1. INTRODUCTION

This document reports on the first COLD functional tests performed on the SPIRE MAIN instrument during the IST 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 (specified in this document) is met.

1.2 REFERENCE DOCUMENTS

Ref	Document	Name	Version/Issue No.
RD01	SPIRE-RAL-DOC-001652	SPIRE Functional Tests Specification	Issue 1.4
RD02	SPIRE-RAL-DOC-001630	SPIRE I-EGSE Set-up Procedure	Issue 2.2
RD03	SPIRE-RAL-PRJ-001078	SPIRE Data ICD	Issue 2.1
RD04	Sap-SPIRE-CCa-076-02	DRCU/DPU Interface Control Document	Issue 1.3
RD05	LAM.PJT.SPI.NOT.011011	MCU/DPU Command List ICD	Issue 5.0
RD06	SPIRE-IFS-PRJ-001391	SPIRE OBS User Manual	Issue 2.2.H
RD07	SPIRE-RAL-PRC-002398	SPIRE FM Cold Functional Test Procedures	Issue 2.4
RD08	SPIRE-RAL-REP-003087	IST WARM FUNCTIONAL TEST REPORT III – Prime Side (After Harness Repair)	Issue 1.0
RD09	HP-2-ASED-SD-0203	SPIRE WFT after repair of pixel anomalies on SVM-SIH connectors based on HP-112000-ASED-NC-3725	Issue 01

1.3 CHANGE RECORD

Document	Change date	Changes
Issue 1.0	07/03/2008	First Version

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2. FUNCTIONAL TEST CONFIGURATION

2.1 Software Configuration

Write down in the table the current EGSE software configuration for the tests:

EGSE component	Version/Build number	Comment
SCOS2000	2.3eP5	
HCSS	v0.6.1 Build (#1430)	
QLA	v3.3	
QLA scripts	Latest versions from CVS	
CCS scripts	CVS version 1.1, Tag SPIRE_COLDFT_PRIME_PROC_V1	
CUS Scripts	Mission config fm_ist_cft_config2 in DB spire_fm_ist_db1 on spireqla	

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
hspireegse	EGSE router	Started	✓
hspireegse	EGSE Gateway	Started	✓
hspireegse	Pipe Gateway	Started	✓
hspireqla	Telemetry Ingestion	Started	✓
hspireqla	Packet Display	Started	✓
spires2k	SCOS2000	Started	✓
hspireqla	CCS Handler (Server)	Started	✓

3. TEST PROCEDURE

The following two sections describe general pass/fail criteria (Section 3.1), the general test layout (Section 3.2) and the detailed procedure for each functional test (Section 3.3).

3.1 GENERAL PASS/FAIL CRITERIA

The general criteria 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 analysed.

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 CFT sequence as it should be performed. In each step of this procedure the operator should refer to the detailed procedure in Section 3.3 .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 #	Procedure Name	Test Purpose	Duration /min
1	SPIRE-IST-COLD-DPU-ON-P	DPU PRIME Power up and OBS start	5
2	SPIRE-IST-COLD-DRCU-ON-P	DRCU PRIME Power up	4
3	SPIRE-IST-COLD-FUNC-SCU-02-P	SCU Nominal Science Contents check PRIME	5
4	SPIRE-IST-COLD-FUNC-SCU-03-P	SCU DC Thermometry check PRIME	8
5	SPIRE-IST-COLD-FUNC-SCU-06-P	SCU AC Thermometry check PRIME	2
6	SPIRE-IST-COLD-FUNC-SCU-07-P	Sorption Cooler Heaters Check PRIME	5
7	SPIRE-IST-COLD-FUNC-PCAL-01-P	PCAL Characterisation Test PRIME	5
8	SPIRE-IST-COLD-FUNC-SCAL-01-P	SCAL Characterisation Test PRIME	18
9	SPIRE-IST-COLD-FUNC-MCU-01-P	MCU Boot Check PRIME	5
10	SPIRE-IST-COLD-FUNC-MCU-03-P	MCU Nom. Science Contents Check PRIME	5
11	SPIRE-IST-COLD-FUNC-BSM-01-P	BSM Chop/Jiggle Sensors check PRIME	5
12	SPIRE-IST-COLD-FUNC-BSM-03-P	BSM Open Loop Dynamics Check PRIME	5
13	SPIRE-IST-COLD-FUNC-BSM-05A-P	BSM Open Loop Chop Test PRIME	5
14	SPIRE-IST-COLD-FUNC-BSM-05B-P	BSM Close Loop Chop Test PRIME	5
15	SPIRE-IST-COLD-FUNC-BSM-06-P	BSM Close Loop Operational Mode Chop Test PRIME	5
16	SPIRE-IST-COLD-BSM-0FF-P	BSM switch OFF PRIME	5
17	SPIRE-IST-COLD-FUNC-SMEC-01-P	SMEC Encoder and LVDT check PRIME	5

Step #	Procedure Name	Test Purpose	Duration /min
18	SPIRE-IST-COLD-FUNC-SMEC-03-P	SMEC Encoder Levels Check PRIME	5
19	SPIRE-IST-COLD-SMEC-OFF-P	SMEC switch OFF PRIME	5
20	SPIRE-IST-COLD-FUNC-DCU-02-P	DCU Nominal Science Contents Check PRIME	5
21	SPIRE-IST-COLD-FUNC-DCU-11-PHOT-P	Photometer BDAs Switch ON Check PRIME	7
22	SPIRE-IST-COLD-FUNC-DCU-13-PHOT-P	Photometer BDAs Integrity Check PRIME	15
23	SPIRE-IST-COLD-FUNC-DCU-14-PHOT-P	Photometer BDAs Noise Check PRIME	5
24	SPIRE-IST-COLD-PHOT-VSS-P	Photometer BDAs Vss Test PRIME	20
25	SPIRE-IST-COLD-PDET-OFF-P	Photometer BDAs Switch OFF PRIME	3
26	SPIRE-IST-COLD-FUNC-DCU-11-SPEC-P	Spectrometer BDAs Switch ON Check PRIME	7
27	SPIRE-IST-COLD-FUNC-DCU-13-SPEC-P	Spectrometer BDAs Integrity Check PRIME	12
28	SPIRE-IST-COLD-FUNC-DCU-14-SPEC-P	Spectrometer BDAs Noise Check PRIME	5
29	SPIRE-IST-COLD-SPEC-VSS-P	Spectrometer BDAs Vss Test PRIME	20
30	SPIRE-IST-COLD-SDET-OFF-P	Spectrometer BDAs switch OFF	3
31	SPIRE-IST-COLD-MCU-OFF-P	MCU switch OFF PRIME	2
32	SPIRE-IST-COLD-SCU-OFF-P	SCU switch OFF PRIME	2
33	SPIRE-IST-COLD-DRCU-OFF-P	DRCU power OFF PRIME	5
34	SPIRE-IST-COLD-DPU-OFF-P	DPU power OFF PRIME	5
35	**Next go back to RD8 for the Redundant tests.**		**15**
Total Duration ~ 4 Hours (just for PRIME)			

Table 1. General CFT sequence

***Note 1:** This procedure is not a functional test, is a close loop initialisation procedure required to test the close loop operability of the BSM.

***Note 2:** This procedure is not a functional test, is a close loop initialisation procedure required to test the close loop operability of the SMEC.

3.3 DETAILED TEST PROCEDURE

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

3.3.1 SPIRE-IST-COLD-DPU-ON-P

Version	2.4
Date	6th December 2007
Purpose	To switch on the SPIRE DPU PRIME and start generating housekeeping
Initial configuration	SPIRE DPU and DRCU PRIME are switched off
Final configuration	SPIRE DPU PRIME is ON and SPIRE HK is being produced , SPIRE DRCU

	PRIME is OFF
Preconditions	• SPIRE FM DPU is electrically integrated with the Herschel Satellite • SPIRE MIB PRIME is imported in the CCS database. • CCS is up and running • FUNCTIONAL TEST PARAMETERS display is selected on the CCS
Duration	5 minutes
Pass/Fail Criteria	Nominal and critical HK reports start being generated at their nominal rates of 1Hz and 0.5Hz respectively.

Procedure Steps:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Pass/ Fail
1	Select DPU AND OBS PARAMETERS display is on the CCS	—	—	—	**Pass**
2	**Power ON the SPIRE DPU PRIME unit using the dedicated spacecraft LCL line and configure 1553 Spacecraft bus for SPIRE DPU PRIME (RT = 21)**	—	—	—	**Pass**
3	Wait for the boot software to produce at least 2 event packets (5,1)	—	—	—	**Pass**
4	Execute TCL script SPIRE-IST-COLD-DPU-START-P.tcl	—	—	—	**Pass**
5	Check that Nominal and Critical HK packets are arriving at the CCS: **SPIRE Nominal HK:** • (type ,subtype) : (3,25) • APID : 0x502 **SPIRE Critical HK:** • (type ,subtype) : (3,25) • APID: 0x500	—	—	—	**Pass**
6	Check that THSK parameter is refreshing every second	THSK	Refreshing @ 1 Hz	—	**Pass**
7	Check that TM2N parameter is incrementing by 1 every second	TM2N	Incrementing by 1 @ 1Hz	—	**Pass**
8	Check that TM1N parameter is incrementing by 1 every 2 second	TM1N	Incrementing by 1 @ 0.5Hz	—	**Pass**
9	**On CCS check the consistency of the SPIRE on board time to the HCDMU time and the CCS. ***	—	—	—	**Pass**
10	On I-EGSE check the consistency between SCOS time and THSK and QLA time.	THSK	Incrementing once per second	—	**Pass**
Test Result (Pass/Fail):					

** Assuming that OBT is provided by the HCDMU following RD02, i.e, OBT is TAI, there should be a 33 second difference between OBS and CCS time (assuming CCS is using UTC). In the case the HCDMU is*

using UTC to specify the on board time, there should be no difference between THSK and the CCS/I-EGSE system time.

3.3.2 SPIRE-IST-COLD-DRCU-ON-P

Version	2.4
Date	6th December 2007
Purpose	To switch on the SPIRE DRCU PRIME and start generating housekeeping
Initial configuration	SPIRE DPU PRIME is ON and DRCU PRIME is switched OFF
Final configuration	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced
Preconditions	• SPIRE FM DRCU is electrically integrated with the Herschel Satellite • SPIRE DRCU is switched OFF • SPIRE MIB PRIME is imported in the CCS database. • CCS is up and running • FUNCTIONAL TEST PARAMETERS display is selected on the CCS
Duration	5 minutes
Pass/Fail Criteria	DRCU voltages show expected ‘ON’ values

Procedure steps:

Step	Description	Parameter	Expected Values Before/After	Actual Values Before/After	Success/ Failure
1	Execute TCL script SPIRE-IST-COLD-DRCU-START-P-STEP1.tcl	—	—	—	**Pass**
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	**Pass**
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	**Pass**
4	**Power ON the SPIRE DRCU PRIME unit using the dedicated spacecraft LCL line.**	—	—	—	**Pass**
5	Execute TCL script SPIRE-IST-COLD-DRCU-START-P-STEP2.tcl Note: The two TCs to clear the SPIRE Critical and Nominal HK reports will fail during execution of this script. These should be ignored because the HK reports will already have been cleared by script SPIRE-IST-COLD-DRCU-START-P-STEP1.tcl	—	—	—	**Pass**
6	Check that THSK parameter is again refreshing every second	THSK	Refreshing @ 1Hz	—	**Pass**
7	Check that TM2N parameter is again incrementing every second	TM2N	Incrementing by 1 @ 1Hz	—	**Pass**
8	Check that the SCU/DCU voltages show nominal values	SCUP5V SCUP9V SCUM9V BIASP5V BIASP9V BIASM9V	~ 5.2 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V ~ 5.1 ± 0.5V ~ 9.0 ± 0.2V ~ -9.0 ± 0.2V	5.238V 9.087V -9.081V 5.18V 8.99V -9.05 **BIASTEMP 294.33K**	**Pass**
Test Result (Pass/Fail):					

3.3.3 SPIRE-IST-COLD-FUNC-SCU-02-P

Version	2.4
Date	6th December 2007
Purpose	SCU Nominal Science Contents Check PRIME
Initial configuration	SPIRE DPU and DRCU PRIME are switched ON, SPIRE HK is being produced
Final configuration	Unchanged
Preconditions	• **SPIRE-IST-COLD-DPU-ON-P** and **SPIRE-IST-COLD-DRCU-ON-P** procedures have been executed. • SPIRE MIB PRIME is imported in the CCS database. • CCS is up and running • I-EGSE is up and running • DPU AND OBS PARAMETERS & FUNCTIONAL TEST PARAMETERS displays are selected on the CCS
Duration	5 minutes (CUS = 35.0)
Success Criteria:	Test passed if : 1. The SPIRE HK parameter SCUFRAMECNT increments 0/31. 2. The SPIRE HK parameter SCUFRAMECNT increments 0x3FFF/1 3. No events are generated during the frame generation. QLA to give go ahead.
CUS Parameters	CUS parameter - scuframes = 0x1f = 31

Test Procedure:

Step#	Action
0	Open **SCU_PARAMETERS** display on SCOS Alpha Numeric Displays.
1	Write down the initial value of the SCUFRAMECNT and TM5N parameters located in SCU_PARAMETERS display.
2	Run QLA script FUNC-SCU-02.py on QLA console.
3	Write down the final value of SCUFRAMECNT and TM5N.
4	Contingency: If test fails repeat steps 1 to 4.

Test Log:

Step	Description	Parameter	Expected Values Before/ After	Actual Values Before /After	Success/ Failure
1	Execute TCL script SPIRE-IST-COLD-FUNC-SCU-02-P.tcl	SCUFRAMECNT TM5N	0/31 0x3FFF/1		**PASS**

Start time @: 06:40
End time @: 06:41
OBSID:0xb0001031
Comments:
SCU frame count 0 at start and 31 at end

```
FUNC-SCU-02 version: 1.5

Housekeeping @  Fri Mar 07 06:41:40 UTC 2008
SCU Science @ Fri Mar 07 06:41:36 UTC 2008

 Name           HSK value  SCU value     Equal (within 10 raw units)?
TCHTRV          18.0       18.0          True
PCALCURR        10.0       10.0          True
SCAL4CURR       8.0        8.0           True
SCAL2CURR       10.0       9.0           True
PCALV           10.0       8.0           True
SCAL4V          10.0       10.0          True
SCAL2V          9.0        10.0          True
PUMPHTRTEMP     65467.0    65467.0       True
PUMPHSTEMP      90.0       90.0          True
EVAPHSTEMP      65466.0    65466.0       True
SHUNTTEMP       65316.0    65317.0       True
EMCFILTEMP      65524.0    65525.0       True
SL0TEMP         184.0      181.0         True
PL0TEMP         65390.0    65389.0       True
OPTTEMP         37.0       37.0          True
BAFTEMP         18.0       16.0          True
BSMIFTEMP       64.0       64.0          True
SCAL2TEMP       7.0        7.0           True
SCAL4TEMP       65444.0    65445.0       True
SCALTEMP        65462.0    65462.0       True
SMECIFTEMP      8.0        9.0           True
SMECTEMP        65466.0    65466.0       True
BSMTEMP         118.0      118.0         True
SUBKTEMP        32754.0    32756.0       True
```

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

3.3.4 SPIRE-IST-COLD-FUNC-SCU-03-P

Test Id:	SPIRE-IST-COLD-FUNC-SCU-03-P
Test Purpose:	FPU DC Thermometry Check
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Duration	8 minutes (CUS = 38.0)
Success Criteria:	Test passed if thermometry channels 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**
CUS Parameters	CUS parameter dcparam = 0xffff = 65535

Test Procedure:

Step#	Action
1	Run QLA script FUNC-SCU-03.py on QLA console.
2	Run SPIRE-IST-COLD-FUNC-SCU-03-P.tcl test procedure from the CCS.
3	Contingency: If test fails: 1. Execute SCU_OFF procedure. 2. Execute SPIRE-IST-COLD-FUNC-SCU-03-P.tcl procedure. 3. Repeat step 1 of the Test Procedure.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
FUNC-SCU-03	**SCUTEMPSTAT**	**0xFFFF/0xFFFF**	**0xFFFF/0xFFFF**	**N/A**	PASS

Start time @: 06:43
End time @: 06:44
OBSID: 0xb0001032

Comments:
L0 ~4.5K
L1 ~7.4K

```
SCU-03 Thermometry Check
OBSID = 0xb0001032

PUMPHTRTEMP  4.52   57625
PUMPHSTEMP   5.37   55834
EVAPHSTMP    5.20   55894
SHUNTTEMP    4.25   53367
EMCFILTMP    7.37   61637
SL0TEMP      4.25   53556
PL0TEMP      4.30   54020
OPTTEMP      7.41   59700
BAFTEMP      7.90   60708
BSMIFTEMP    7.47   58909
SCAL2TEMP    7.43   60005
SCAL4TEMP    7.31   60027
SCALTEMP     7.35   59596
SMECIFTEMP   7.23   58810
SMECTEMP     7.24   49730
BSMTEMP      7.39   40453
```

3.3.5 SPIRE-IST-COLD-FUNC-SCU-06-P

Test Id:	SPIRE-IST-COLD-FUNC-SCU-06-P
Test Purpose:	SCU/FPU AC Thermometry Check
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Duration	2 minutes
Success Criteria:	At ~ 4K the SUBKTEMP reading should calibration should start being in range. **Open Circuit Criterion:** **RAW reading in the range 0 -100** **Short Circuit Criterion:** **RAW reading of -32768**
CUS Parameters	acparam = 0x1

Test Procedure:

Step#	Action
1	Run SPIRE-IST-COLD-FUNC-SCU-06-P.tcl test procedure from the CCS.
2	Contingency: If test fails : 1. Send manual command: SEND_DRCU_COMMAND Parameter1 = 0xA0860000 Parameter2 = 0 2. Then repeat steps 1 and 2 of the Test Procedure. **Note:** **If the test fails and the SUBKTEMP channel is switched OFF manually, the expected value before/after execution of FUNC-SCU-06 for SUBKSTAT is 0/1**

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
FUNC-SCU-06	**SUBKSTAT** **SUBKTEMP**	**0/1** **He I (~4K)** **He II (~1.7K)**	0/1	**N/A**	PASS

Start time @: 06:47
End time @: 06:48
OBSID: 0xb0001033

Comments:
SUBKTEMP ~4.36K

QLA script output file: FUNC-SCU-06_B0001033.txt

SCU-06
Start time @: 07-Mar 06:49:42
End time @: 07-Mar 06:49:55
OBSID: 0xB0001033

SUBKSTAT:
Start value: 0x0
End value: 0x1

SUBKTEMP
RAW value before: 32757

RAW value after: 32616
Converted after: 4293 mK

3.3.6 SPIRE-IST-COLD-FUNC-SCU-07-P

Test Id:	**SPIRE-IST-COLD-FUNC-SCU-07-P**
Test Purpose:	Sorption Cooler Heater Check (Not at He II)
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Constraints	**This test should not be performed at He II temperatures, unless specifically instructed to do so by the I-EGSE staff.**
Duration	5 minutes (CUS 95.0)
Success Criteria:	Test passed if : • Sorption cooler heat switches and pump heater show expected voltages • PCALCURR HK parameter shows the commanded current. • PCALV parameter shows a linear increase proportional to the bias applied. (the proportionality constant in this case should be the PCAL resistor value) i.e.

