SPIRE-AST-REP-002630

Title: **SPIRE IMT**

CI-No: 153200

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Issue	Date	Sheet	Description of Change	Release
1	04/10/ 2005		First Issue	

Table of Content

1	**Scope**	**8**
1.1	Objective	8
1.2	Summary	8
2	**Documents/Drawings**	**9**
2.1	Applicable Documents	9
2.2	Reference Documents	9
2.3	OtherDocuments	9
3	**Configuration**	**10**
3.1	PLM Configuration	10
3.2	Environment	10
4	**Conditions**	**11**
4.1	Personnel	11
4.2	Environmental	11
4.3	General Precautions and Safety	11
4.3.1	General Safety Requirements, Precautions	11
4.3.2	ESD constraints	11
4.3.3	Special QA Requirements	11
4.4	EGSE	11
4.4.1	Hardware: CCS, EGSE's and DFE's	12
4.4.2	Hardware: Prime Instrument: SPIRE	12
4.4.3	Software	12
4.4.4	Special Equipment	14
4.5	MIB	15
4.5.1	Version	15
4.5.2	Configuration & Manual changes	15
5	**Step by Step Procedure: Configure CCS and EGSE**	**18**
6	**Step by Step Procedure: Power On SPIRE**	**19**
6.1.1	SFT-SPIRE-CCS-DPU-ON	19
6.1.2	SFT-SPIRE-CCS-DRCU-ON	20

7	**Step by Step Procedure: SPIRE IMT part 1 results**	**22**
7.1	SPIRE-IMT-NOISE-P	22
7.2	SPIRE-IMT-NOISEVBIAS-S	23
8	**Step by Step Procedure: Power On Instruments**	**25**
8.1	Power on PACS to STANDBY Mode	25
8.2	Power on HIFI to STANDBY Mode	27
9	**Step by Step Procedure: SPIRE IMT part 2 results**	**30**
9.1	SPIRE-IMT-CREC	30
9.2	SPIRE-IMT-PHOTSTBY	33
9.3	SPIRE-IMT-LC-P	34
9.4	SPIRE-IMT-CREC	35
9.5	SPIRE-IMT-LC-P	38
9.6	SPIRE-IMT-LC-P	39
9.7	Preparations Day 3 of IMT	40
9.8	SPIRE-IMT-PCAL-LEVEL	41
9.9	SPIRE-IMT-CREC	41
9.10	SPIRE-IMT-PHOTSTBY	43
9.11	SPIRE-IMT-LC-P	44
9.12	SET SPIRE to STANDBY	44
9.13	PACS Cooler Recycle and additional tests	45
10	**Step by Step Procedure: Switch Off Instruments**	**46**
10.1	Switch Off SPIRE	46
10.1.1	SFT-SPIRE-CCS-FUNC-THO	46
10.1.2	SFT-SPIRE-CCS-DRCU-OFF	47
10.1.3	SFT-SPIRE-CCS-DPU-OFF	48
10.2	Switch Off HIFI	49
10.3	Switch Off PACS	50
11	**Step by Step Procedure: Set EGSE to OFFLINE**	**51**
12	**Summary Sheets**	**52**

12.1 Procedure Variation Summary 52
12.2 Non Conformance Report (NCR) Summary 53
12.3 Sign-off Sheet 54

Appendix 1: SPIRE Nominal Bus Profile (SPIRE_prime_inst.PST) 55

Appendix 2: Log of EGSE_CONFIG_AUTO.tcl 59

Appendix 3: Log of INSTR_POWER_ON.tcl (Used for SPIRE power on) 62

Appendix 4: Log of PACS_POWER_ON_NonPrime.tcl (used for PACS power on) 66

Appendix 5: Log of INSTR_POWER_ON.tcl (used for HIFI power on)70

Appendix 6: Log of PACS_POWER_OFF.tcl 75

Appendix 7: HP-111000-ASED-NC-1513 – SPIRE EQM Cooler recycling 79

13 Distribution List 80

Table of Figures

Error! No table of figures entries found.

