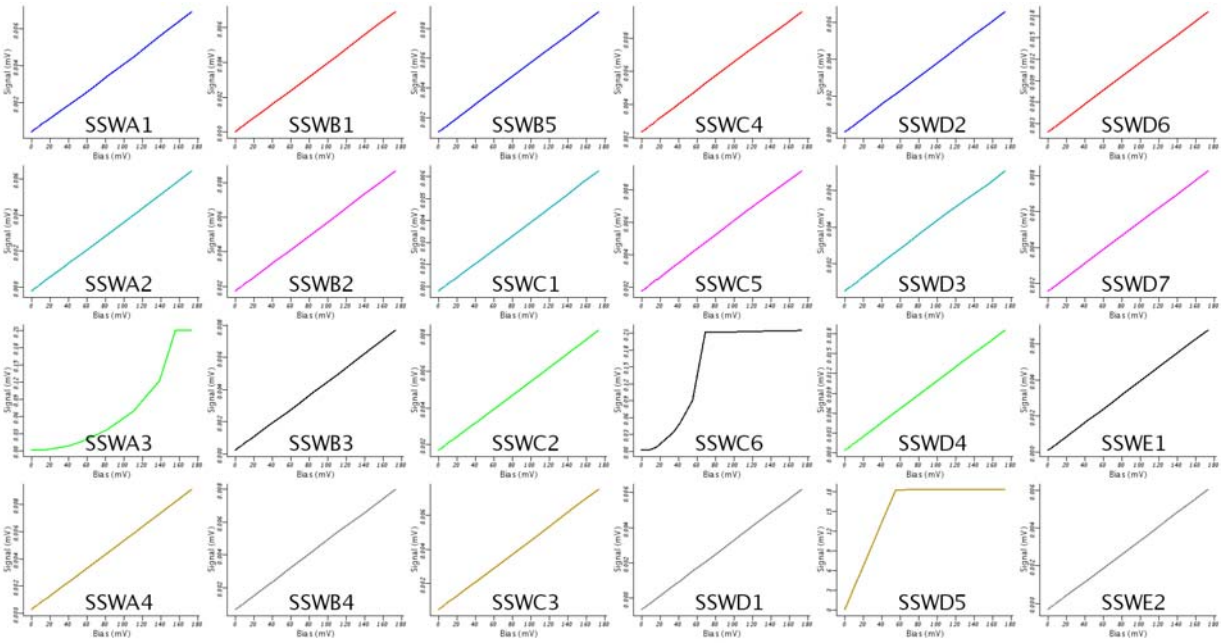


Figure 14. SSW Detectors (1)