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

CUS Parameters	evaphs = 0.804 pumphs = 0.804 pumpht = 21.85

Procedure Steps:

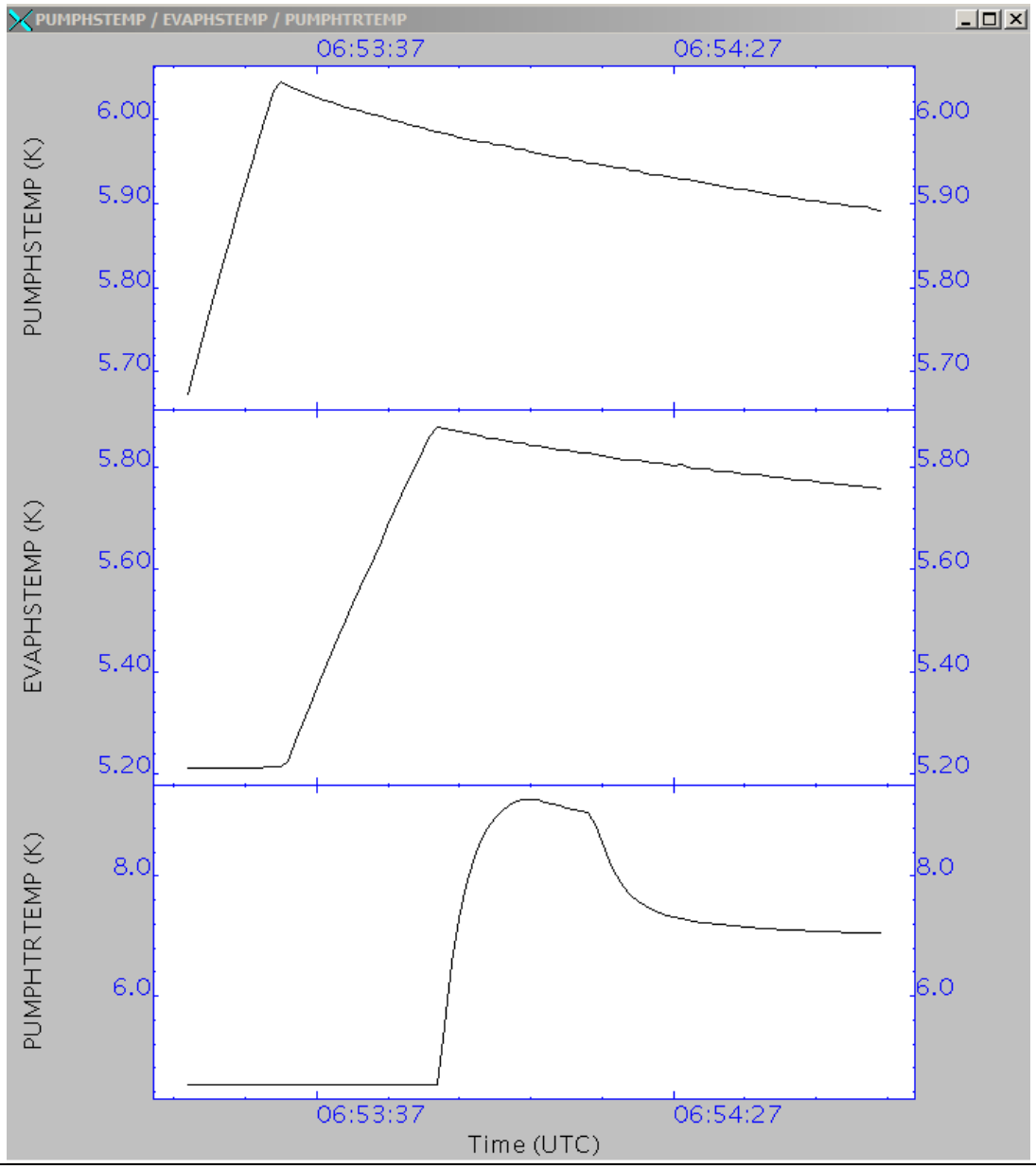
Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1.	**Open** SCU_PARAMETERS **display on SCOS Alpha Numeric Displays.**				
2.	Run SPIRE-IST-COLD-FUNC-SCU-07-P.tcl test procedure from the CCS.				
3.	Execute TCL script SPIRE-IST-COLD-FUNC-SCU-07-P.tcl	—	—	—	
4.	**Wait for the parameter BBFULLTYPE to get set to Cooler_Htr_Chk**	BBFULLTYPE	Cooler_Htr_Chk		
5.	Record the value of parameter SPHSV – the Sorption Pump Heat Switch Voltage. *This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.*	SPHSV – mV	0/~323/0		
6.	Record the value of parameter EVHSV – the Evaporator Heat Switch Voltage. *This voltage stays on for ~20 seconds. Wait for the voltage to go to zero to continue.*	EVHSV – mV	0/~323/0		
7.	Record the value of parameter SPHTRV – the Sorption Pump Heater Voltage. *This voltage stays on for ~20 seconds.Wait for the voltage to go to zero to continue.*	SPHTRV – V	0/~8.8/0		
8.	**Wait for the I-EGSE staff to confirm the success or failure of this test. If test fails repeat.**	—	—	—	
Test Result (Pass/Fail):					

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-SCU-07-P.tcl	**SPHSV** **EVHSV** **SPHTRV**	**0/ ~ 323 mV** **0/ ~ 323 mV** **0/ ~ 8.8 V**	~0. / 324.44 mV ~0 / 324.30 mV ~0 / 8.85V	**N/A**	

Start time @: 06:53
End time @: 06:54
OBSID: 0xb0001034

Comments: QLA Plots of PUMPHSTEMP, EVAPHSTEMP and EVAPHSTEMP



3.3.7 SPIRE-IST-COLD-FUNC-PCAL-01-P

Test Id:	SPIRE-IST-COLD-FUNC-PCAL-01-P
Test Purpose:	Photometer Calibrator Characterisation
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Duration	5 minutes (CUS 216.0)
Success Criteria:	Test passed if : • PCALCURR HK parameter shows the commanded current. • PCALV parameter shows a linear increase proportional to the bias applied. (the proportionality constant in this case should be the PCAL resistor value)

CUS Parameters	p_start = 1.0; // Start input bias (mA)
	p_end = 7.0; // End input bias (mA)
	p_step = 1.0; // Step input bias (mA)

Test Procedure

Step#	Action
1	Run QLA script FUNC-PCAL-01.py on QLA console.
2	Run SPIRE-IST-COLD-FUNC-PCAL-01-P test procedure from the CCS.
3	Contingency: If test fails repeat steps 1 and 2.

Test Log:

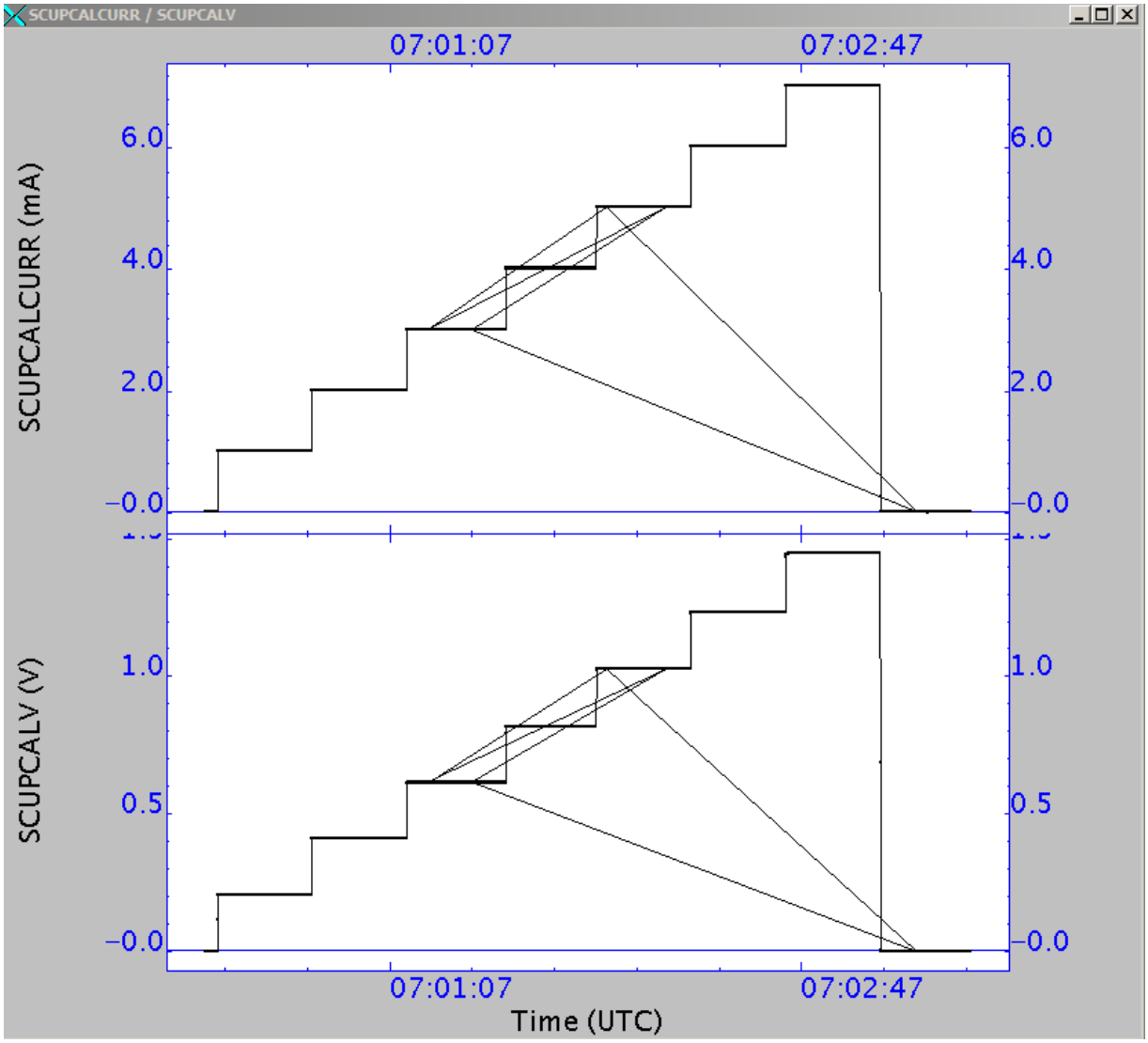
Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-PCAL-01-P	**PCALCURR PCALV**	**Starts at 0 then steps through 1, 2, 3 .. and ends at 7mA**	See plot below	**N/A**	PASS

Start time @: 07:00
End time @: 07:05
OBSID: 0xb0001035

Comments:

Monitored PCAL current on SCOS – PCAL current settings OK

QLA script produces new plots for every current level – normally there is a single plot. Also the time series plots of PCALCURR and PCALV show lines crisscrossing.



These problems appear to be due to the HK and science packets not arriving in time order.

PCALCURR / PCALV / THSK / OBSID

PCALCURR mA	PCALV V	THSK UTC	OBSID None
2.01484	0.408247	07-Mar 07:01:03	2.952794165E9
2.01484	0.408298	07-Mar 07:01:04	2.952794165E9
2.01484	0.408349	07-Mar 07:01:05	2.952794165E9
2.01484	0.408247	07-Mar 07:01:06	2.952794165E9
2.01484	0.408298	07-Mar 07:01:07	2.952794165E9
2.01484	0.408298	07-Mar 07:01:08	2.952794165E9
2.01484	0.408247	07-Mar 07:01:09	2.952794165E9
2.01484	0.408349	07-Mar 07:01:10	2.952794165E9
3.025033	0.61291	07-Mar 07:01:11	2.952794165E9
3.024784	0.61291	07-Mar 07:01:12	2.952794165E9
3.024784	0.612859	07-Mar 07:01:13	2.952794165E9
3.024784	0.61291	07-Mar 07:01:14	2.952794165E9
3.025033	0.61291	07-Mar 07:01:15	2.952794165E9
3.025531	0.61291	07-Mar 07:01:16	2.952794165E9
3.025033	0.612859	07-Mar 07:01:17	2.952794165E9
5.044671999999999	1.025653	07-Mar 07:02:02	2.952794165E9
5.044671999999999	1.0255509999999999	07-Mar 07:02:03	2.952794165E9
5.0449209999999995	1.0254489999999998	07-Mar 07:02:04	2.952794165E9
5.045419	1.0254489999999998	07-Mar 07:02:05	2.952794165E9
5.0449209999999995	1.0255509999999999	07-Mar 07:02:06	2.952794165E9
5.044671999999999	1.0254489999999998	07-Mar 07:02:07	2.952794165E9
5.044671999999999	1.0255509999999999	07-Mar 07:02:08	2.952794165E9
5.0449209999999995	1.025602	07-Mar 07:02:09	2.952794165E9
5.044671999999999	1.025602	07-Mar 07:02:10	2.952794165E9
5.0449209999999995	1.025602	07-Mar 07:02:11	2.952794165E9
5.0449209999999995	1.025602	07-Mar 07:02:12	2.952794165E9
5.04517	1.025602	07-Mar 07:02:13	2.952794165E9
5.044671999999999	1.0254489999999998	07-Mar 07:02:14	2.952794165E9
5.044671999999999	1.025602	07-Mar 07:02:15	2.952794165E9
3.025033	0.61291	07-Mar 07:01:18	2.952794165E9
3.024784	0.61291	07-Mar 07:01:19	2.952794165E9
3.024784	0.61291	07-Mar 07:01:20	2.952794165E9
3.024784	0.613012	07-Mar 07:01:21	2.952794165E9
3.024784	0.61291	07-Mar 07:01:22	2.952794165E9
3.025531	0.612859	07-Mar 07:01:23	2.952794165E9
3.024784	0.612859	07-Mar 07:01:24	2.952794165E9
3.024784	0.612961	07-Mar 07:01:25	2.952794165E9
3.024784	0.61291	07-Mar 07:01:26	2.952794165E9
3.025033	0.612859	07-Mar 07:01:27	2.952794165E9
3.024784	0.612859	07-Mar 07:01:28	2.952794165E9
5.044671999999999	1.025704	07-Mar 07:02:16	2.952794165E9
5.0449209999999995	1.025602	07-Mar 07:02:17	2.952794165E9

3.3.8 SPIRE-IST-COLD-FUNC-SCAL-01-P

Test Id:	SPIRE-IST-COLD-FUNC-SCAL-01-P
Test Purpose:	Spectrometer Calibrator Characterisation
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON
Duration	18 minutes (CUS 926)
Success Criteria:	Test passed if : • SCAL4CURR HK parameter shows the commanded current sequence (1,2,3,4,5,5.5mA) • SCAL2CURR HK parameter shows the commanded current sequence(1,2,3,4,5,5.5mA) • SCA2LV parameter shows a linear increase proportional to the bias applied. (the proportionality constant in this case should be the SCAL2V resistor value) • SCAL4V parameter shows a linear increase proportional to the bias applied. (the proportionality constant in this case should be the SCAL4V resistor value) • SCAL2TEMP and SCAL4TEMP values follow the increased bias settings
CUS Parameters	s2_start = 1.0 \\ S2 Bias RAW s2_end = 5.0 \\ S2 Bias RAW s2_step = 1. 0 \\ S2 Bias RAW s4_start = 1.0 \\ S4 Bias RAW s4_end = 5.0 \\ S4 Bias RAW s4_step = 1.0 \\ S4 Bias RAW

Test Procedure

Step#	Action
1	Run QLA script FUNC-SCAL-01.py on QLA console.
2	Run SPIRE-IST-COLD-FUNC-SCAL-01-P test procedure from the CSS.
3	Contingency: If test fails repeat steps 1 and 2.

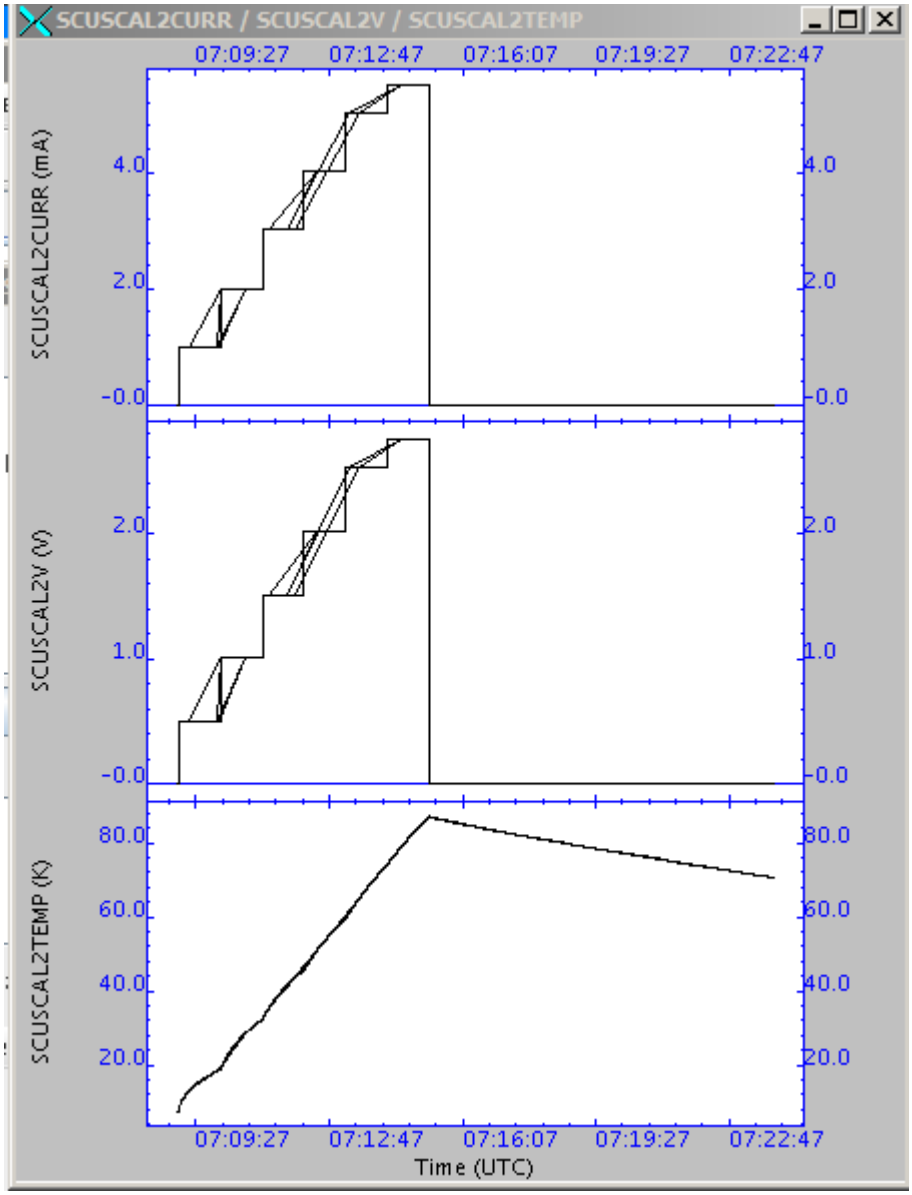
Test Log:

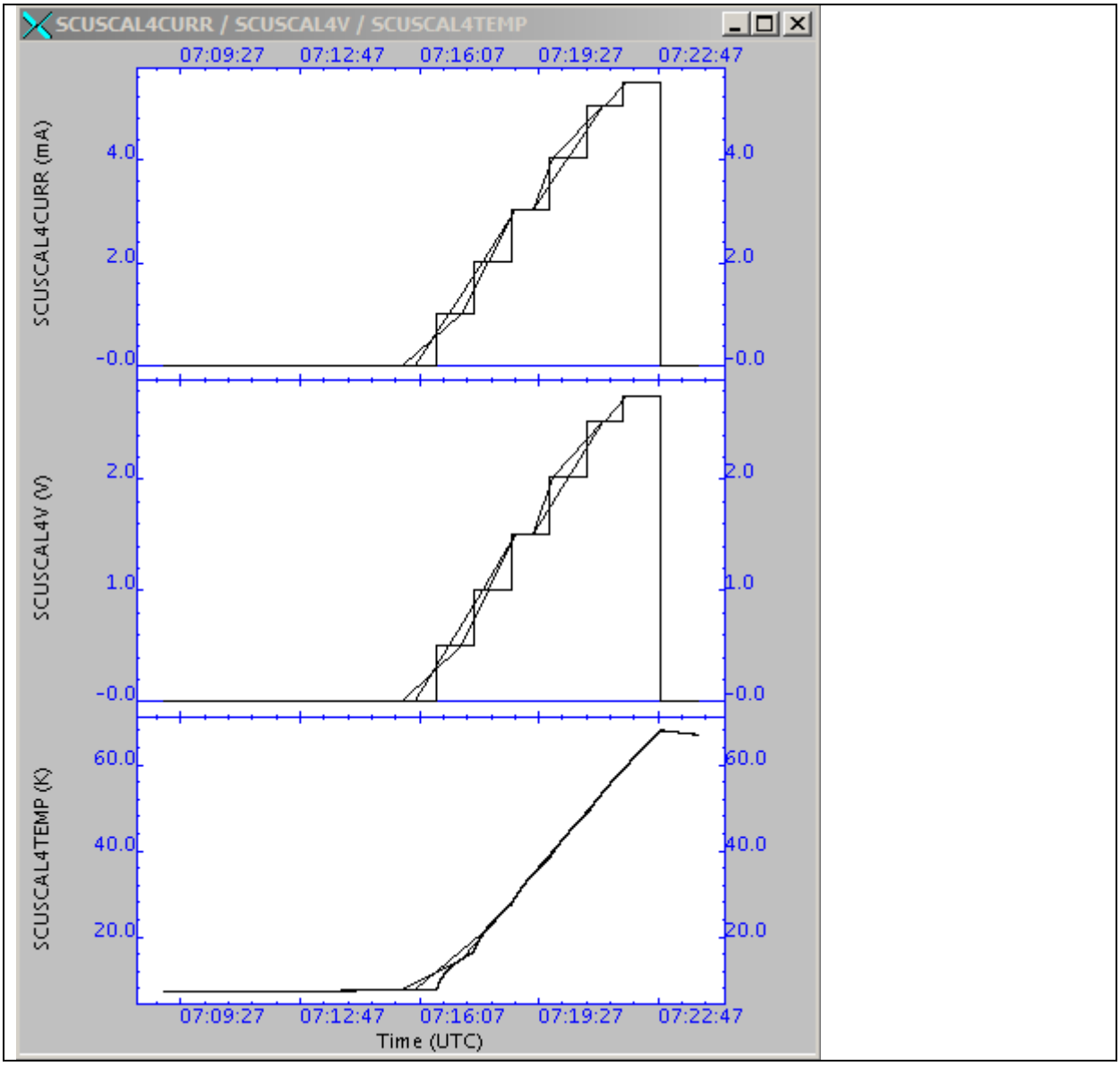
Test Id	Key Parameter(s)	Expected Value Before/During test	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-SCAL-01-P	**SCAL2CURR** **SCAL4CURR** **SCAL2V** **SCAL4V** **SCAL2TEMP** **SCAL4TEMP**	**0/1,2,3,4,5,5.5mA** **0/1,2,3,4,5,5.5mA** **0/0.5,1.0,1.5,2.0,2.5.2.75V** **0/0.5,1.0,1.5,2.0,2.5.2.75V**	See plots below	**N/A**	Pass
Note: First SCAL2CURR starts at 0 then steps through 1, 2, 3 .. and ends at 7mA, then the same for SCAL4CURR					

Start time @: 07:08
End time @: 07:23
OBSID: 0xb0001036

Comments: Test completed successfully. SCAL2 and SCAL4 temperatures on SCOS both at ~64K at end of test.