List of Tables

Table 12.1-1: Procedure Variation Sheet 52

Table 12.2-1: Non-Conformance Record Sheet.....53

1 Scope

1.1 Objective

This test report describes the results of the IMT performed for the Herschel SPIRE Instrument.

The test was performed at ASED in Ottobrunn from 26/09/2005 to 29/09/2005.

1.2 Summary

Detailed results are given in the as-run-procedure in Chapter 7

The following NCR's have been raised:

- HP-111000-ASED-NC-1513 – SPIRE EQM Cooler recycling (see Appendix 7)

The following NCR's have been altered:

- N/A

An overview can be found in chapter 12.2

Conclusion:

The IMT was stopped after the third failed cooler recycle. An NCR is raised (ASED-NC-1513) to track his problem. The problem will be investigated and once solved, IMT will continue.

Extra Comments:

N/A

2 Documents/Drawings

2.1 Applicable Documents

INSTRUMENT PLM EQM LEVEL TEST PROCEDURE

HP-2-ASED-PR-0051, issue 1.1 from 24.06.2005

EGSE CONFIGURATION PROCEDURE

HP-2-ASED-PR-0035, Issue 4 from 03.08.2005

INSTRUMENT TEST PROCEDURE

SPIRE-RAL-PRC-002512, Issue 1.1 from 23.09.2005

2.2 Reference Documents

N/A

2.3 OtherDocuments

N/A

3 Configuration

3.1 PLM Configuration

SVM integrated with cryostat. Cryostat is at He II level (~1.7 K).

3.2 Environment

Environmental	Actual
Clean Room Class	100.000
Temperature	~21 °C
Rel. Humidity	~52.10 %
Pressure	~857 mbar

4 Conditions

4.1 Personnel

Responsibility	Name / Organization
Test Manager	S. Idler
Test Engineer	S. Ilsen
EGSE Operator	S. Ilsen
Instrument Engineer	A. Aramburu, B. Swinyard, S. Sidher
PA Responsible	D. Hendry / E. Lamprecht
ESA/Alcatel Representative	W. Pinter-Krainer, G. Doubrovik

4.2 Environmental

See chapter 3.2

4.3 General Precautions and Safety

N/A

4.3.1 General Safety Requirements, Precautions

N/A

4.3.2 ESD constraints

N/A

4.3.3 Special QA Requirements

N/A

4.4 EGSE

4.4.1 Hardware: CCS, EGSE's and DFE's

Item	Hardware Id	Serial No.
CCS	N/A	HPCCS 4
PLM SCOE	SE8426	03/001
CDMU DFE	SE8455	03/002
CRYO SCOE	EQM	N/A
IEGSE	N/A	N/A

4.4.2 Hardware: Prime Instrument: SPIRE

Item	Model	Remark
DPU	HSDPU AVM	
DRCU	HSDCU QM1 HSFCU QM1	

4.4.3 Software

Prime Instrument: PACS

SW Ident	Issue /Version	Responsible	Comment
Inst OBS SPU	11.7	Inst	
Inst SPU boot OBSW	1.4	Inst	
Inst OBS DECMEC	5.0.25 Version for Mech control cold	Inst	V 5.0.24 Mech controller hot
Inst DECMEC boot OBSW	1.1	Inst	
Inst OBS DPU	7.68	Inst	
Inst DPU Boot OBSW	1.0	Inst	

Standby Instrument: HIFI

SW Ident	Issue /Version	Responsible	Comment
Inst ICU OBS	2.22	Inst	18.05.2005
Inst LCU OBS	17.0	Inst	01.10.2004

Standby Instrument: SPIRE

SW Ident	Issue /Version	Responsible	Comment
Inst DPU OBS	2.0.A1 Boot SW June 2003	Inst	