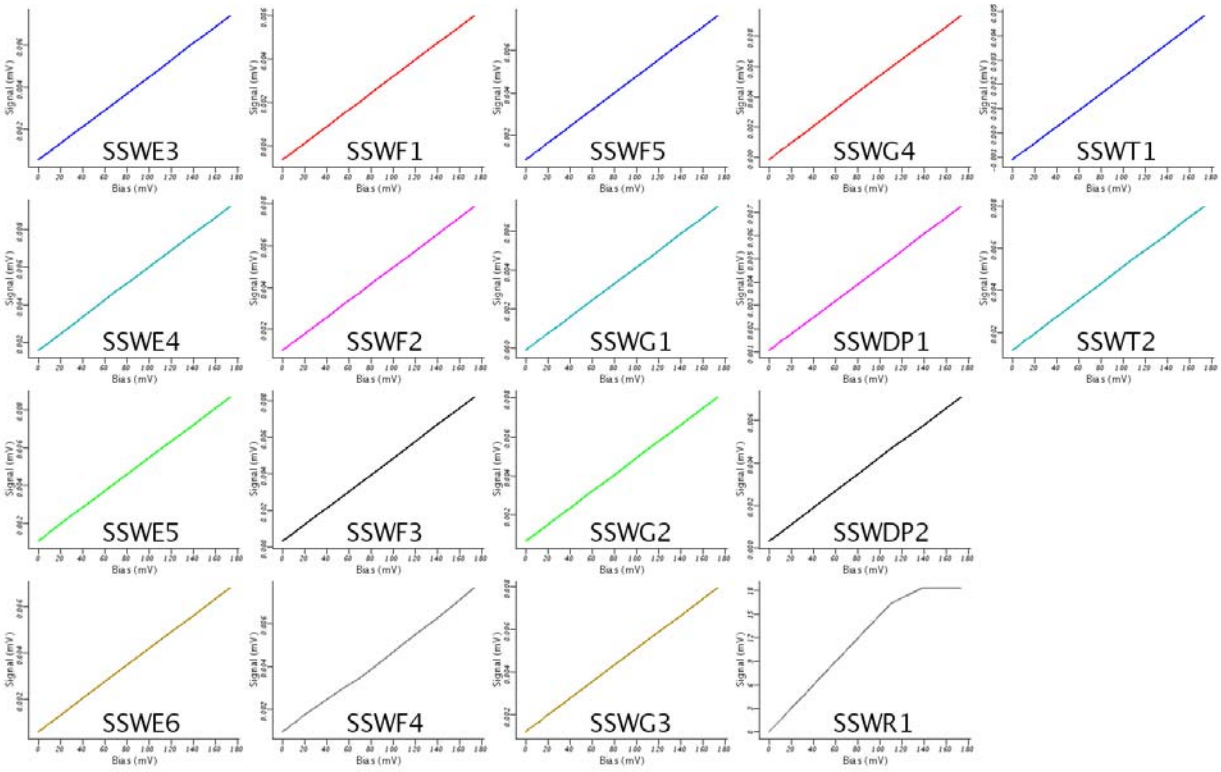


Figure 135. SSW Detectors (2)

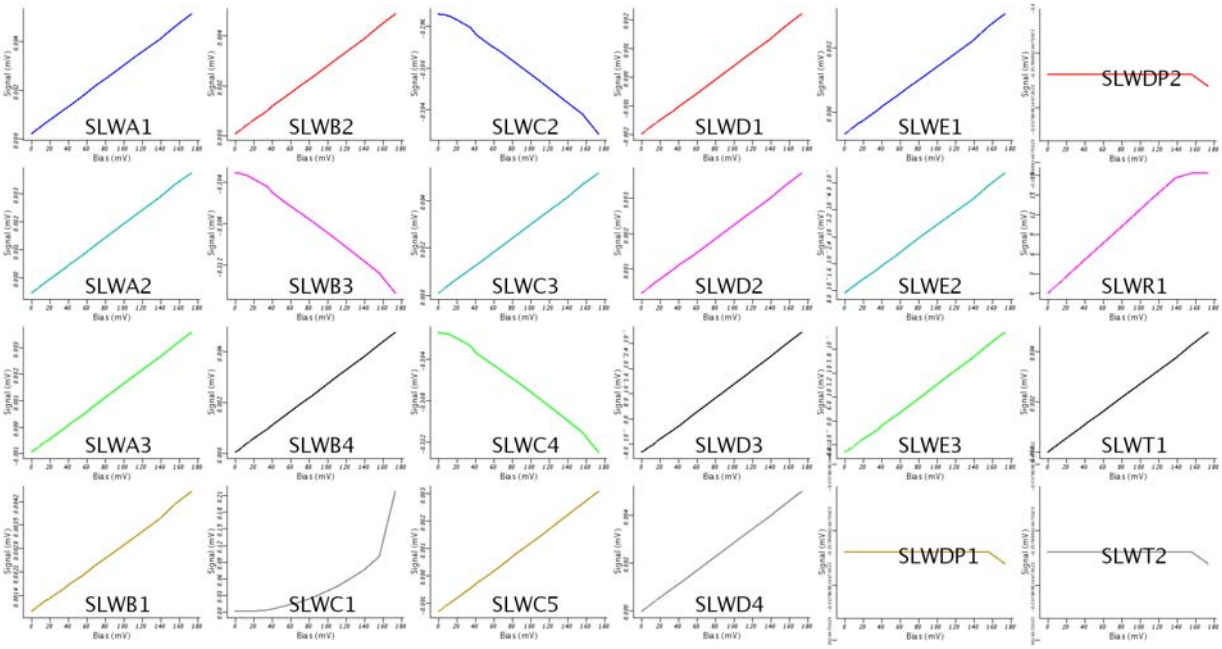


Figure 146. SLW Detectors (1)