TM packets arriving in wrong time order again produce crisscrossing lines on the QLA plots.




SCUSCAL4CURR / SCUSCAL4V / SCUSCAL4TEMP
07:09:27
07:12:47
07:16:07
07:19:27
07:22:47
SCUSCAL4CURR (mA)
4.0
2.0
-0.0
SCUSCAL4V (V)
2.0
1.0
-0.0
SCUSCAL4TEMP (K)
60.0
40.0
20.0
Time (UTC)

3.3.9 SPIRE-IST-COLD-FUNC-MCU-01-P

Test Id:	SPIRE-IST-COLD-FUNC-MCU-01-P
Test Purpose:	MCU Boot Check
Initial Configuration:	DRCU_ON + AC/DC thermometry ON
Final Configuration:	DRCU_ON + AC/DC thermometry ON +MCU ON
Duration	5 mins (CUS 64.0)
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
1	Run SPIRE-IST-COLD-FUNC-MCU-01-P test procedure from the CCS.
2	When procedure is finished, write down 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	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-MCU-01-P	MCUP5V MCUP15V MCUP14V MCUM14V MCUM15V MCUMACTEMP MCUBSMTEMP MCUSMECTEMP	N/A/ ~ 5V N/A / ~15V N/A / ~ 14V N/A / ~ -14V N/A / ~ -15V N/A / ~ 300K N/A / ~ 300K N/A / ~ 300K	5.01 V 15.54 V 14.15V -14.47 V -15.63 V 291.61 K 296.60 K 296.20 K	N/A	PASS

Start time @: 07:38
End time @: 07:40

OBSID: 0xb0001037
Comments:
MCU booted OK

3.3.10 SPIRE-IST-COLD-FUNC-MCU-03-P

Test Id:	**SPIRE-IST-COLD-FUNC-MCU-03-P**
Test Purpose:	MCU Nominal Science Generation Check
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON
Duration	5 mins (CUS 69.0)
Success Criteria:	Test passed if : 1. MCU produces each type of the frames requested and with the following characteristics. 2. No events are generated during the different frames generation.

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						

CUS Parameters	n_eng_frames = 100; //number of engineering frames
	f_eng_frames = 64.1; //frequency of engineering frames generation
	n_smec_frames = 100; //number of smec frames
	f_smec_frames = 250.0; //frequency of smec frames generation
	n_bsm_frames = 100; //number of bsm frames
	f_bsm_frames = 64.1; //frequency of bsm frames generation
	ftime = 10; //time for continuous generation

Test Procedure:

Step#	Action
1	Write down the current value of MCUFRAMECNT located in MCU_PARAMETERS display
2	Run SPIRE-IST-COLD-FUNC-MCU-03-P test procedure from the CCS.
3	When test is finished Write down the current value of MCUFRAMECNT.
4	Contingency: If test fails repeat steps 1 to 4.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-MCU-03-P.tcl	**MCUFRAMECNT**	**0/ ~ 297**	**0 / 297**		Pass

Start time @: 07:41
End time @: 07:42
OBSID: 0xb0001038

Comments: QLA produced the following files

QLA-MCU-03_B0001038_8901.txt

Housekeeping Fri Mar 07 07:41:25 UTC 2008
Science Fri Mar 07 07:41:24 UTC 2008

Name	HK before	Science	HK after	Equal (within 10%)?
SMECENCSIG1	12403.0	12406.0	12405.0	True
SMECENCSIG2	20068.0	20070.0	20067.0	True
SMECLVDTDCSIG	32759.0	32758.0	32761.0	True
SMECLVDTACSIG	27325.0	27324.0	27320.0	True
SMECMOTORCURR	32780.0	32779.0	32778.0	True
SMECMOTORVOLT	32775.0	32772.0	32777.0	True
CHOPSENSSIG	32764.0	32762.0	32764.0	True
CHOPMOTORCURR	32776.0	32776.0	32777.0	True
CHOPMOTORVOLT	32768.0	32766.0	32760.0	True
JIGGSENSSIG	32758.0	32754.0	32752.0	True
JIGGMOTORCURR	32773.0	32774.0	32775.0	True
JIGGMOTORVOLT	32764.0	32770.0	32762.0	True

QLA-MCU-03_B0001038_8902.txt

Housekeeping Fri Mar 07 07:41:42 UTC 2008
Science Fri Mar 07 07:41:41 UTC 2008

Name	HK before	Science	HK after	Equal (within 10%)?
SMECENCPOSN	0.0	0.0	0.0	True
SMECENCFINEPOSN	0.0	0.0	0.0	True
SMECLVDTDCSIG	32759.0	32760.0	32758.0	True
SMECMOTORBEMF	4.0	4.0	9.0	True

QLA-MCU-03_B0001038_8903.txt

Housekeeping Fri Mar 07 07:41:58 UTC 2008
Science Fri Mar 07 07:41:57 UTC 2008

Name	HK before	Science	HK after	Equal (within 10%)?
CHOPSENSSIG	32762.0	32762.0	32761.0	True
CHOPDACVAL	32768.0	32768.0	32768.0	True
CHOPMOTORVOLT	32764.0	32768.0	32764.0	True
JIGGSENSSIG	32755.0	32757.0	32756.0	True
JIGGDACVAL	32768.0	32768.0	32768.0	True
JIGGMOTORVOLT	32766.0	32768.0	32767.0	True

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

3.3.11 SPIRE-IST-COLD-FUNC-BSM-01-P

Test Id:	SPIRE-IST-COLD-FUNC-BSM-01-P
Test Purpose:	BSM Switch ON Check
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON +MCU ON + BSM ON (open loop)
Duration	5 mins (CUS 24.0)
Success Criteria:	Test passed if: 1. CHOPSENSPWR HK parameter goes from 0 to 1 2. CHOPSENSIG HK parameter changes 3. JIGGSENSPWR HK parameter goes from 0 to 1 4. JIGGSENSSIG HK parameter changes

Test Procedure

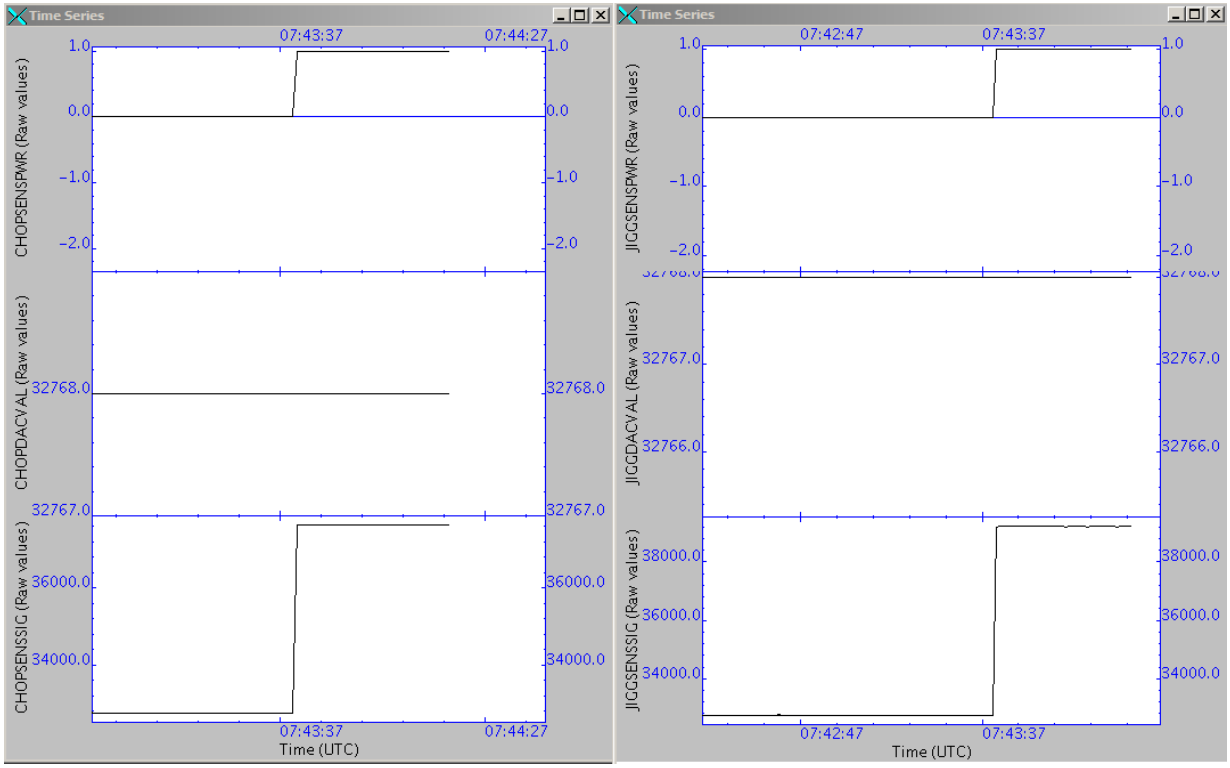
Step#	Action
1	Run SPIRE-IST-COLD-FUNC-BSM-01-P test procedure from the CCS.
2	When the test is finished record all the Key parameters noted below
3	Contingency: If test fails repeat steps 1 and 2.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
FUNC-BSM-01	**CHOPSENSPWR** **CHOPLOOPMODE** **CHOPSENSSIG** **JIGGSENSPWR** **JIGGLOOPMODE** **JIGGSENSSIG**	**0/1/1** **3/3** **?/?** **0/1/1** **3/3** **?/?**	0 / 1 3 / 3 7FFD / 9301 0 / 1 3 / 3 7FF4 / 9930	**N/A**	Pass

Start time @: 07:43
End time @: 07:44
OBSID: 0xb0001039

Comments:



3.3.12 SPIRE-IST-COLD-FUNC-BSM-03-P

Test Id:	SPIRE-IST-COLD-FUNC-BSM-03-P
Test Purpose:	BSM Open Loop dynamics Check
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)
Duration	5 mins (CUS 269.0)
Success Criteria:	Test passed if the chop sensor signal evolves in the same way as the positions set (i.e. if choppos2 > choppos1 ➔ chopsenssig2 > chopsenssig1) for each jiggle position.

CUS Parameters	frametype = "BSM"; // Specifyes MCU frame type [BSM,SMEC,BSM+SMEC,ENG,TEST]
	framerate = 64.0; // Specifies the frame rate
	j_start = 0x4000; // RAW jiggle target start position
	j_end = 0xc000; // RAW jiggle target end position
	j_step = 0x4000; // RAW jiggle target step in position
	j_delay = 2; // Time at each jiggle target position in seconds
	c_start = 0x3000; // RAW chop target start position
	c_end = 0xf000; // RAW chop target end position
	c_step = 0x1000; // RAW chop target step in position
	c_delay = 5; // Time at each chop target position in seconds

Test Procedure

Step#	Action
1	**On QLA open up 2 time series display with the following HK parameters in each display:** **Display 1:** *HK* : CHOPPOSN *BSM Nominal Science*: BSMCHOPMOTORCURR BSMCHOPSENSSIG BSMCHOPMOTORVOLT **Display2:** *HK* : JIGGPOSN *BSM Nominal Science*: BSMJIGGMOTORCURR BSMJIGGSENSSIG BSMJIGGMOTORVOLT
2	**Run SPIRE-IST-COLD-FUNC-BSM-03-P test procedure from the CCS**
3	Contingency: If test fails repeat step 2.

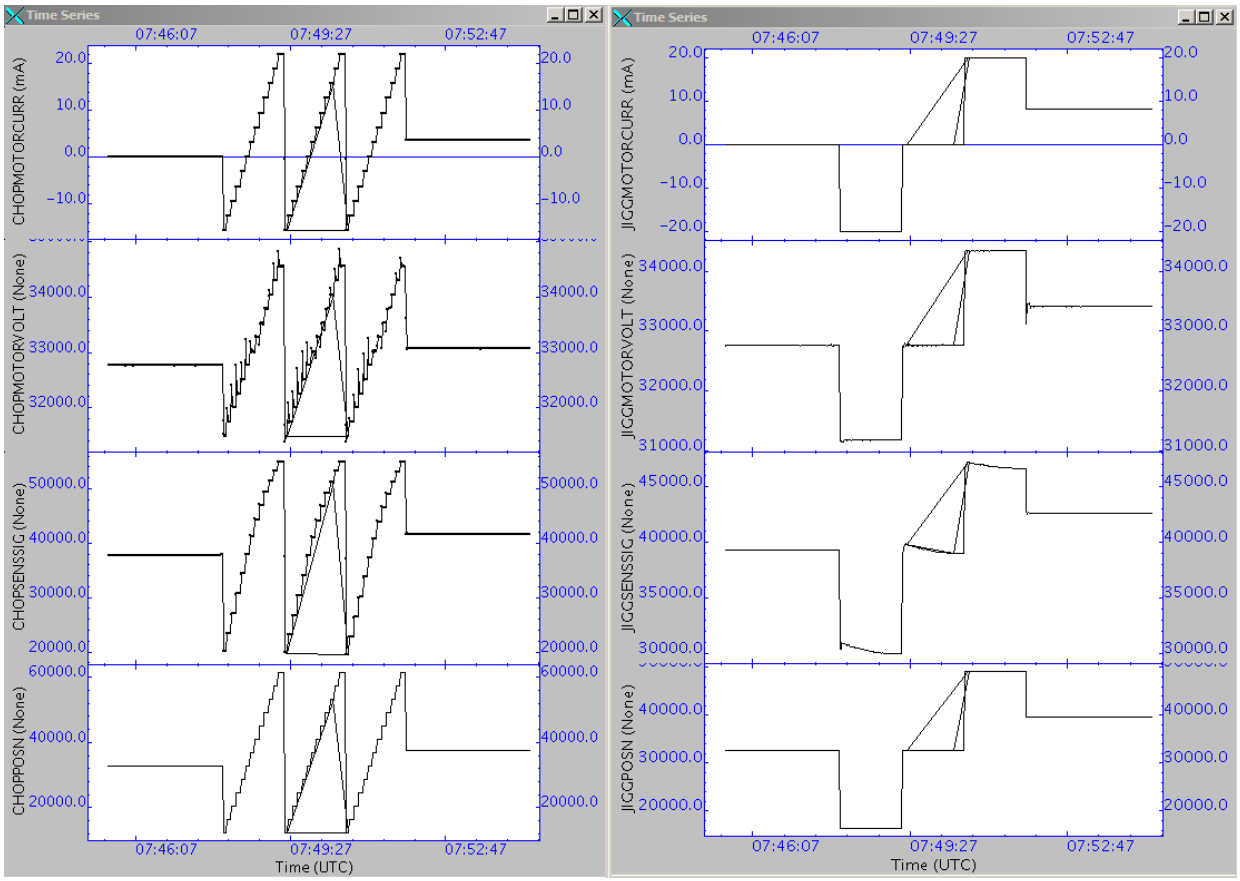
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-BSM-03-P				N/A	**Pass**

Start time @: 07:48
End time @: 07:52
OBSID: 0xb000103a

Comments: Nominal behaviour.

QLA plots



3.3.13 SPIRE-IST-COLD-FUNC-BSM-05A-P

Test Id:	SPIRE-IST-COLD-FUNC-BSM-05A-P.tcl
Test Purpose:	BSM Open Loop chop test (Degraded operational mode check)
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)
Duration	5 mins (CUS 75.0)
Success Criteria:	**Note:** **The purpose of this test is to check the effectiveness of the dumping of the natural oscillations of the BSM in chop axis via motor bemf, through the use of the commendable motor resistance value.** **As it is now is just a check of the default motor resistance value.** **NO adjusting of this value should be attempted during this test.** **The success criteria are therefore not applicable.**

CUS Parameters	frametype = "BSM"; // Specifyes MCU frame type [BSM,SMEC,BSM+SMEC,ENG,TEST]
	framerate = 125.0; // Specifies the frame rate
	on_source_chop = 0xa000; // On source chop position
	on_source_jiggle = 0x8000; // On source jiggle position
	off_source_chop = 0x8000; // Off source chop position
	off_source_jiggle = 0x8000; // Off source jiggle position
	ncycles = 50; //Number of chop cycles
	chop_period = 500000; //period of chop cycles in microsec
	dcumode = 0; //Data type
	dcusample = 4; //Number of DCU samples per chop position
	dcudelay = 34959; //Dealy to start sampling the DCU
	bsmsample = 31; //Number of BSM samples per position

Test Procedure

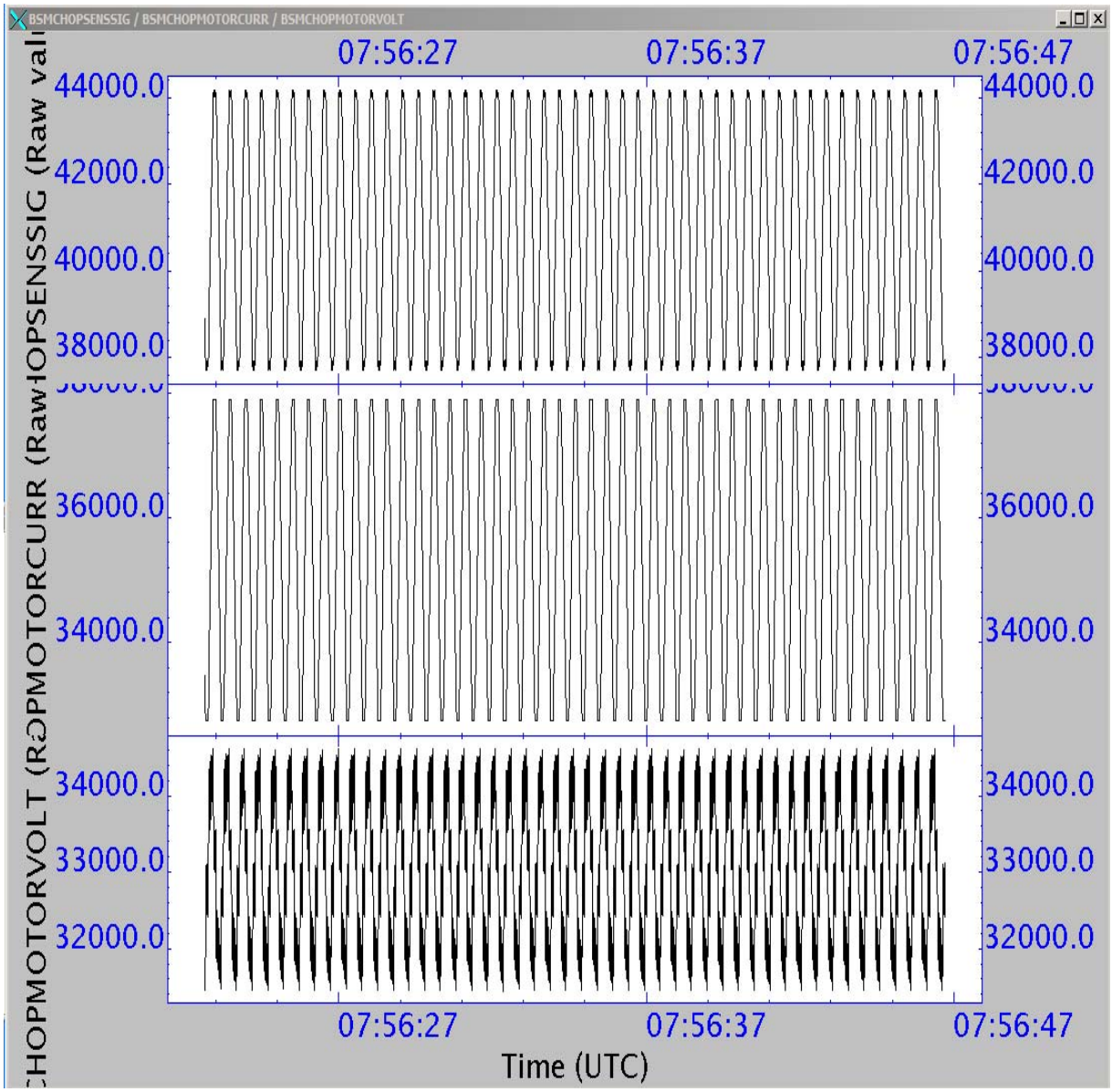
Step#	Action
1	**On QLA open up a time series display of HK parameters:** BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT
2	**Run SPIRE-IST-COLD-FUNC-BSM-05A-P.tcl test procedure from the CCS.**
3	Contingency: None contemplated.