IEGSE Configuration

SW Ident	Issue /Version	Responsible	Comment
MIB on I-EGSE	SPIRE_MIB_CQM2_2.0.A2_After_WUC_08072005	Inst	
HCSS Build Version	644	Inst	
PACS Build	159	Inst	

CCS Configuration

SW Ident	Issue /Version	Responsible	Comment
TCL Scripts HIFI	ist_cus_0.7_tcl.zip	Inst	Delivered on 19.08.2005
TCL Scripts PACS	IMT_cus-shell-scripts_19092005.zip	Inst	Delivered on 19.09.2005
TCL Scripts SPIRE	SPIRE-SFTs-Issue1.2_15092005 SPIRE_EQM_IMT_1_1	Inst	Delivered on 16.09.2005 Delivered on 23.09.2005
CCS MIB Bridge files	CCS_Her_PLM__01_v1_2.zip	ASP	2005-09-08
CCS S/W Release	2.0.614	Terma	

CDMU DFE Configuration

SW Ident	Issue /Version	Responsible	Comment
CDMU DFE CMS	2.3.0.0	SSBV	Part of CDMU DFE Workstation
CDMU DFE Pipe I/F (IPC Handler P7001)	2.4.0.0	SSBV	Part of CDMU DFE Workstation
CDMU DFE Pipe I/F (IPC Handler Pipe P 7002)	1.2.1.0	SSBV	Part of CDMU DFE Workstation
CDMU archive Browser	2.2.2.72	SSBV	Part of CDMU DFE Workstation
Mil-STD-1553b BusMonitor	1.11.1.87	SSBV	Part of CDMU DFE Workstation
CDMU DFE IPC Handler object implementation	2.4.0.18	SSBV	Part of CDMU DFE Workstation

SimFE	1.5.0.0	SSBV	Part of CDMU DFE Platform
HLBC	1.07.00	SSBV	Part of CDMU DFE Platform

PLM SCOE Configuration

SW Ident	Issue /Version	Responsible	Comment
PLM SCOE CMS	1.5.0.0	SSBV	Part of PLM SCOE Workstation
PLM SCOE archive browser	2.2.1.70	SSBV	Part of PLM SCOE Workstation
PLM SCOE pipe I/F	1.3.0.0	SSBV	Part of PLM SCOE Workstation
PLM SCOE IPC Handler object implementation	2.1.0.7	SSBV	Part of PLM SCOE Workstation
PDU Controller	1.5.0.0	SSBV	Part of PLM SCOE Platform

Bus Profiles

The following bus profiles are loaded on the CDMU DFE. They are provided, checked and validated by Patrice Couzin (ASP). They were delivered by email on 01.09.2005

- PACS_prime_inst.PST
- SPIRE_prime_inst.PST
- HIFI_prime_inst.PST
- PACS_SPIRE_par.PST
- PACS_burst_mode.PST
- Inst_sdby.PST

The profiles allow one instrument in PRIME mode, while the others are in standby mode. This test will use only the following bus profile(s):

- SPIRE_prime_inst.PST (see Appendix 1)

4.4.4 Special Equipment

N/A

4.5 MIB

4.5.1 Version

The used MIB has reference: CCS_Her_PLM__01_v1_2.zip

And reference date: 2005-09-08

The MIB was received by email from Sonia Dos-Santos (ASP) on 08/09/2005

4.5.2 Configuration & Manual changes

The following files have been manually changed by Alcatel after the generation process (taken from the configuration.txt file included in the MIB):

- CDF.DAT

  HPSDB does not allows fixed counter flags (ie CDF_ELTYPR=F for counters) HPSDB NCR 478

- CDF.DAT

  Problem on the (PTC,PFC)=(7,0) Variable octect string (PP004380).

  PACS has the following data:

  PC010380 E 8 32 PP004380 R

  On HPSDB this line is generated

  PC010380 E 0 32 0 PP004380 R

  For now has been manually replaced.