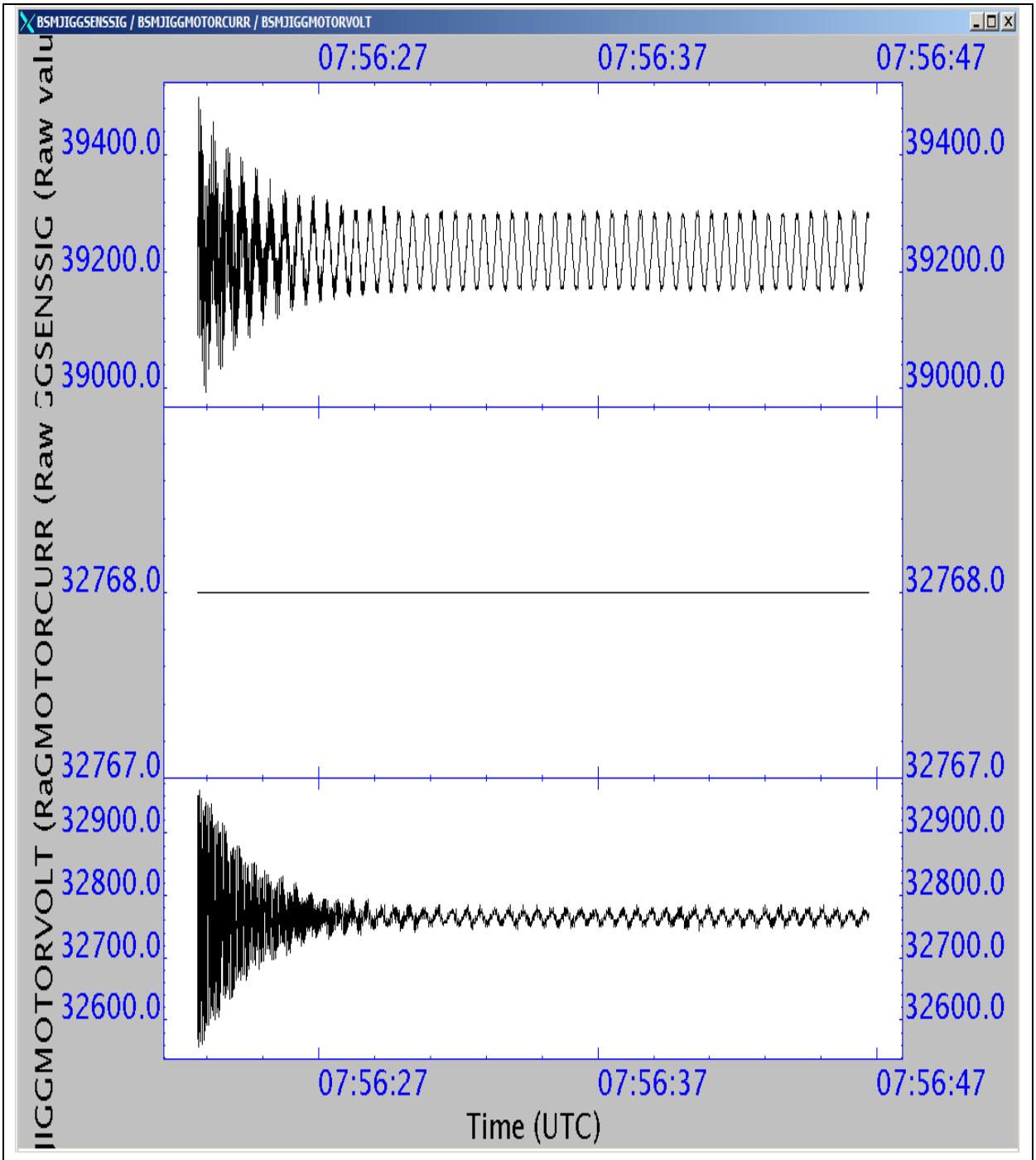
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-BSM-05A-P.tcl	BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT	?/? ?/? ?/?		N/A	**Pass**

Start time @: 07:56
End time @: 07:58
OBSID: 0xb000103b

Comments:




BSMJIGGSENSSIG / BSMJIGGMOTORCURR / BSMJIGGMOTORVOLT
07:56:27
07:56:37
07:56:47
39400.0
39200.0
39000.0
32768.0
32767.0
32900.0
32800.0
32700.0
32600.0
Time (UTC)

3.3.14 SPIRE-IST-COLD-FUNC-BSM-05B-P

Test Id:	SPIRE-IST-COLD-FUNC-BSM-05B-P
Test Purpose:	BSM Close Loop chop test
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 (CLOSED loop)
Duration	5 mins (CUS 72.0)
Success Criteria:	**Note:** **Currently this test does not differ at ALL from the next one.** **In any case the success/fail criteria are NOT applicable for this test.**

CUS Parameters	frametype = "BSM"; // Specifyes MCU frame type [BSM,SMEC,BSM+SMEC,ENG,TEST]
	framerate = 125.0; // Specifies the frame rate
	on_source_chop = 0xb600; // On source chop position (46592)
	on_source_jiggle = 0x9a60; // On source jiggle position (39520)
	off_source_chop = 0x6a28; // Off source chop position (27176)
	off_source_jiggle = 0x9a60; // Off source jiggle position (39520)
	ncycles = 50; //Number of chop cycles
	chop_period = 500000; //period of chop cycles in microsec
	dcumode = 0; //Data type
	dcusample = 4; //Number of DCU samples per chop position
	dcudelay = 34959; //Dealy to start sampling the DCU
	bsmsample = 31; //Number of BSM samples per position

Test Procedure

Step#	Action
1	Execute SPIRE-IST-COLD-BSM-INIT-P.tcl from the CCS.
2	On QLA open up a time series display of HK parameters: BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT
3	Run SPIRE-IST-COLD-FUNC-BSM-05B-P.tcl test procedure from the CCS.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-BSM-INIT-P.tcl	**CHOPLOOPMODE** **JIGGLOOPMODE**	**3/-/1** **3/-/1**	**3/-/1** **3/-/1**	**N/A**	**Pass**
SPIRE-IST-COLD-FUNC-BSM-05B-P.tcl	**BSMCHOPSENSSIG** **BSMCHOPMOTORCURR** **BSMCHOPMOTORVOLT**	**?/?** **?/?** **?/?**	See plots below	**N/A**	**Pass**

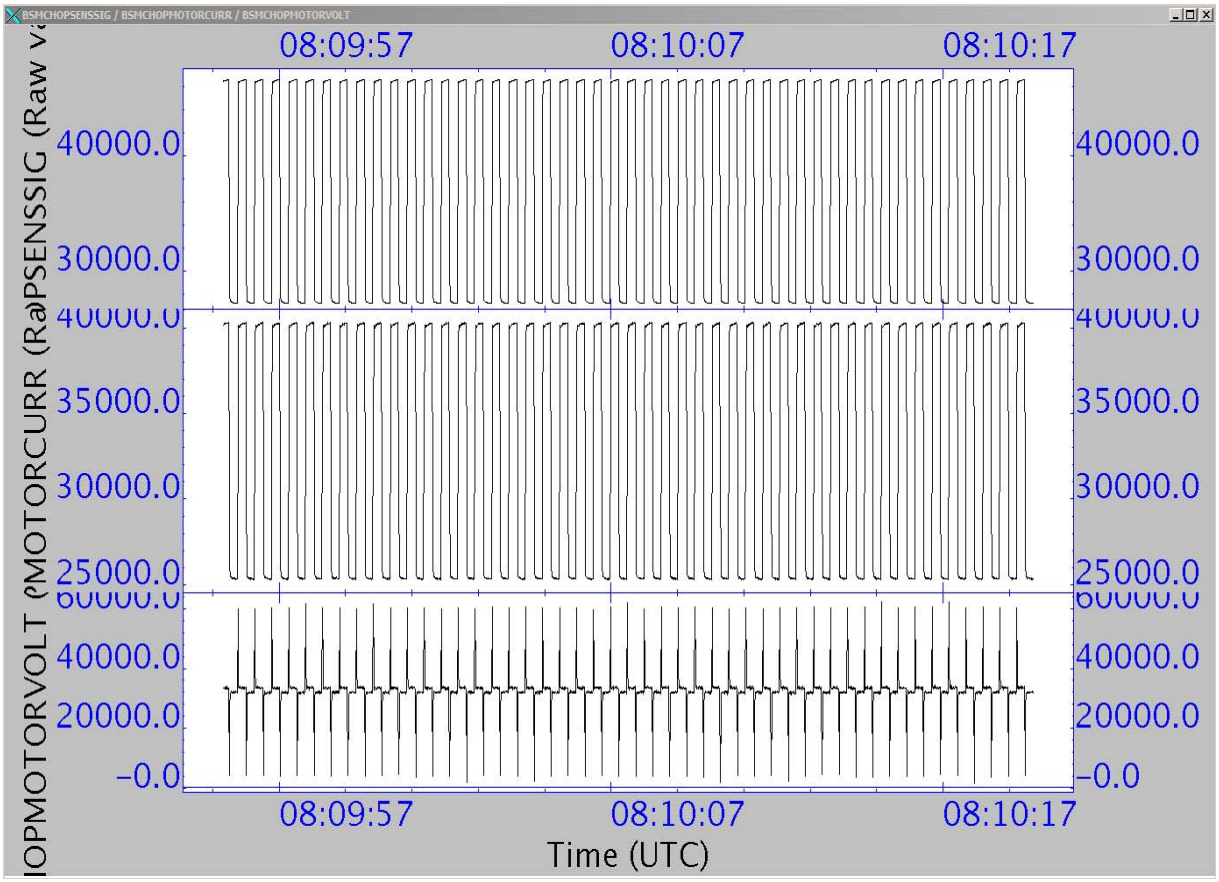
FUNC-BSM-05B
Start time: 08:03
End time: 08:04
OBSID: 0xb000103c

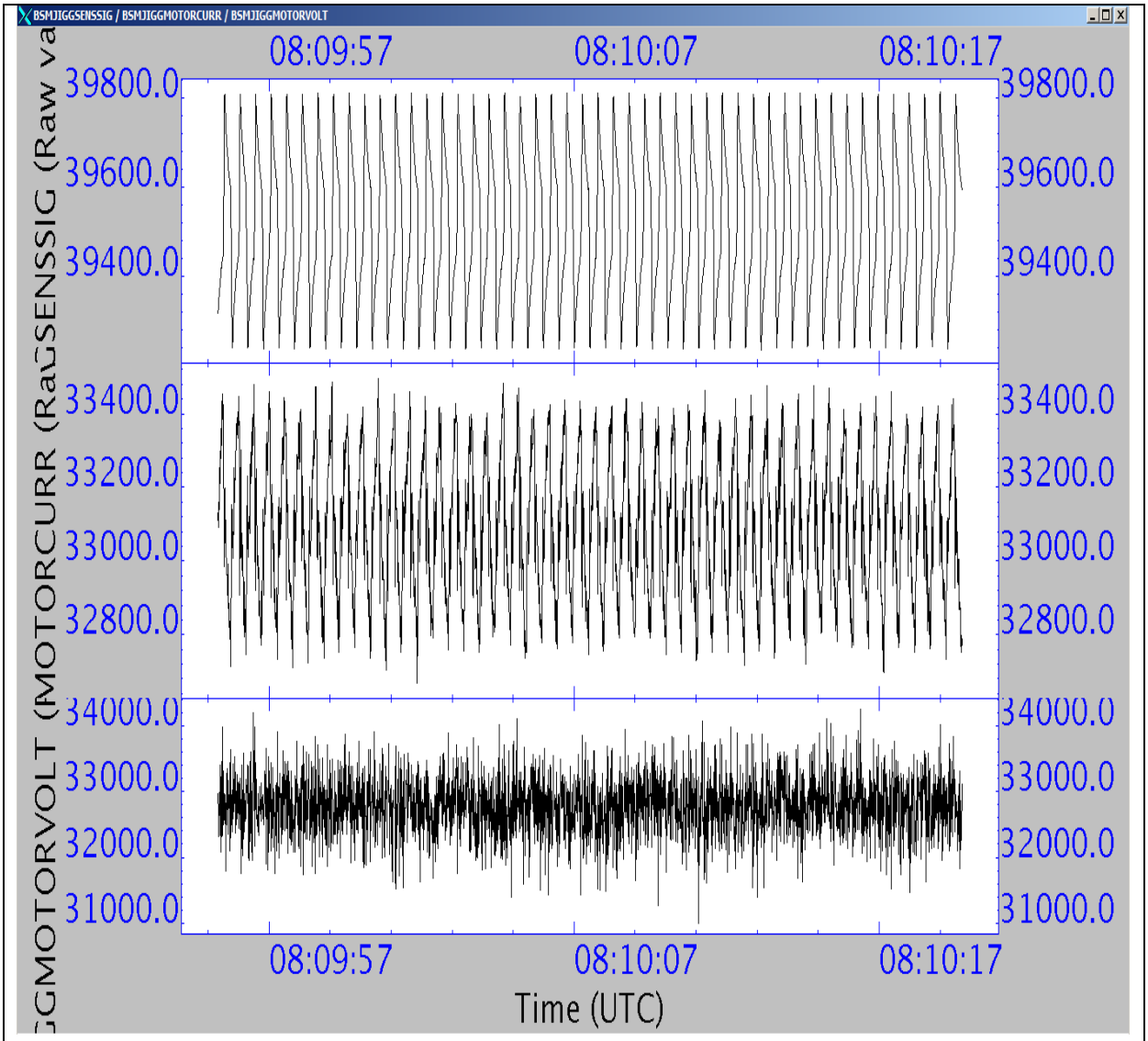
Comments: BSM_INIT had not been run. So this large chop throw test was done in open loop.

BSM_INIT:
Start Time: 08:07
End Time: 08:08
OBSID: 0xb000103d

FUNC-BSM-05B
Start time: 08:10
End time: 08:12
OBSID: 0xb000103e

Comments: Chopping OK. Settling time ~32 ms.




BSMJIGGSENSSIG / BSMJIGGMOTORCURR / BSMJIGGMOTORVOLT
08:09:57
08:10:07
08:10:17
39800.0
39600.0
39400.0
33400.0
33200.0
33000.0
32800.0
34000.0
33000.0
32000.0
31000.0
Time (UTC)

3.3.15 SPIRE-IST-COLD-FUNC-BSM-06-P

Test Id:	SPIRE-IST-COLD-FUNC-BSM-06-P
Test Purpose:	BSM Operational Mode Check
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)
Duration	5 mins (CUS 72.0)
Success Criteria:	**Note:** **The purpose of this test is to check the effectiveness 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.**

CUS Parameters	frametype = "BSM"; // Specifyes MCU frame type [BSM,SMEC,BSM+SMEC,ENG,TEST]
	framerate = 125.0; // Specifies the frame rate
	on_source_chop = 0x5279; // On source chop position (21113)
	on_source_jiggle = 0x8d00; // On source jiggle position (36096)
	off_source_chop = 0xad87; // Off source chop position (44423)
	off_source_jiggle = 0x8d00; // Off source jiggle position (36096)
	ncycles = 50; //Number of chop cycles
	chop_period = 500000; //period of chop cycles in microsec
	dcumode = 0; //Data type
	dcusample = 4; //Number of DCU samples per chop position
	dcudelay = 34959; //Dealy to start sampling the DCU
	bsmsample = 65535; //Number of BSM samples per position

Test Procedure

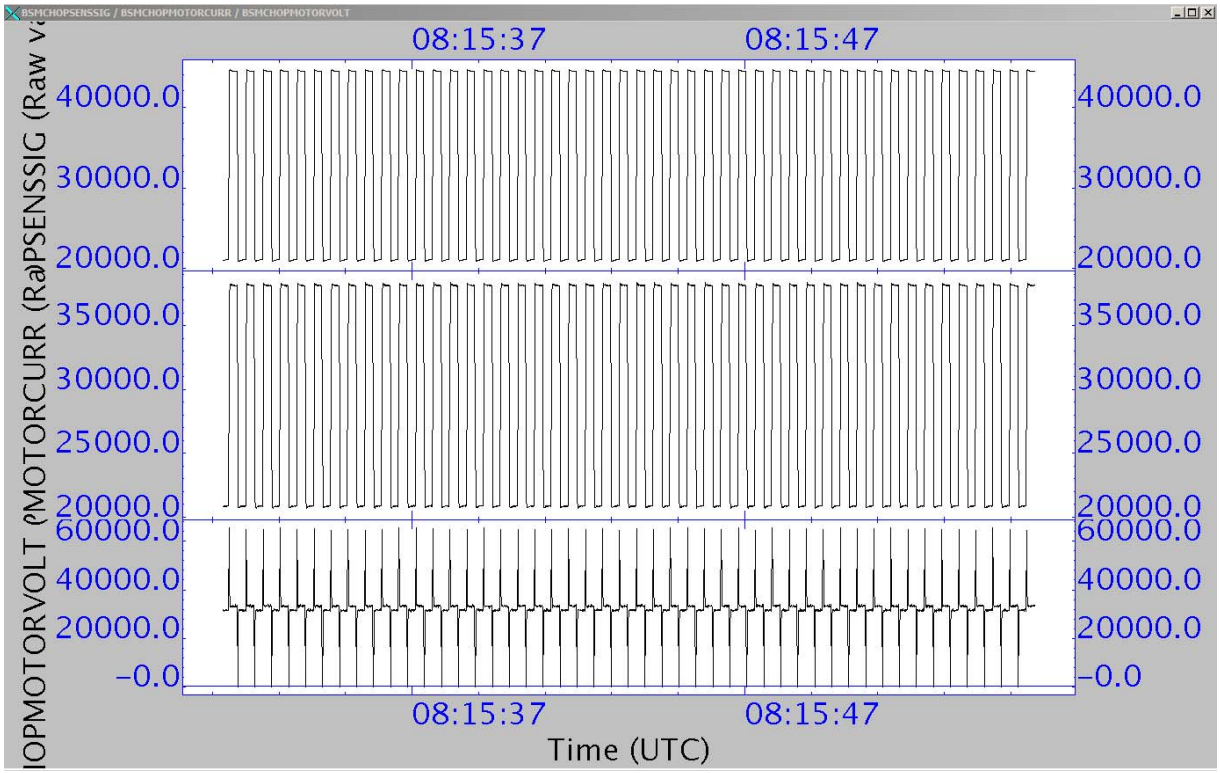
Step#	Action
1	**On QLA open up a time series display of science parameters:** BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT
2	**Run SPIRE-IST-COLD-FUNC-BSM-06-P test procedure from the CCS.**

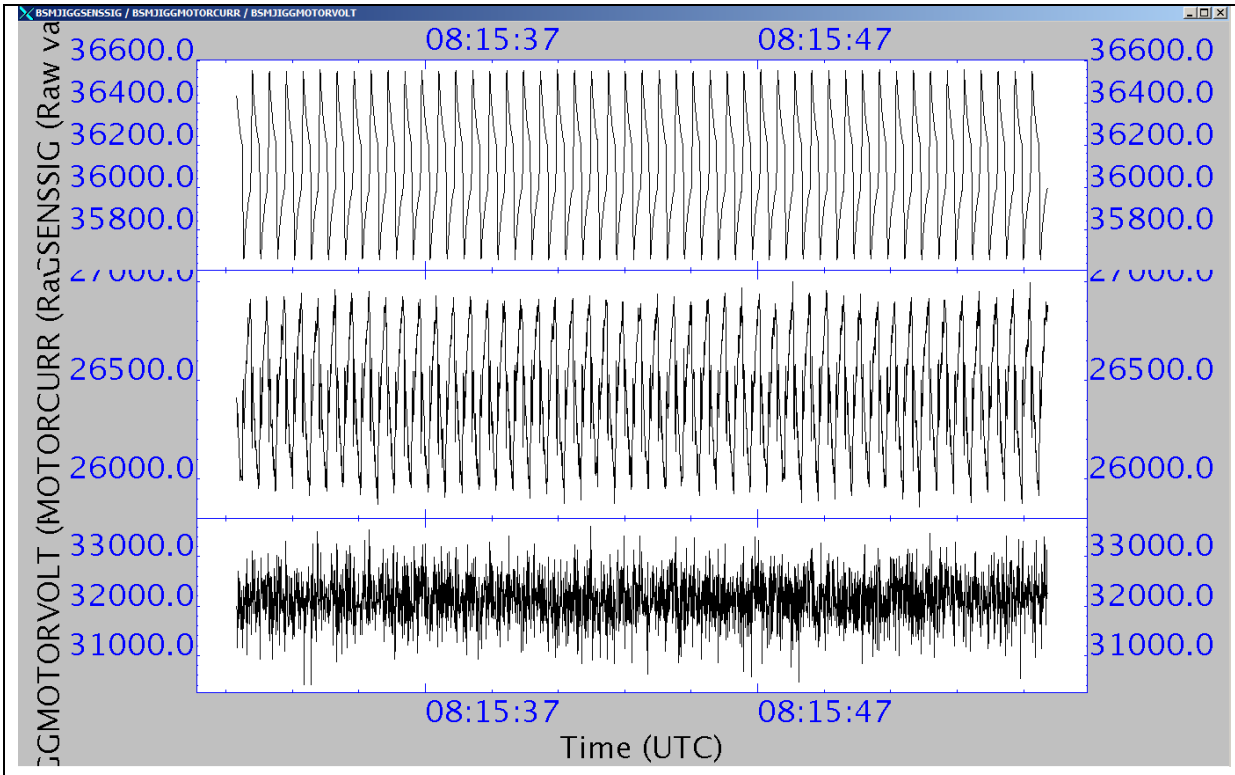
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-BSM-06-P	CHOPLOOPMODE JIGGLOOPMODE	1/1/1 1/1/1	1/1/1 1/1/1		
	BSMCHOPSENSSIG BSMCHOPMOTORCURR BSMCHOPMOTORVOLT	?/? ?/? ?/?	See plots below	N/A	N/A

Start time @: 08:15
End time @: 08:17
OBSID: 0xb000103f

Comments: Needs better tuning for this chop throw 44423/21113. For tuning during SPT will use 250Hz sampling, rather than 125Hz.





Step#	Action	Comments
4	Execute BSM_OFF	Start Time: 08:19 End Time: 08:20 OBSID: 0xb0001040

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

3.3.16 SPIRE-IST-COLD-FUNC-SMEC-01-P

Test Id:	SPIRE-IST-COLD-FUNC-SMEC-01-P
Test Purpose:	SMEC Switch ON Check. Encoder and LVDT alive 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)
Duration	5 Minutes (CUS 40.0)
Success Criteria:	Test passed if : 1. SMECENCPWR HK parameter changes from 0 to 4. 2. SMEC encoder signals 1 and 2 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:

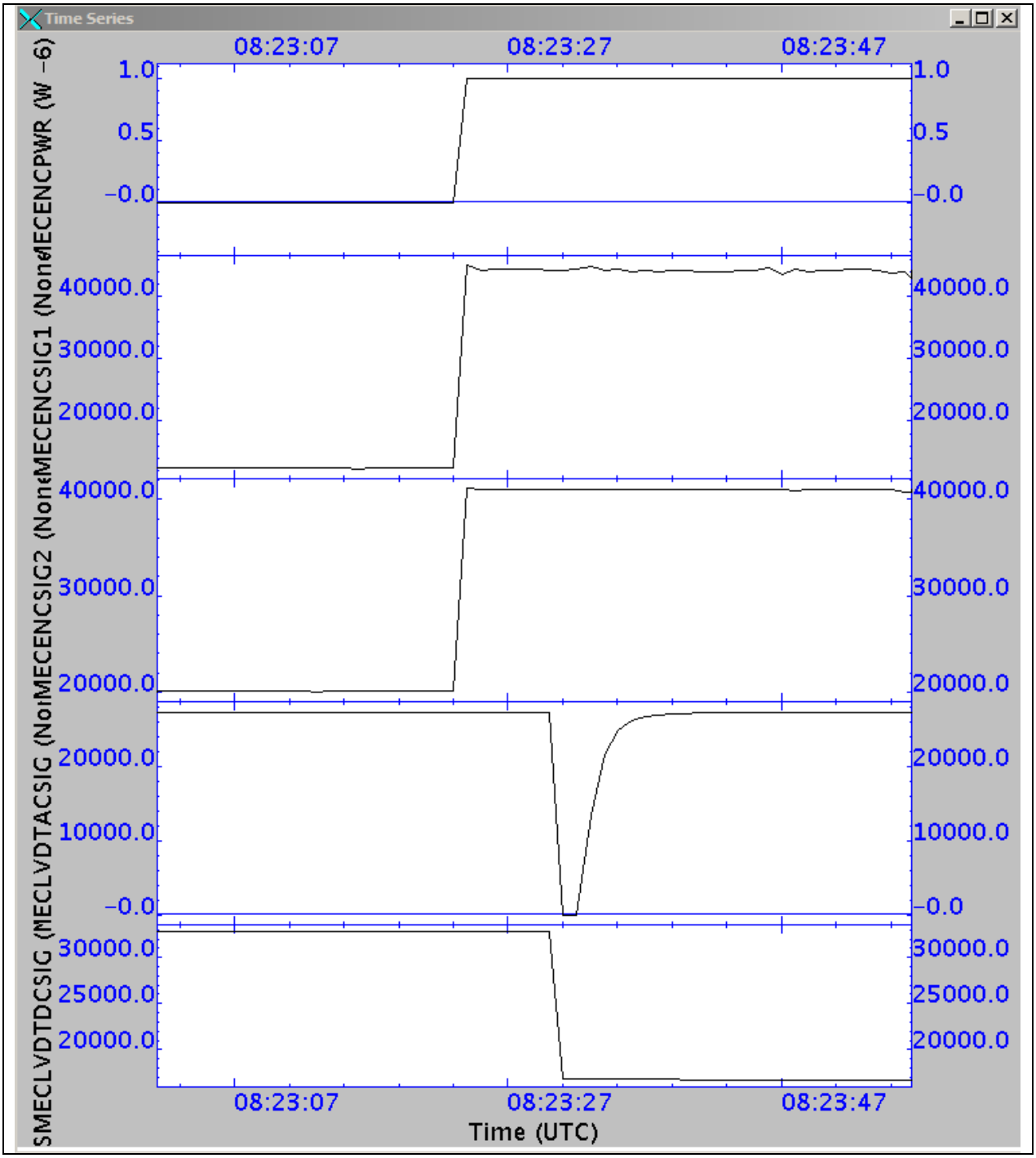
Step#	Action	Comments
1	Run FUNC-SMEC-01.py script on QLA	
2	Run SPIRE-IST-COLD-FUNC-SMEC-01-P test procedure from the CCS.	
3	Contingency: If test fails repeat steps 1.	

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-SMEC-01-P	SMECENCPWR SMECLVDTPWR SMECENCSIG1 SMECENCSIG2	0/-/1 0/-/1		N/A	Pass

Start time @: 08:23
End time @: 08:24
OBSID: 0xb0001041

Comments:


Time Series
08:23:07
08:23:27
08:23:47
1.0
0.5
-0.0
40000.0
30000.0
20000.0
40000.0
30000.0
20000.0
20000.0
10000.0
-0.0
30000.0
25000.0
20000.0
SMECLVDTDCSIG (MECLVDTACSIG (NonMECENCSIG2 (NonMECENCSIG1 (NonMECENCPWR (W -6)
Time (UTC)

3.3.17 SPIRE-IST-COLD-FUNC-SMEC-03-P

Test Id:	SPIRE-IST-COLD-FUNC-SMEC-03-P
Test Purpose:	SMEC (PRIME) Encoder Integrity 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)
Duration	5 minutes (CUS 49.0)
Success Criteria:	Test passed if: SMEC encoder signals 1 and 2 show a variation on their amplitudes from one LED illumination level to another. (i.e. MCUENGSMECENCSIG1/2 increase as the encoder power is increased.)

CUS Parameters	frametype = "ENG"; // Specifies MCU frame type [BSM,SMEC,BSM+SMEC,ENG,TEST]
	framerate = 64.0; // Specifies the frame rate
	framenumber = 0xffff; // Frame number
	level_init = 1; //
	level_start = 1;
	level_end = 3;
	level_step = 1;
	led_delay = 5; // Time at each level in seconds

Test Procedure:

Step#	Action
1	**Run FUNC-SMEC-03.py script on QLA**
2	**Run SPIRE-IST-COLD-FUNC-SMEC-03-P test procedure from the CCS.**
3	Contingency: If test fails repeat steps 1 and 2.

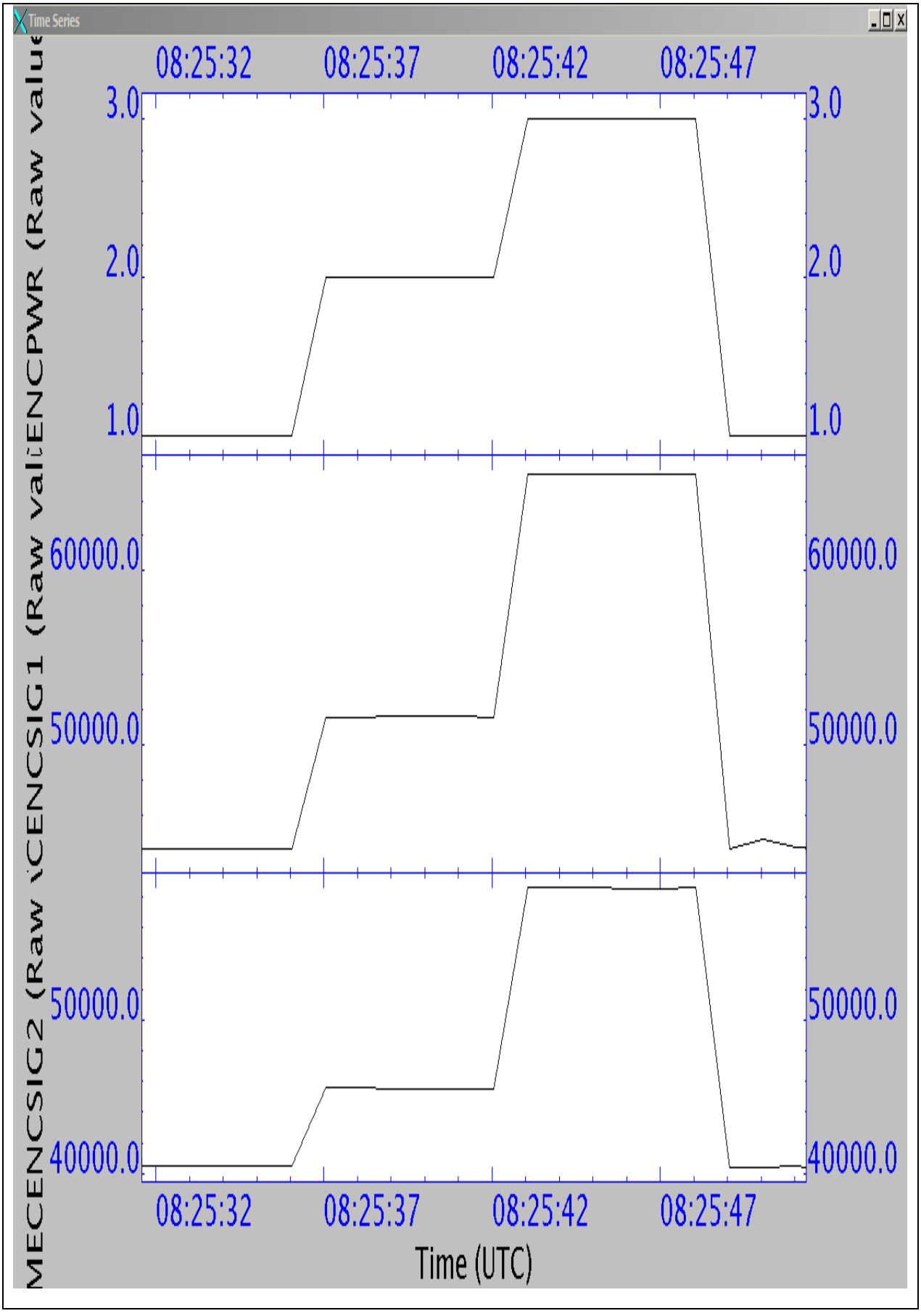
Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-SMEC-03-P	**SMECENCPWR SMECENCSIG1 SMECENCSIG2**		See plots below		**Pass**

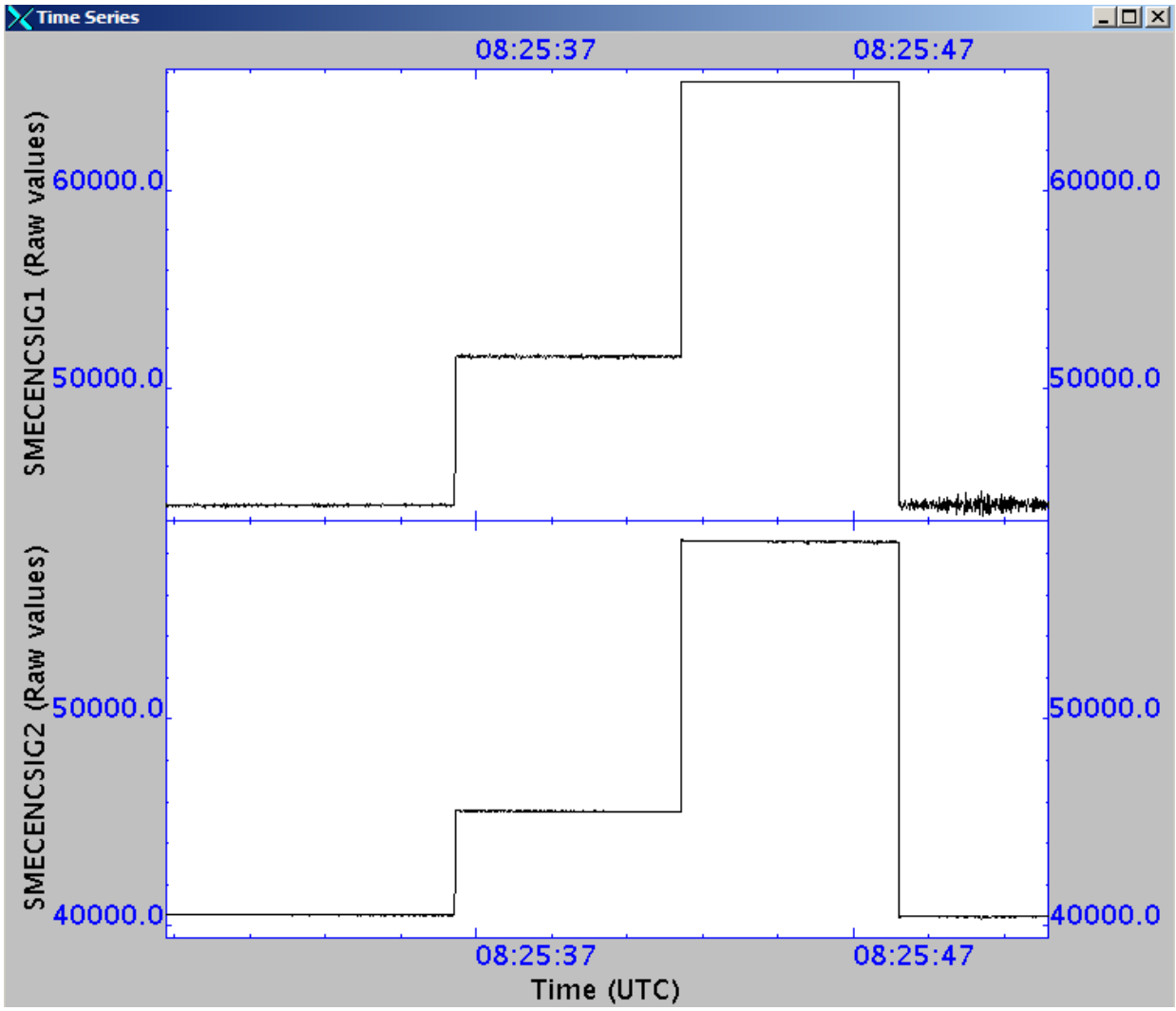
Start time @: 08:25
End time @: 08:26
OBSID: 0xb0001042

Comments: Encoder signal 1 saturated at power level 3. Signal 2 high but OK.

HK plot:


Time Series
08:25:32
08:25:37
08:25:42
08:25:47
3.0
2.0
1.0
60000.0
50000.0
50000.0
40000.0
MECENCSIG2 (Raw vCENCSIG1 (Raw valENCPWR (Raw value
Time (UTC)

MCU Engineering data plot:



3.3.18 SPIRE-IST-COLD-FUNC-SMEC-OFF-P

Test Id:	SPIRE-IST-COLD-FUNC-SMEC-OFF-P
Test Purpose:	SMEC (PRIME) Switch OFF
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 OFF
Duration	3 minutes
Success Criteria:	HK Parameters SMECENCPWR and SMECLVDTPWR show expected OFF values.

Test Procedure:

Step#	Action
1	Run Execute SPIRE-IST-COLD-SMEC-OFF-P.tcl test procedure from the CCS.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-SMEC-OFF-P	SMECENCPWR SMECLVDTPWR	1/-/0 1/-/0	**1/0** **1/0**		**Pass**

Start time @: 08:28
End time @: 08:29
OBSID: 0xb0001042

Comments:

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

3.3.19 SPIRE-IST-COLD-FUNC-DCU-02-P

Test Id:	**SPIRE-IST-COLD-FUNC-DCU-02-P**
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON
Duration	5 Minutes (CUS 140.0)
Success Criteria:	Test passed if DCUFRAMECNT goes from n to n+700 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

CUS Parameters	photbiasfreq = 200.0;
	photsampfreq = 15.3;
	specbiasfreq = 160.0;
	specsampfreq = 80.0;
	frames = 100;

Test Procedure:

Step#	Action	Comments
1	Write the current value of DCUFRAMECNT located in DCU PARAMETERS	
2	Run QLA script FUNC-DCU-02.py on QLA console.	
3	Run SPIRE-IST-COLD-FUNC-DCU-02-P test procedure from the CCS.	
4	Write the current value of DCUFRAMECNT	
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
SPIRE-IST-COLD-FUNC-DCU-02-P	DCUFRAMECNT	n/n+700	1600/2300	**700**	Success

Start time @: 08:35
End time @: 08:40
OBSID: 0xb0001044

Comments: OK

Level 3 temperatures:
T246: 10.5K
T247: 11.47K

These temperatures are within the safe JFET switch-on constraints of 10-15K

Test successful but the QLA script did not produce the expected 7 files.
Files QLA-DCU-02_B0001044_8800<n>.txt – where n=0 to 6, should have been produced.
Instead only 5 files were produced, viz. QLA-DCU-02_B0001044_880<2/3/5/6>.txt and QLA-DCU-02_B0001044_8000.txt.

Contents of QLA created files show sampling times to be consistent with input parameters entered for sampling frequencies of photometer ~15.3Hz ($\Delta t \sim 65.5$ ms) **and spectrometer 80Hz** $\Delta t \sim 12.5$ ms**.**

3.3.20 SPIRE-IST-COLD-FUNC-DCU-11-PHOT-P

Test Id:	SPIRE-IST-COLD-FUNC-DCU-11-PHOT-P
Test Purpose:	Photometer BDAs Switch ON Check
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
Duration	7 minutes (CUS 122.0)
Success Criteria:	Test passed if Photometer JFET source and drain voltages are correct: 1. PSWJFETVSS1/2/3/4/5/6 (values according to latest Vss). 2. PMLWJFETVSS1/2/3/4 (values according to latest Vss). 3. PSWJFETSTAT = 0x3F 4. PMLWJFETSTAT = 0x**7**F

CUS Parameters	heater_V = 0; // Specifies if the heater is to be switched ON or not
	array = "PF"; //default array to switch ON

Test Procedure:

Step#	Action
1	Run SPIRE-IST-COLD-FUNC-DCU-11-PHOT-P test procedure from the CCS. with default input parameters
2	After the test, write down the values RAW and converted values of: PSWJFETSTAT, PMLWJFETSTAT, PSWJFET1/2/3/4/5/6V PMWJFET1/2/3/4V PLWJFET1/2V located in the DCU PARAMETERS display
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	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-DCU-11-PHOT-P	**PSWJFETSTAT** **PMLWJFETSTAT** **PLIABITSTAT** **PLIAP5V** **PLIAP9V** **PLIAM9V**	**0/0x3f** **0/0x7f** **1** **~0/ ~+5.17 ± 0.1V** **~0/ ~+11.53 ± 0.1V** **~0/ ~-11.53 ± 0.1V**	**OK** **OK** **1** **5.23V** **11.58V** **-11.58V**	**N/A**	**Pass**

Start time @: 08:40
End time @: 08:43
OBSID: 0xb0001045

Comments:
All the photometer JFETs switched on OK

QLA script output:

```
DCU-11-phot
Start time @: 07-Mar 08:39:58
End time @: 07-Mar 08:41:44
OBSID: 0xB0001045

PLIABITSTAT:
Start value: 0x0
End value: 0x4C

                  Before/After
PSWJFETSTAT      0x0/0x3F
PMLWJFETSTAT     0x0/0x7F

PSWJFET1V        -0.00/-1.47 V
PSWJFET2V        -0.00/-1.47 V
PSWJFET3V        -0.00/-1.47 V
PSWJFET4V        -0.00/-1.47 V
PSWJFET5V        -0.00/-1.47 V
PSWJFET6V        -0.00/-1.47 V

PMWJFET1V        -0.00/-1.47 V
PMWJFET2V        -0.00/-1.47 V
PMWJFET3V        -0.00/-1.47 V
PMWJFET4V        -0.00/-1.47 V

PLWJFET1V        -0.00/-1.47 V
PLWJFET2V        -0.00/-1.47 V

TCJFETV          0.00/-1.47 V
```

Plots to be attached.