- DPC.DAT

  Add the line

  HA000289 HU035197 63 1 Y N

  HPSDB NCR, not possible to add User parameters on an alphanumeric display (NCR 495)

  Note: The parameter HU035197 can not be loaded via S2K files, because is not associated to a Packet (NCR created 475)

  Error HPSDB Solution: The parameter as been loaded by the an XML file Add_Parameter_HU035197.xml, to correct this problem.

- PLF.DAT

  (HPSDB NCR 474) error when loading/generating SCOS TM packets has fixed and variable but with diferent definitions, (the following packet has the

parameter repeated 16 times on plf.dat, and repeated 0 times (variable) on the vpd.dat table)

The vpd.dat is corrected generated but not the plf.dat

replace the line (manual)

HM057190 80044289 0 0 1 0 0 0

by

HM056190 80044289 16 0 1 0 0 0

HM057190 80044289 17 0 64 0 0 0

- TCD.DAT

  Generated empty by HPSDB, NCR 497 replaced by the one used on the tests week 28

- SCO.DAT

  replaced by the one used on the tests week 28. This file shall be discussed with S. Ilsen because of the SCOE's names, HPSDB generates the names of the real elements.

- TMD.DAT

  Add packets sent by SPIRE team by email on 31/08/2005

- PCF.DAT

  Change PCF_VALPAR=0 on the parameter HU035197 inside of the pcf.dat. This was ok on HIFI, but not done on the XML file loaded

  Add_Parameter_HU035197.xml

- PLF.DAT

  Change the field PLF_LOGCC from NULL to 32 bits (see email from Luc Dubbeldam- HIFI on 06/09/2005)

  HM057190 80044289 17 0 64 32 0 0

The following files have been changed manually by ASED OTN (Stijn Ilsen):

- CAP.DAT – The decimal separator for the EQM CRYO SCOE calibration is manually changed from “,” to “.”. This also to solve problems with the EQM CRYO SCOE calibrations. EQM CRYO SCOE MIB will be updated by ASED to avoid this problem in the future.
- TMD.DAT – The EQM CRYO packets have been added to the tmd.dat file on the CCS to make sure all EQM CRYO SCOE packets are forwarded to the IEGSE.

Remark: Because of NCR 1482, a MIB change was necessary after the first day of IMT. The CDF.DAT file is changed. Command PC162420 allows 8 entries for parameter PP067420, this is changed into 9.

5 Step by Step Procedure: Configure CCS and EGSE

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution - steps 1 to 9)**

Remark: Before the start of the IMT, an SFT Cold He 2 was executed. All SCOE's and the CCS were configured at that time and left online after the SFT. This means that all steps in this chapter are actually executed before the SFT and not before the IMT. They are included to have a complete report. More information about the SFT Cold He 2 can be found in the test report (HP-2-ASED-TR-0095)

Step #	Action	Comments	Check
1	Note Testsession	2005_09_26_06_36_ilsens_hpws42_REALTIME_S_SFT_C2	**OK**
2	Power on CDMU DFE platform		**OK**
3	Power on PLM SCOE platform		**OK**
4	Power on the CDMU DFE workstation and wait for the BIST to finish.	Check: BIST successful?	**OK**
5	Power on the PLM SCOE workstation and wait for the BIST to finish.	Check: BIST successful?	**OK**
6	Execute "EGSE_CONFIG_AUTO.tcl" (see Appendix 2)	Check: PLM SCOE HK packets arriving	**OK**
		Check: CDMU DFE HK packets arriving	**OK**
		Check: Check name of bus profile (PST) in CDMU DFE HK or on CDMU DFE workstation **Result: SPIRE_prime_inst.pst**	**OK**
7	Execute "SubscribeParams.tcl"	Check: Wait until status of TCL file has changed to WAITING. This can take up to 10 minutes.	**OK**
8	Execute "Connect HIEGSE"	Check with IEGSE operators if IEGSE is connected.	**OK**
9	Execute "WARNING_LAMP_POWER_ON.tcl"	**Not done since warning lamp is broken.**	**N/A**
extra	Execute "connect EQMCRYO"		**OK**