3.3.21 SPIRE-IST-COLD-FUNC-DCU-13-PHOT-P

Test Id:	SPIRE-IST-COLD-FUNC-DCU-13-PHOT-P
Test Purpose:	Photometer Detectors Integrity Check
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
Duration	15 minutes (CUS 726)
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.

CUS Parameters	dcumode = "PF"; // Specifies array in which to perform LC
	mclkdiv = 0x95; // Master clock divisor ,which specifies bias freq
	biasdiv = 0x6; // Sampling divisor ,which specifies sampling rate
	psw_phase = 0x80; // PSW demod phase
	pmw_phase = 0x80; // PMW demod phase
	plw_phase = 0x80; // PLW demod phase
	ftime = 10; // Time at each bias level

Test Procedure:

Step#	Action
1	Run FUNC-DCU-13P.py script on QLA
2	Run SPIRE-IST-COLD-FUNC-DCU-13-PHOT-P test procedure from the CCS. With default input parameters
3	Contingency: If test fails repeat step 1 and 2.

Test Log:

Test Id	Key Parameter(s)	Expected Value Before	Actual Value Before/After	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-DCU-13-PHOT-P	**PLIABITSTAT PSWJFETSTAT PMLWJFETSTAT**	**1/1 0x3F/0x3F 0x7F/0x7F**	1/1 0x3F/0x3F 0x7F/0x7F		**Pass**

OBSID: 0xb0001046
Start: 09:04
End: 09:14

Comments:

PSW-D15 Load Curve is reversed again. Was OK after the harness repair (see WFT report following harness repair RD08)

PMW-B9 is still reversed because the harness repair was not carried out (see RD08 and RD09)

3.3.22 SPIRE-IST-COLD-FUNC-DCU-14-PHOT-P

Test Id:	SPIRE-IST-COLD-FUNC-DCU-14-PHOT-P
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
Duration	5 minutes
Success Criteria:	Test passed if : The Photometer detectors do not show excess noise.

Test Procedure:

Step#	Action	Comments
1	**Run SPIRE-IST-COLD-FUNC-DCU-14-PHOT-P test procedure from the CCS.**	
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
SPIRE-IST-COLD-FUNC-DCU-14-PHOT-P	PLIABITSTAT PSWJFETSTAT PMLWJFETSTAT	1/1 0x3F/0x3F 0x7F/0x7F	1/1 0x3F/0x3F 0x7F/0x7F		**Pass**

Start time @: 09:38
End time @: 09:40
OBSID: 0xb0001047

Comments:

Detectors settings:

Bias frequency: 130 Hz
Sampling frequency: 18 Hz
PSW phase: 180.71 deg
PMW phase: 180.71 deg
PLW phase: 180.71 deg
PSW bias : ~ 31mV
PMW bias : ~ 31mV
PLW bias : ~ 31mV
TC bias : ~ 62 mV

Duration of test: 2 minutes

3.3.23 SPIRE-IST-COLD-PHOT-VSS-P

Test Id:	SPIRE-IST-COLD-PHOT-VSS-P
Purpose:	Photometer BDAs Vss Test PRIME
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
Duration	20 minutes
Success Criteria:	Test passed if the Photometer detectors do not show excess noise.

Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Check that Photometer LIAs and detectors are switched on	PLIABITSTAT PSWJFETSTAT PMLWJFETSTAT	1/1 0x3F/0x3F 0x7F/0x7F		
2	Execute TCL script SPIRE-IST-COLD -PHOT-VSS-P.tcl	—	—	—	
3	**Wait for the I-EGSE staff to confirm the success or failure of this test**	—	—	—	
Test Result (Pass/Fail):					

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
SPIRE-IST-PHOT-VSS-P	PLIABITSTAT PSWJFETSTAT PMLWJFETSTAT	1/1 0x3F/0x3F 0x7F/0x7F	1/1 0x3F/0x3F 0x7F/0x7F		**Pass**

Start time @: 09:45
End time @: 10:05
OBSID: 0xb0001048

Comments:

Script executed successfully but CCS report seeing problems with the Set Dummy part of the script.

Noise is close to minimum at Vss ~ -1.5V (TBC)

3.3.24 SPIRE-IST-COLD-PDET-OFF-P

Test Id:	SPIRE-IST-COLD-PDET-OFF-P
Test Purpose:	Photometer BDAs Switch OFF
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Photometer BDAs ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Photometer BDAs OFF
Duration	3 minutes
Success Criteria:	Test passed if SCUDCDCSTAT goes from 4 to 6, Spectrometer LIAs voltages are correct and SJFET voltages are also correct.

Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-IST-COLD-PDET-OFF-P.tcl	—	—	—	
2	Check that the Photometer detectors are switched off	PSWJFETSTAT PMLWJFETSTAT	0x3F/-/0 0x7F/-/0		
3	Check that the Photometer LIAs are switched off	PLIABITSTAT	1/-/0		
4	**Wait for the I-EGSE staff to confirm the success or failure of this test**	—	—	—	
Test Result (Pass/Fail):					

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
SPIRE-IST-PDET-OFF-P	PLIABITSTAT PSWJFETSTAT PMLWJFETSTAT	1/0 0x3F/0 0x7F/0	1/0 0x3F/0 0x7F/0	N/A	Pass

Start time @: 10:21
End time @: 10:23
OBSID: 0xb0001049

Comments:

3.3.25 SPIRE-IST-COLD-FUNC-DCU-11-SPEC-P

Test Id:	SPIRE-IST-COLD-FUNC-DCU-11-SPEC-P
Test Purpose:	Spectrometer BDAs switch ON check
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
Duration	7 minutes
Success Criteria:	Test passed if SCUDCDCSTAT goes from 4 to 6, Spectrometer LIAs voltages are correct and SJFET voltages are also correct.

CUS Parameters	heater_V = 0; //Specifies if the heater is to be switched ON
	array = "SF"; //default array to swicth ON

Test Procedure:

Step#	Action
1	**Run SPIRE-IST-COLD-FUNC-DCU-11-SPEC-P test procedure from the CCS.**
2	**After the test Write down the values RAW and converted values of:** LIASTAT SLIAP5V, SLIAP9V, SLIAM9V SSWJFETSTAT,SLWJFETSTAT SSWJFET1V,SLWJFET2V located in on the DCU PARAMETERS display.
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	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-DCU-11-SPEC-P	**SPECJFETSTAT** **SSWJFET1V** **SSWJFET2V** **SLWJFET1V** **SLIABITSTAT** **SLIAP5V** **SLIAP9V** **SLIAM9V**	**0/7** **0V/-1.5V** **0V/-1.5V** **0V/-1.5V** **1** **~0/ ~+5.23 ± 0.1V** **~0/ ~+11.57 ± 0.1V** **~0/ ~-11.54 ± 0.1V**	**0 / 7** **0 / -1.47V** **0 / -1.47V** **0 / -1.47V** **5.25V** **11.59V** **-11.56V**	**N/A**	**Pass**

Start time @: 10:28
End time @: 10:30
OBSID: 0xb000104a

Comments: S-LIA temperatures ~300K

QLA output:

```
DCU-11-spec
Start time @: 07-Mar 10:28:48
End time @: 07-Mar 10:30:26
OBSID: 0xB000104A
```

```
SLIABITSTAT:
Start value: 0x0
End value: 0x1

                  Before/After
SCUDCDCSTAT      0x4/0x6
LIASTAT          0x0/0x0
SLIAP5V          0.11/5.25 V
SLIAP9V          0.02/11.59 V
SLIAM9V          0.02/-11.56 V
SPECJFETSTAT     0x0/0x7
SSWJFET1V        -0.00/-1.47 V
SSWJFET2V        -0.00/-1.47 V
SLWJFET1V        -0.00/-1.47 V
```

SSW JFETs 1 and 2 don't appear to have switched on.

Deviation from standard CFT sequence

Switch off and try switching on again:

1) SPIRE-IST-COLD-SDET-OFF
Start time @: 10:47
End time @: 10:48
OBSID: 0xb000104b

T246 = 10.66K
T247 = 11.92K

2) SPIRE-IST-COLD-FUNC-11-SPEC-P
Start time @: 10:53
End time @: 10:55
OBSID: 0xb000104c

SSW JFETs 1 and 2 don't appear to have switched on.
NCR HP-112000-ASED-NC-3996 raised.

3) Now try the Spectrometer Vss test out of sequence:

SPIRE-IST-COLD-SPEC-VSS-P
Start time @: 11:11
End time @: 11:26
OBSID: 0xb000104d

SSW and SLW biases set to non-nominal values of ~1.38mV

Noise on the channels on JFETs 1 &2 is changing with each Vss step.

JFETs 1 & 2 switched on at -2.4V.

Use JFET 1 & 2 Vss values -2.6V for next switch-on.

Manual commands sent from the CCS to start DCU data generation in order to ensure

that the JFETs are still on.

0x843e0001

JFETs look OK

11:48
0x843e0000
FLUSH_FIFO(0x1000)

3.3.26 SPIRE-IST-COLD-FUNC-DCU-13-SPEC-P

Test Id:	SPIRE-IST-COLD-FUNC-DCU-13-SPEC-P
Test Purpose:	Spectrometer detectors check
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Final Configuration:	Unchanged
Duration	12 minutes
Success Criteria:	The spectrometer detectors show a small linear variation on the output voltage when different bias is applied through the load curve.

CUS Parameters	dcumode = "SF"; //DCU data mode
	mclkdiv = 0x79; //Master clock divisor
	biasdiv = 0x1; // Bias divisor
	ssw_phase = 0x80; // SSW demod phase
	slw_phase = 0x80; // SLW demod phase
	ftime = 10; // Time at each bias level

Test Procedure:

Step#	Action	Comments
1	On QLA bring up a time series display of a couple of pixels on each of the spectrometer BDAs	
2	Run SPIRE-IST-COLD-FUNC-DCU-13-SPEC-P test procedure from the CCS.	
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	No. of frames received	Test Result
SPIRE-IST-COLD-FUNC-DCU-13-SPEC-P	SPECJFETSTAT SLIABITSTAT	7 1	7 1	N/A	Pass

Start time @: 11:55
End time @: 12:08
OBSID: 0xb000104e

Load Curve plots look OK.
These plots not included in report as the test will be repeated later – see deviation from standard CFT sequence in section 3.3.29.

3.3.27 SPIRE-IST-COLD-FUNC-DCU-14-SPEC-P

Test Id:	
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
Duration	5 minutes (CUS 146.0)
Success Criteria:	The Spectrometer detectors don't show excess noise.

CUS Parameters	dcumode = "SF"; //Array on which phase peak up is to be done
	ftime = 120; //time at each phase

Test Procedure:

Step#	Action	Comments
1	**Run SPIRE-IST-COLD-FUNC-DCU-14-SPEC-P test procedure from the CCS.**	
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
SPIRE-IST-COLD-FUNC-DCU-14-SPEC-P	SPECJFETSTAT SLIABITSTAT	7 1		N/A	

Start time @: 12:09
End time @: 12:11
OBSID: 0xb000104f

Comments:

Detectors settings:
Bias frequency: 160.09 Hz
Sampling frequency: 80.04 Hz
SSW phase: 180.71 deg
SLW phase: 180.71 deg
SSW bias : ~ 31mV
SLW bias : ~ 31mV
Duration of test: 2 minutes

3.3.28 SPIRE-IST-COLD- SPEC-VSS-P

Test Id:	
Purpose	Spectrometer BDAs Vss Test PRIME
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU ON + Spectrometer LIAs ON + Spectrometer BIAS ON + Spectrometer JFETs ON
Final Configuration:	Unchanged
Duration	20 minutes (CUS 906.0)
Success Criteria:	Spectrometer BDA Vss values are optimised

CUS Parameters	jfet_Vss_start = -1.4; //Starting JFET source voltage
	jfet_Vss_end = -2.6; //ending JFET source voltage
	jfet_Vss_step = -0.2; //steping JFET source volatge
	ftime = 120; //wait time at each level;

Procedure Steps:

Step	**Description**	**Parameter - Unit**	**Expected Values Before/ During/ After**	**Actual Values Before/ During/ After**	**Success/ Failure**
1	Check that the Spectrometer detectors and LIAs are switched on	SPECJFETSTAT SLIABITSTAT	7 1		
2	Execute TCL script SPIRE-IST-COLD- SPEC-VSS-P.tcl	—	—	—	
3	**Wait for the I-EGSE staff to confirm the success or failure of this test**	—	—	—	
Test Result (Pass/Fail):					

Test Id	**Key Parameter(s)**	**Expected Value Before/After**	**Actual Value Before/After**	**Nb. of frames received**	**Test Result**
SPIRE-IST-COLD-FUNC-DCU-14-SPEC-P	**SPECJFETSTAT SLIABITSTAT**	**7 1**	**7 1**	**N/A**	

Start time @: 12:12
End time @: 12:28
OBSID: 0xb0001050

Comments:

Detectors settings:
Bias frequency: 160.09 Hz
Sampling frequency: 80.04 Hz
SSW phase: 180.71 deg
SLW phase: 180.71 deg
SSW bias : ~ 31mV
SLW bias : ~ 31mV

3.3.29 SPIRE-IST-COLD-SDET-OFF-P

Test Id:	SPIRE-IST-COLD-SDET-OFF-P
Purpose	Spectrometer BDAs Switch OFF
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 BDAS OFF
Duration	3 minutes
Success Criteria:	DCU HK parameters show expected values

Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-IST-COLD-SDET-OFF-P.tcl	—	—		
2	Check that the Spectrometer detectors are switched off	SPECJFETSTAT	7/-/0		
3	Check that the Spectrometer LIAs are switched off	SLIABITSTAT	1/-/0		
4	**Wait for the I-EGSE staff to confirm the success or failure of this test**	—	—	—	
Test Result (Pass/Fail):					

Test Id	Key Parameter(s)	Expected Value Before/After	Actual Value Before/After	Nb. of frames received	Test Result
SPIRE-IST-COLD-SDET-OFF-P	**SPECJFETSTAT** **SLIABITSTAT**	**7** **1**		**N/A**	

Start time @: 13:04
End time @: 13:05
OBSID: 0xb0001051

Comments:

Deviation from standard CFT sequence

Updated SSWNominalSettings.txt Cal Table to increase SSW Vss settings to -2.6V.
Committed to registry
Stopped CCS Handler

Changed mission config to fm_ist_cft_config2 after increasing the SSW Vss settings to -2.6V.
Restarted CCS Handler.

SPIRE-IST-COLD-FUNC-11-SPEC-P
Start time @: 13:23
End time @: 13:25
OBSID: 0xb0001055

SPIRE-IST-COLD-FUNC-13-SPEC-P
Start time @: 13:29
End time @: 13:25
OBSID: 0xb0001056

See Annexe 2 for Load Curve plots.

SPIRE-IST-COLD-SDET-OFF-P
Start time @: 13:42
End time @: 13:43
OBSID: 0xb0001057

3.3.30 SPIRE-IST-COLD-MCU-OFF-P

Test Id:	SPIRE-IST-COLD-MCU-OFF-P
Purpose	MCU Prime Switch OFF
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU Prime ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry ON+MCU Prime OFF
Duration	5 minutes
Success Criteria:	MCU HK parameters show expected values

Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute SPIRE-IST-COLD-MCU-OFF-P.tcl	—	—	—	**OBSID: 0xb0001058 13:44**
2	Check that the MCU is switched off	MCUBITSTAT	1/-/0		
Test Result (Pass/Fail):					

3.3.31 SPIRE-IST-COLD-SCU-OFF-P

Test Id:	SPIRE-IST-COLD-SCU-OFF-P
Purpose	SCU Prime Switch OFF
Initial Configuration:	**DRCU_ON** + AC/DC thermometry ON
Final Configuration:	**DRCU_ON** + AC/DC thermometry OFF
Duration	5 minutes
Success Criteria:	SCU HK parameters show expected values

Procedure Steps:

Step	Description	Parameter - Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	Execute TCL script SPIRE-IST-COLD-SCU-OFF-P.tcl	—	—	—	**OBSID: 0xb0001058 13:45**
2	A few seconds later record the value of parameter SCUTEMPSTAT	SCUTEMPSTAT	0xFFFF/-/0		
3	A few seconds later record the value of parameter SUBKSTAT	SUBKSTAT	1/-/0		
Test Result (Pass/Fail):					

3.3.32 SPIRE-IST-COLD-DRCU-OFF-P

Test Id:	**SPIRE-IST-COLD-SCU-OFF-P**
Purpose	DRCU PRIME Switch OFF
Initial Configuration:	SPIRE DPU and DRCU PRIME are ON and SPIRE HK is being produced and AC/DC thermometry is ON.
Final Configuration:	SPIRE DPU PRIME is ON, SPIRE DRCU PRIME is OFF and SPIRE HK is not being produced.
Duration	5 minutes
Success Criteria:	THSK and TM2N stop refreshing/incrementing

Procedure Steps:

Step	**Description**	**Parameter - Unit**	**Expected Values Before/ During/ After**	**Actual Values Before/ During/ After**	**Success/ Failure**
1	Execute TCL script SPIRE-IST-COLD-DRCU-OFF.tcl	—	—	—	
2	Check that THSK parameter is not refreshing anymore	THSK	Not refreshing	—	
3	Check that TM2N parameter is not incrementing anymore	TM2N	Not incrementing	—	
4	**Power OFF the SPIRE DRCU PRIME unit.**	—	—	—	
Test Result (Pass/Fail):					

3.3.33 SPIRE-IST-COLD-DPU-OFF-P

Test Id:	SPIRE-IST-COLD-DPU-OFF-P
Purpose	DPU PRIME Switch OFF
Initial Configuration:	SPIRE DPU PRIME is ON but not generating HK.
Final Configuration:	SPIRE DPU PRIME is OFF.
Duration	5 minutes
Success Criteria:	Power to SPIRE DPU PRIME is OFF

Procedure Steps:

Step	Description	Parameter – Unit	Expected Values Before/ During/ After	Actual Values Before/ During/ After	Success/ Failure
1	**Power OFF the SPIRE DPU PRIME unit.**	—	—	—	
Test Result (Pass/Fail):					

4. END TEST SEQUENCE

4.1 NORMAL END TEST SEQUENCE

The following table shows the steps performed to end the functional test sequence.

Step#	Action	HK parameters	Expected Value	Comments	Check
1	Check BSM is OFF	CHOPSENSPWR JIGGSENSPWR	0 0	0 0	✓ ✓
2	Check SMEC is OFF	SMECENCPWR	0	0	✓

Final instrument configuration is REDY.

5. ANNEXE 1 (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 OBSIDs 0xB0001046 for photometer and 0xB0001056 for spectrometer.

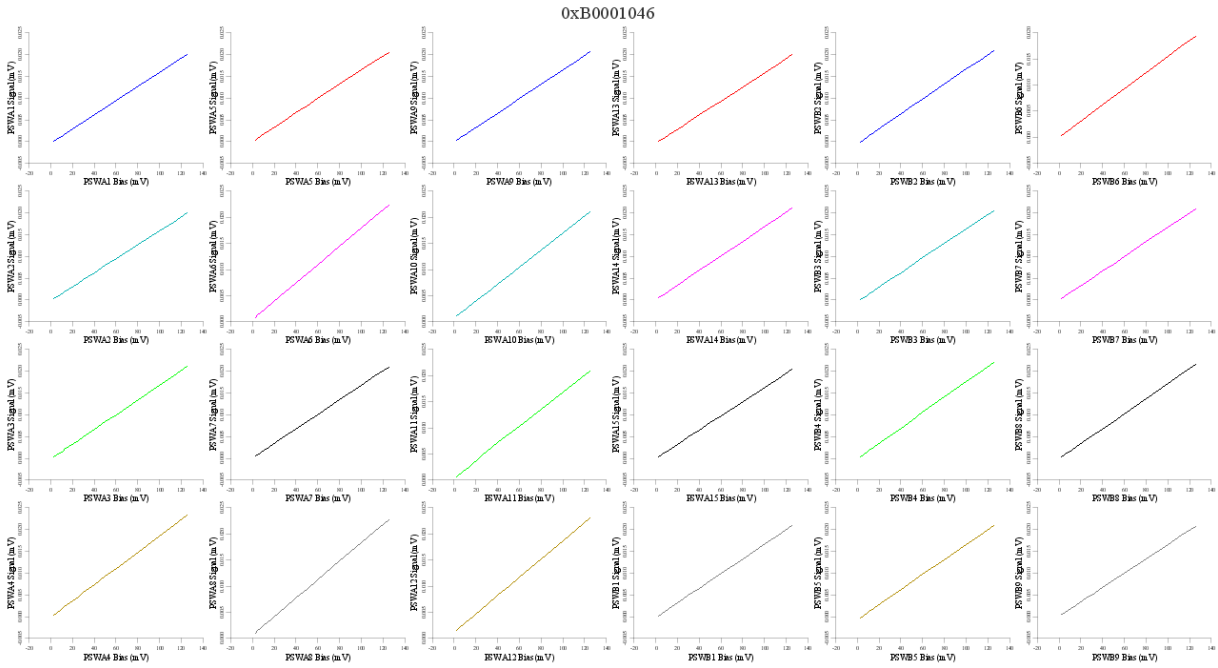


Figure 1. PSW Detectors (1)

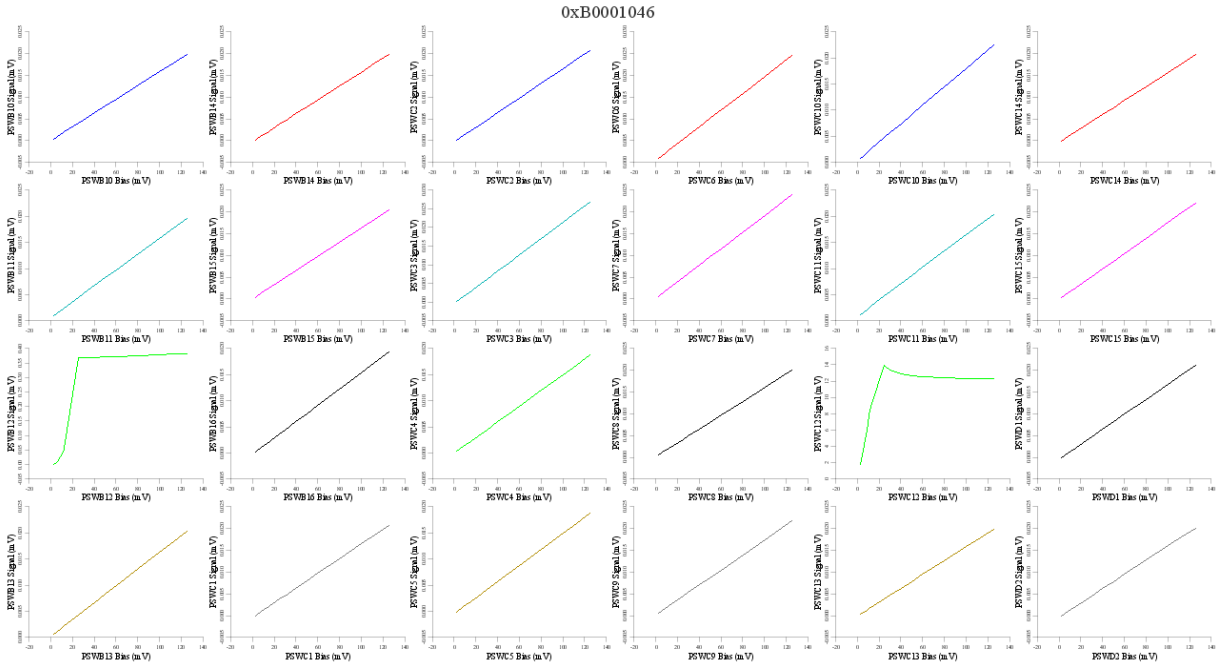


Figure 2. PSW Detectors (2)

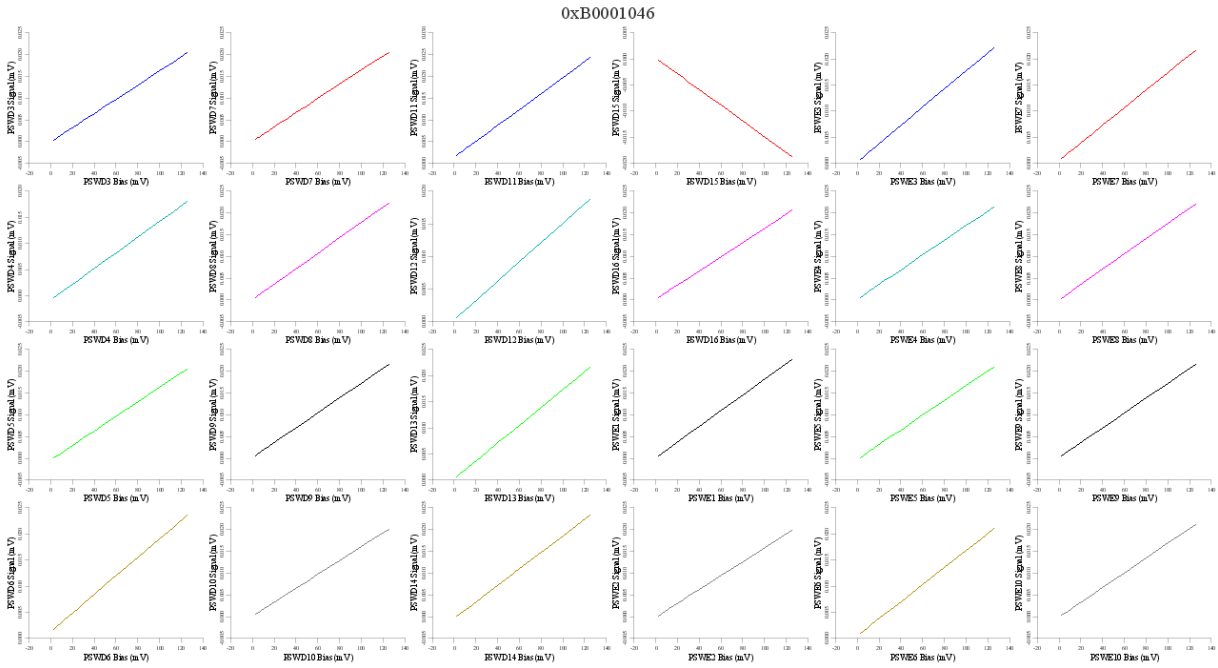


Figure 3. PSW Detectors (3)

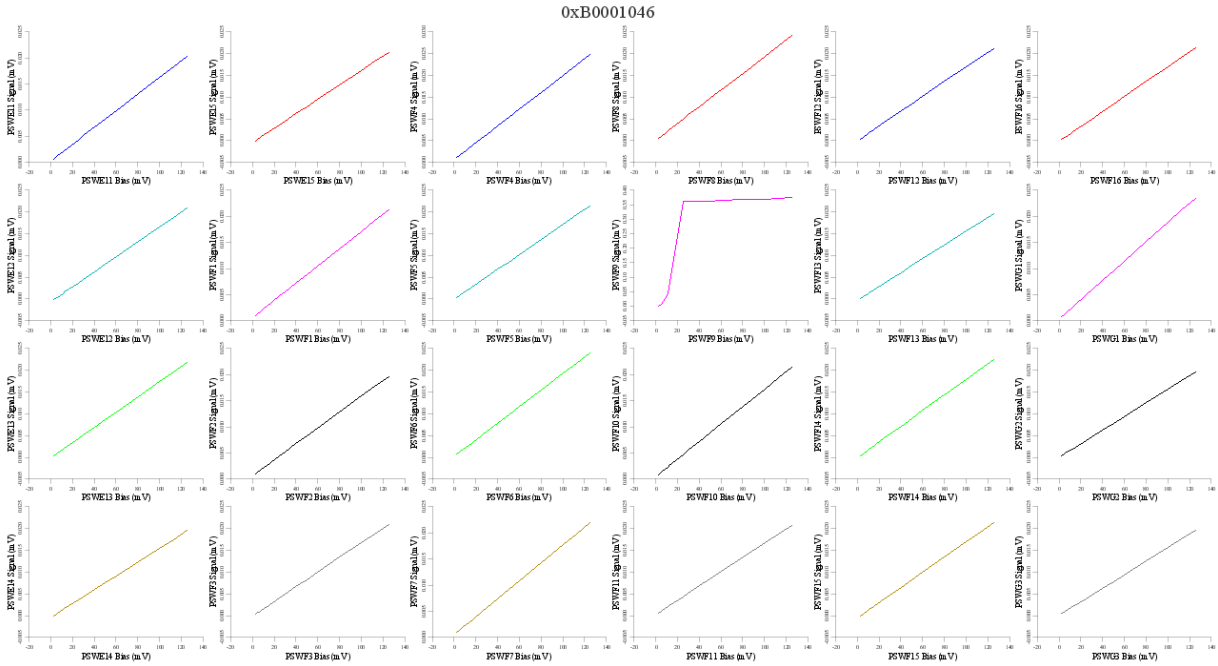


Figure 4. PSW Detectors (4)

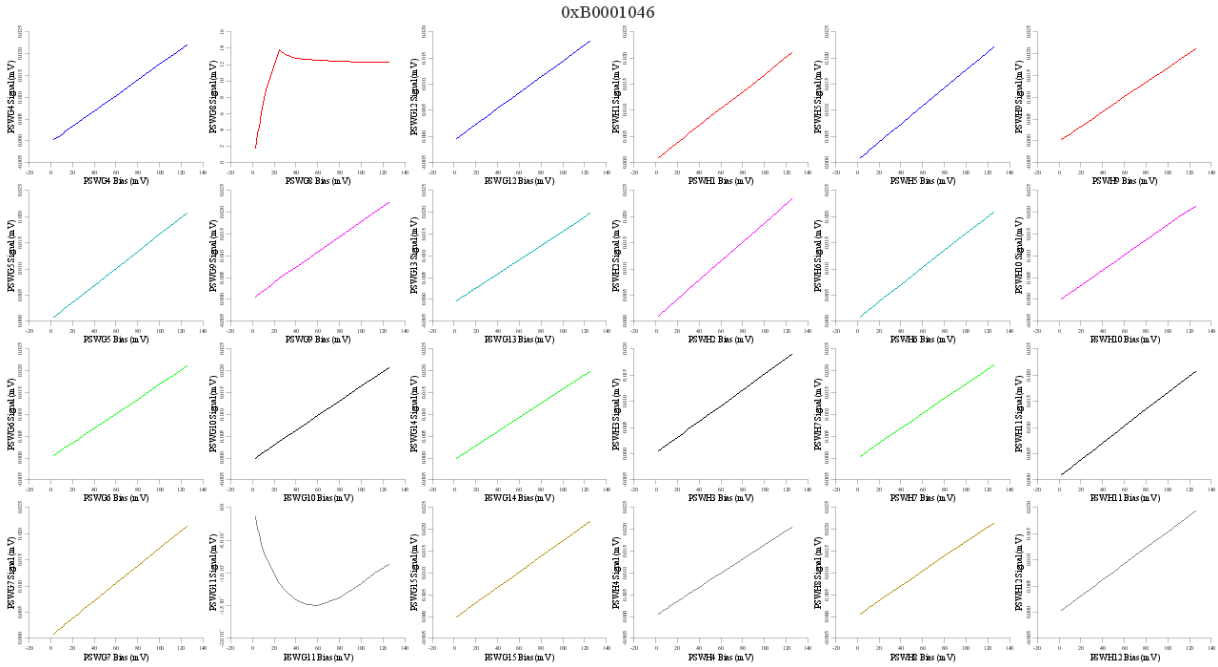


Figure 5. PSW Detectors (5)

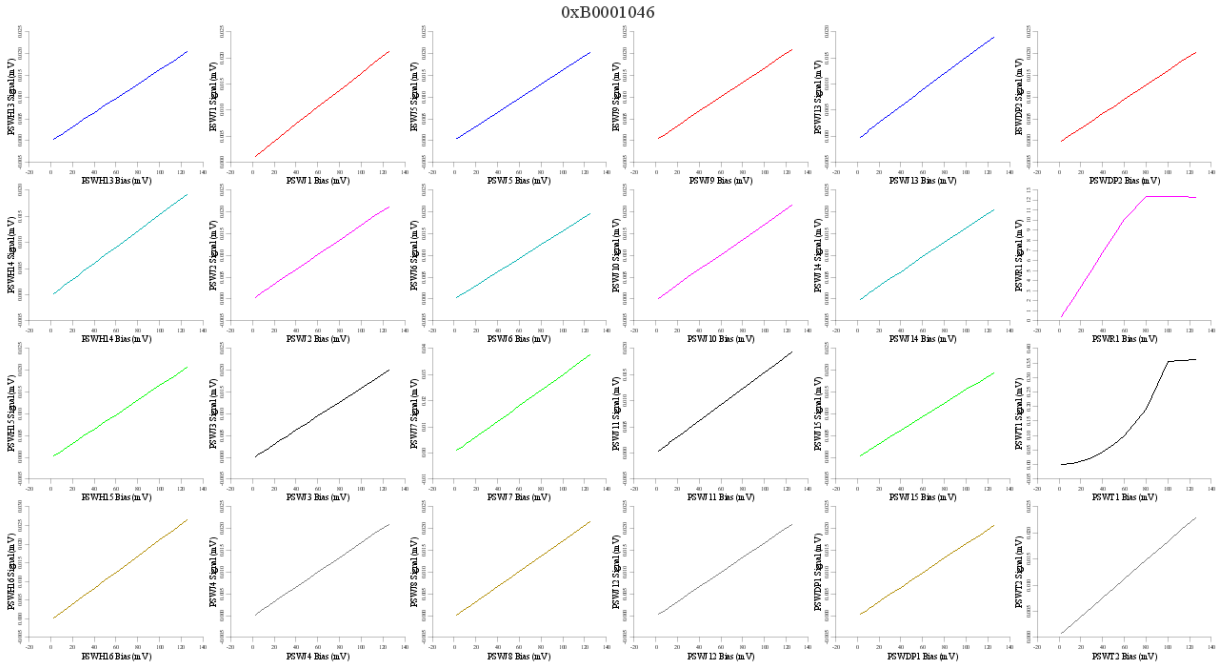


Figure 6. PSW Detectors (6)

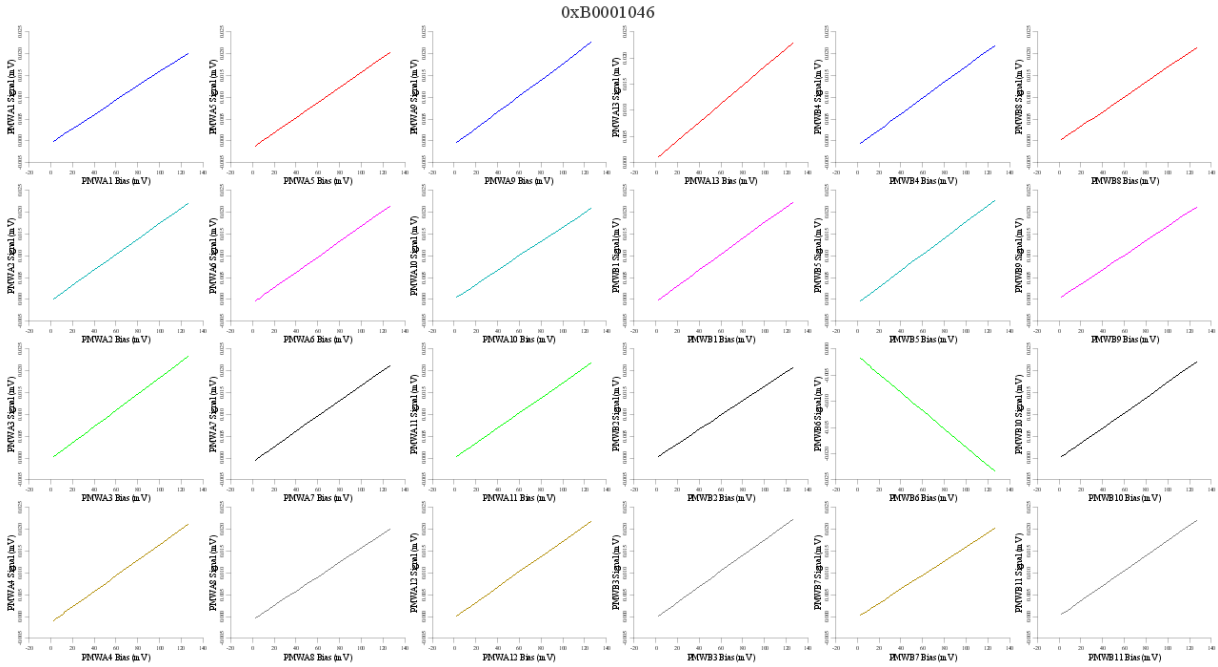


Figure 7. PMW Detectors (1)

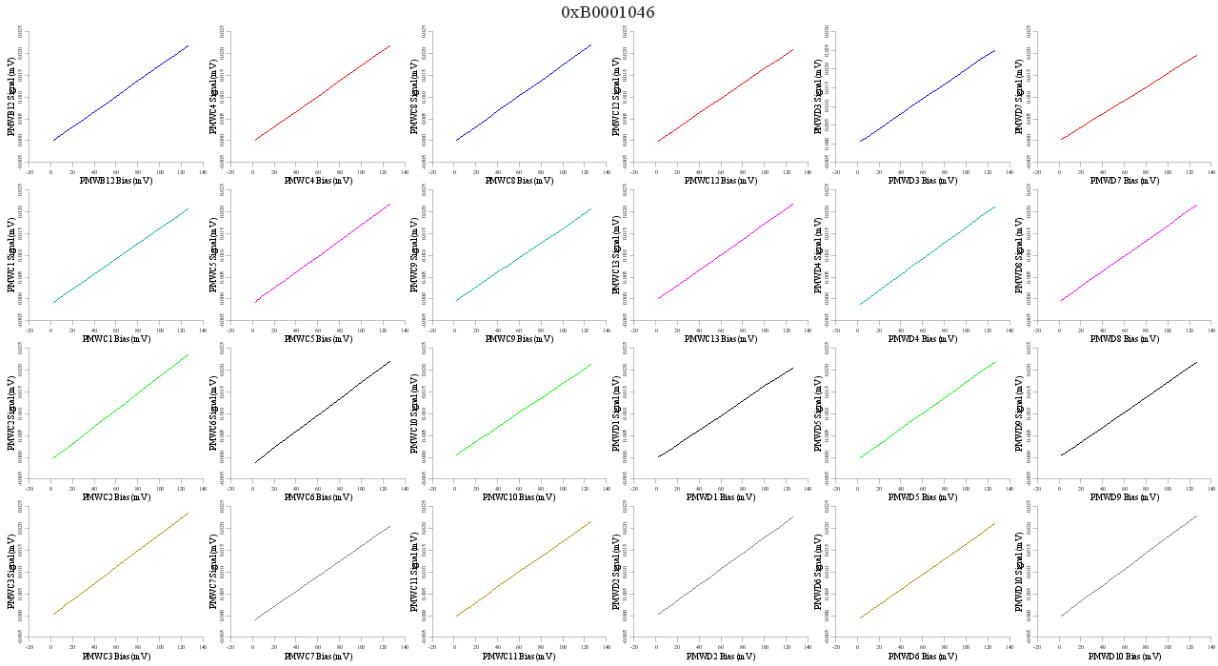


Figure 8. PMW Detectors (2)

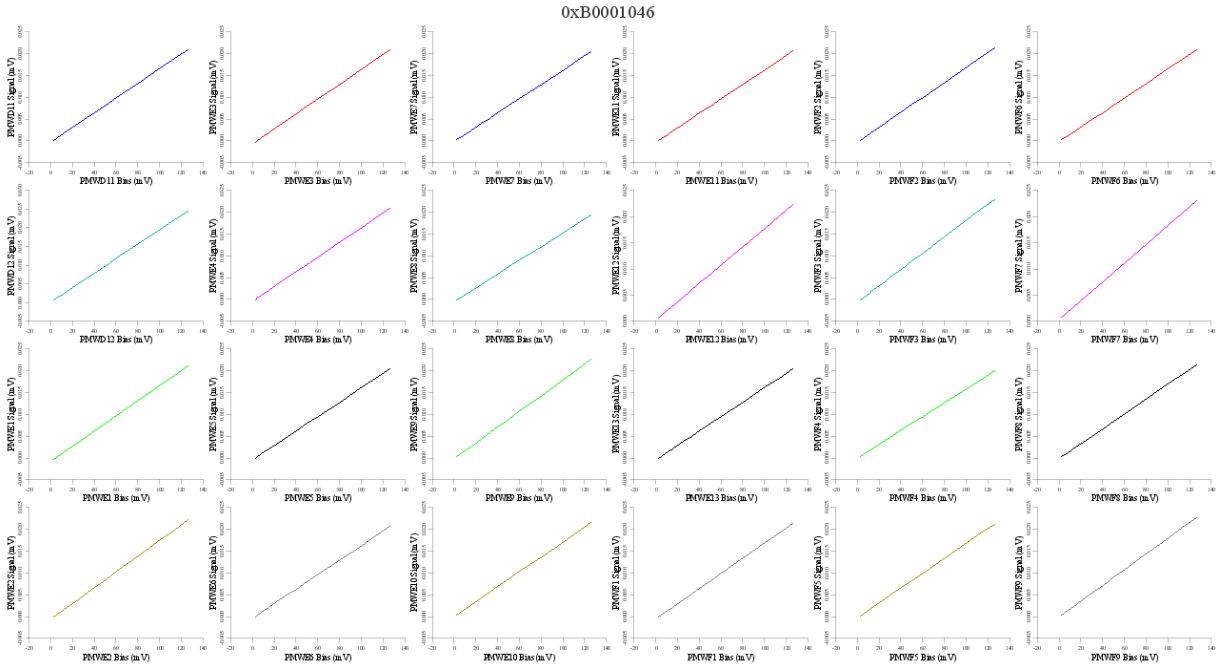


Figure 9. PMW Detectors (3)