6 Step by Step Procedure: Power On SPIRE

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 10)**
- **SPIRE-RAL-PRC-002494 (Issue 1.3 – 23/09/05)**

Step #	Action	Comments	Check
1	CCS 28V Power Supply to the DPU is available		**OK**
2	SPIRE MIB is imported in the CCS database.		**OK**
3	CCS is up and running (SCOS, TOPE and the CDMU Simulator)		**OK**
4	DPU AND OBS PARAMETERS display is selected on the CCS		**OK**

6.1.1 SFT-SPIRE-CCS-DPU-ON

Purpose: To switch on the SPIRE DPU and start generating housekeeping

Step #	Action	Comments	Check
1	Power on the SPIRE DPU using the CCS 28V Power Supply	**This action is performed from INSTR_POWER_ON.tcl (see Appendix 3)** **Result:** • **Voltage: 27.8 V** • **Current: 0.45 A** **(5,2) packet received**	**OK**
2	Execute TCL script SFT-SPIRE-CCS-DPU-ON.tcl		**OK**
3	Check that THSK parameter on the DPU AND OBS PARAMETERS display on SCOS is refreshing every second	THSK incrementing every second	**OK**
4	Check that TM2N parameter on the DPU AND OBS PARAMETERS display on SCOS is incrementing every second	TM2N incrementing every second	**OK**

Final Configuration: SPIRE DPU is on but the DRCU is still off

6.1.2 SFT-SPIRE-CCS-DRCU-ON

Purpose: To switch on the SPIRE DRCU and start generating housekeeping

Step #	Action	Comments	Check
1	Execute TCL script SFT-SPIRE-CCS-DRCU-ON-STEP1.tcl	**HK stopped as expected**	**OK**
2	Check that THSK parameter is not refreshing anymore		**OK**
3	Check that TM2N parameter is not incrementing anymore		**OK**
4	Ensure the SPIRE Power Bench is connected to the mains – see Figure 2.		**OK**
	Ensure all 5 remote DCU switches are in the off position – see Figures 3 & 4 below.		**OK**
	Switch on the Primary Power on the back of the SPIRE Power Bench (Figure 2).	**Prime power led becomes orange** **Main power led becomes green**	**OK**
	Switch on the Secondary Power on the front of the SPIRE Power Bench by pulling out and lifting up the switch (shown in yellow circle in Figure 5)	**Secondary power led becomes red**	**OK**
5	Execute TCL script SFT-SPIRE-CCS-DRCU-ON-STEP2.tcl		**OK**
6	Manual Switch on of the DRCU by the CCS staff step 2: • Switch on all 5 remote DCU		**OK**

	switches		
7	Check that THSK parameter is again refreshing every second	**THSK incrementing every second**	**OK**
8	Check that TM2N parameter is again incrementing every second	**TM2N incrementing every second**	**OK**

Final Configuration:

- SPIRE DPU and DRCU are both on
- HK generation is on

7 Step by Step Procedure: SPIRE IMT part 1 results

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 11)**
- **SPIRE-RAL-PRC-002512**

Planning and sequence of this SPIRE IMT can be found in SPIRE-RAL-NOT-002284

7.1 SPIRE-IMT-NOISE-P

Purpose: Check the noise in PLW JFETs with shorted inputs versus Vss (detectors at ~2K)