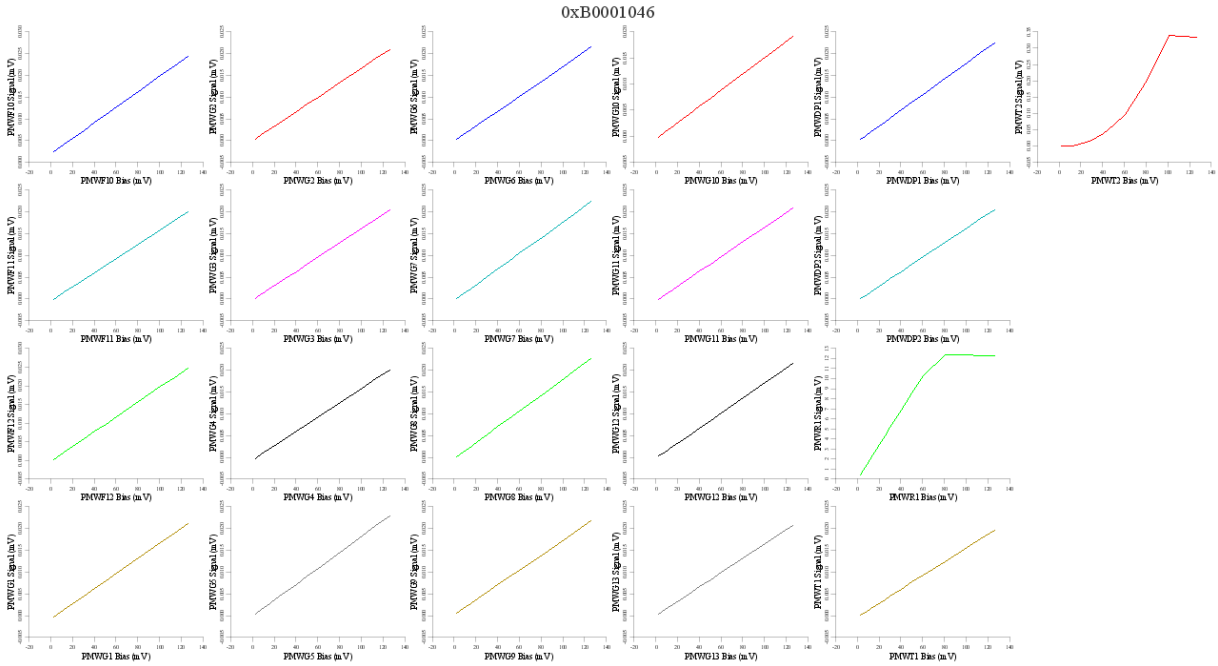


Figure 10. PMW Detectors (4)

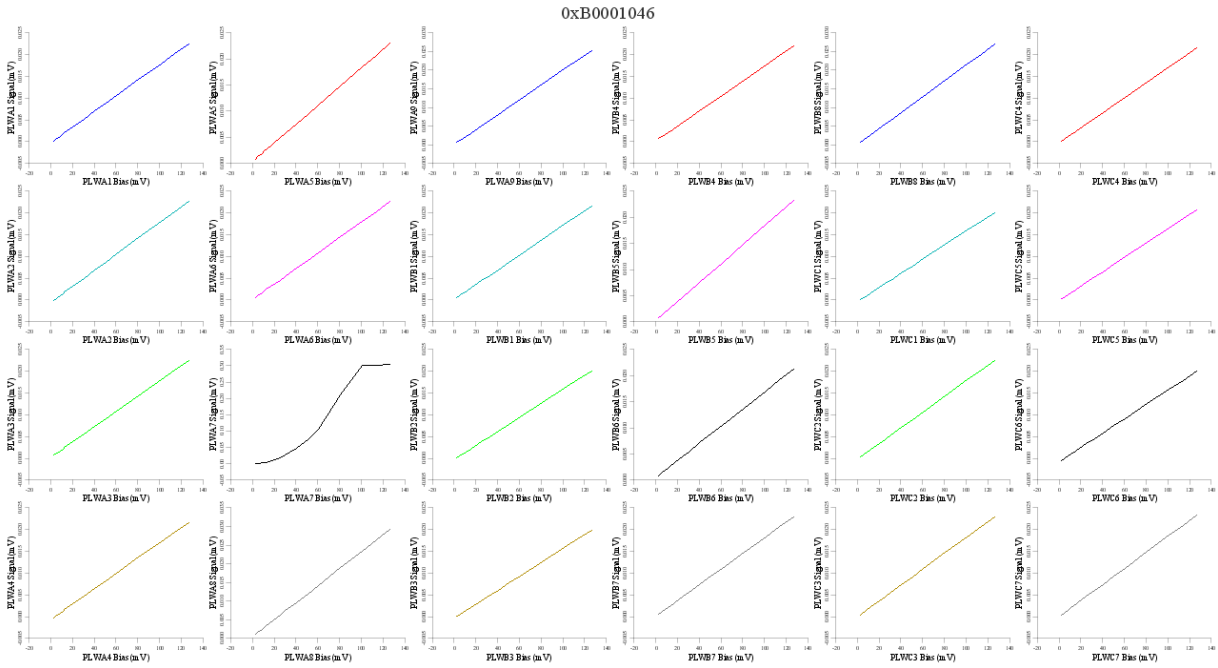


Figure 11. PLW Detectors (1)

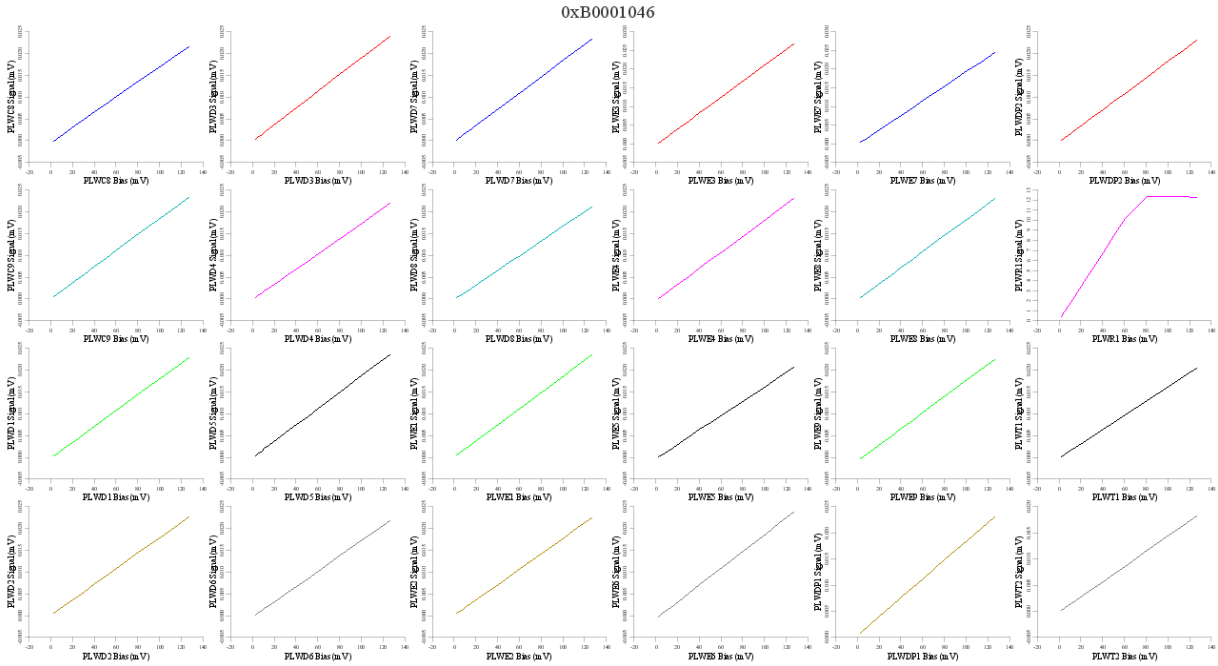
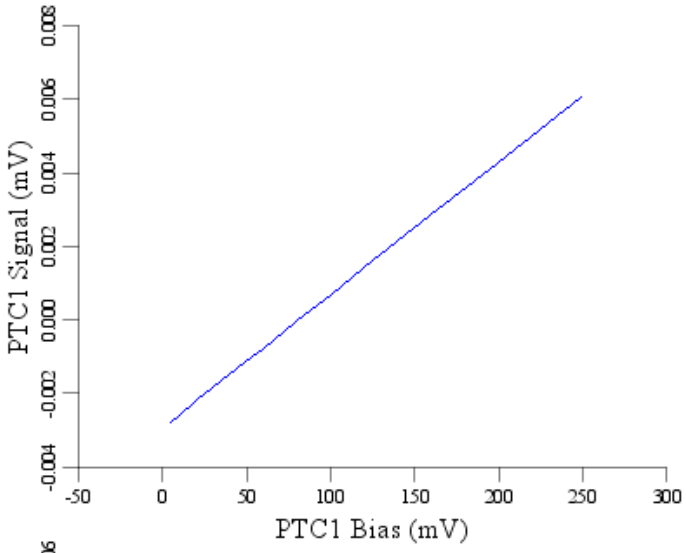
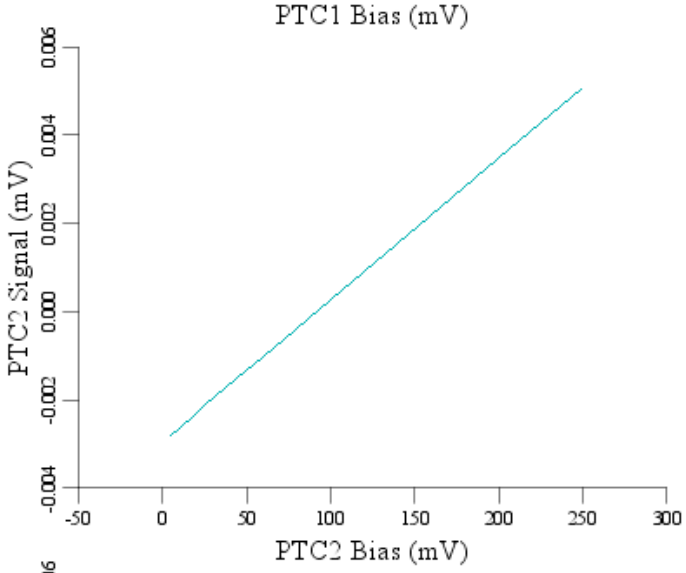


Figure 12. PLW Detectors (2)

0xB0001046


PTC1 Signal (mV)
0.008
0.006
0.004
0.002
0.000
-0.002
-0.004
-50
0
50
100
150
200
250
300
PTC1 Bias (mV)


PTC2 Signal (mV)
0.006
0.004
0.002
0.000
-0.002
-0.004
-50
0
50
100
150
200
250
300
PTC2 Bias (mV)

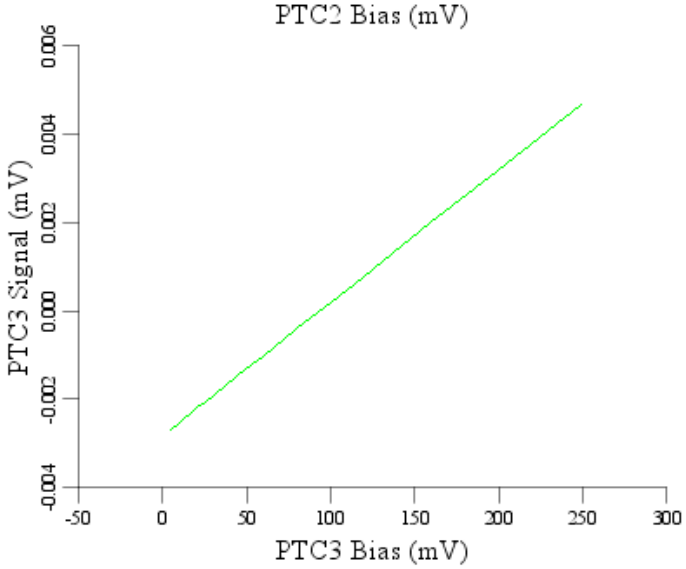

PTC3 Signal (mV)
0.006
0.004
0.002
0.000
-0.002
-0.004
-50
0
50
100
150
200
250
300
PTC3 Bias (mV)

Figure 13. PTC Detectors (1)

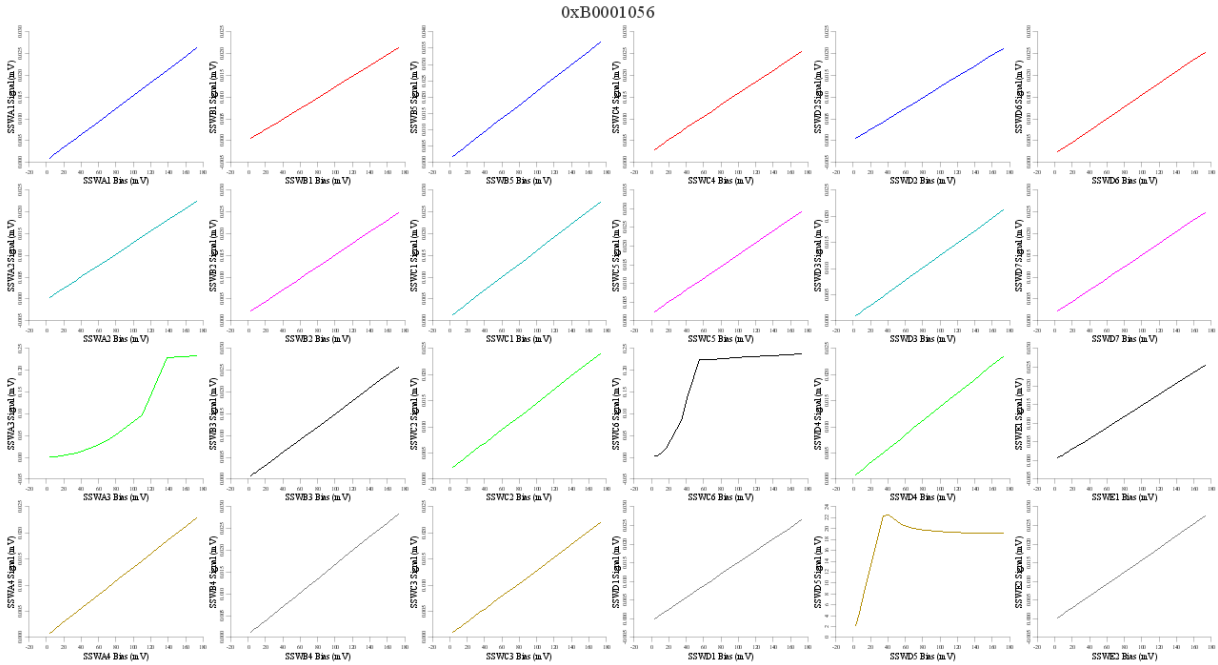


Figure 14. SSW Detectors (1)

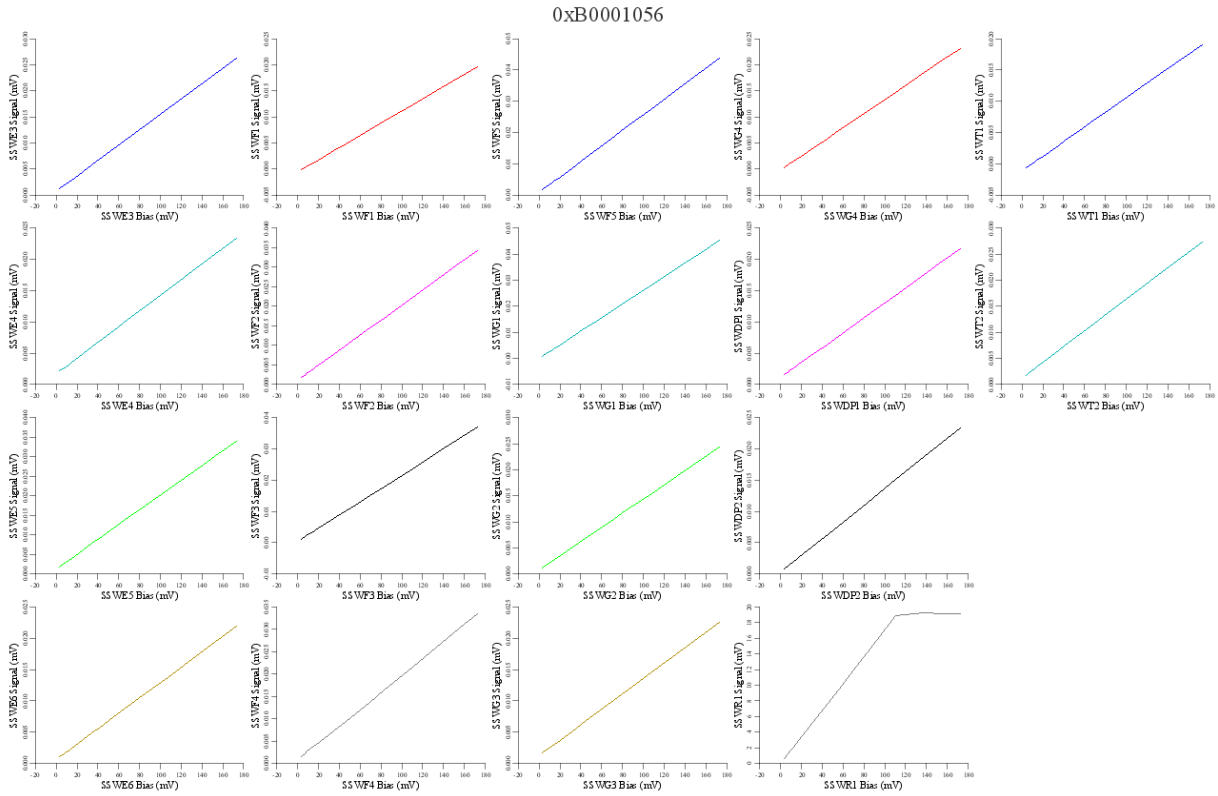


Figure 135. SSW Detectors (2)

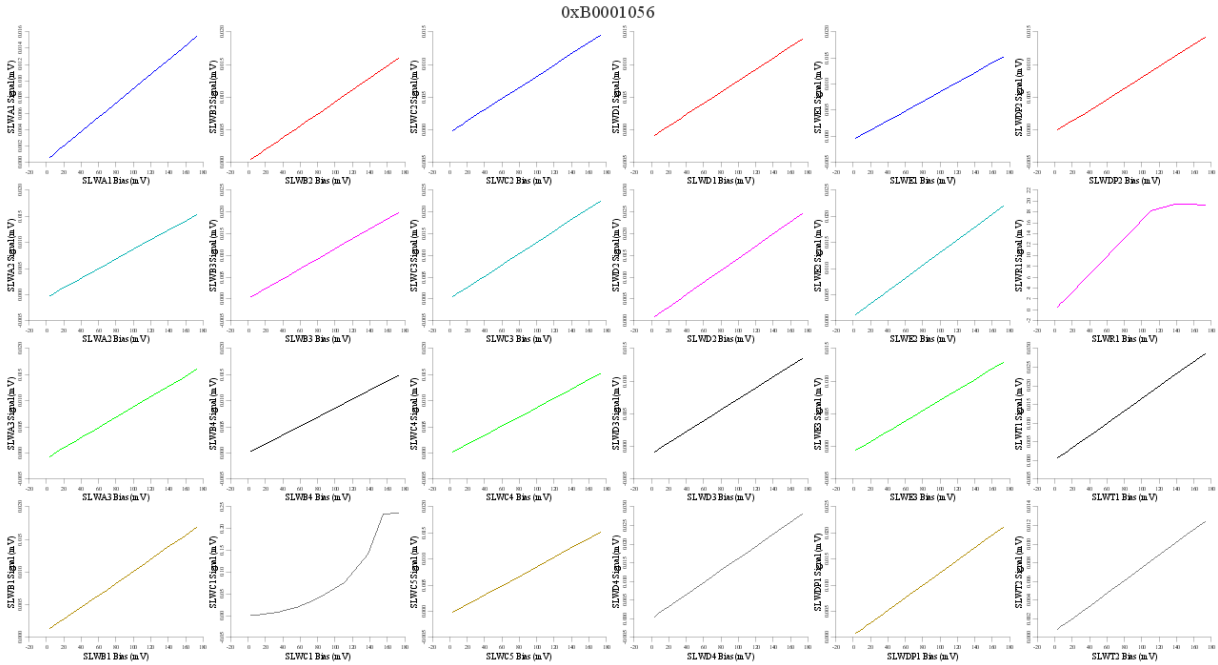


Figure 146. SLW Detectors (1)