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are off		**OK**
3	DPU and OBS PARAMETERS display is selected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
1	Execute: SPIRE-IMT-PDET-ON-STEP1.tcl	Check if the following parameters change value: SCUDCDCSTAT 0/1 (before/after) **This step was not executed since the instrument was already in a correct configuration (from the SFT)**	**N/A**
2	Execute: SPIRE-IMT-PDET-ON-STEP2.tcl	**Execution of the TCL was aborted after the detected of inconsistencies in the TCL script.** Check if the following parameters change value: MODE REDY/ PHOTSTBY (before/after)	**NOK**
Extra	Execute (again): SPIRE-IMT-PDET-ON-STEP2.tcl	**Execution of the TCL was aborted after the detected of inconsistencies in the TCL script.** Check if the following parameters change value:	**NOK**

		MODE REDY/ PHOTSTBY (before/after)	
Extra	Execute (again): SPIRE-IMT-PDET-ON-STEP2.tcl	**This CUS code was updated on the IEGSE to correct the inconsistencies. After this, the script executed nominally.** Check if the following parameters change value: MODE REDY/ PHOTSTBY (before/after)	**OK**
3	Wait for the I-EGSE staff to confirm the success or failure of step 2	**SPIRE personnel indicates step 2 was successful**	**OK**
Extra	Execute: SPIRE-IMT-STOP-P	**This step was included on demand of SPIRE personnel**	**OK**
4	Execute: SPIRE-IMT-NOISE-P.tcl	**SPIRE will do offline analysis on the gathered data**	**OK**
extra	Execute: SPIRE-IMT-PDET-OFF-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**

Final Configuration: SPIRE is in REDY mode

7.2 SPIRE-IMT-NOISEVBIAS-S

Purpose: Measure noise versus bias using Spectrometer side and STM JFETS

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The STM JFETs are off		**OK**
3	DPU and OBS PARAMETERS display is selected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
1	Execute: SPIRE-IMT-PDET-ON-STEP1.tcl	Check if the following parameters change value: SCUDCDCSTAT 0/1 (before/after) **This step was not executed since the instrument was already in a correct configuration (from the SFT)**	**N/A**

2	Execute: SPIRE-IMT-SDET-ON.tcl	Check if the following parameters change value: MODE REDY/ SPECSTBY (before/after) **In this script a command is missing. This result is a wrong value of the MODE parameter at the end of the test. The MODE should be SPECSTBY, but is PHOTSTBY. This will be corrected by SPIRE. During the test A. Aramburu corrected the CUS script. No NCR is raised at this point (problem is already solved).**	**NOK**
Extra	Execute: SPIRE-IMT-STOP-S	**This step was included on demand of SPIRE personnel**	**OK**
3	Execute: SPIRE-IMT-NOISEVBIAS-S.tcl		**OK**
4	Execute: SPIRE-IMT-SDET-FF.tcl	Check if the following parameters change value: MODE SPECSTBY/ REDY (before/after) **In this script a command is missing. This result is a wrong value of the MODE parameter at the end of the test. The MODE should be REDY, but is PHOTSTBY. During the test A. Aramburu corrected the CUS script. No NCR is raised at this point (problem is already solved).**	**OK**
5	Wait for the I-EGSE staff to confirm the success or failure of this test		**OK**

Final Configuration: SPIRE is in REDY mode

Remark: Until now both PACS and HIFI were switched off. They will be first switched on, after which the IMT will continue.

8 Step by Step Procedure: Power On Instruments

Philosophy:

Since SPIRE is already on and in PRIME mode, the SPIRE prime bus profile is loaded on the CDMU DFE. This means that HIFI and SPIRE are considered to be in standby mode from the beginning.

The instruments will be powered on in the following order:

- SPIRE (to PRIME mode) – Already done
- PACS (to PRIME mode)
- HIFI (to STANDBY mode)

Monitoring:

All data coming from the instruments will be stored on the CCS. No active monitoring will be done on the instruments in standby mode. Of course limits will be monitored and checked and if necessary the instrumenters will be contacted and corrective actions taken.

8.1 Power on PACS to STANDBY Mode

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 10)**
- **PACS-ME-TP-021 (Issue 1.1 – 06/09/05 – chapter 4.1)**

Configuration Check:

Step #	Action	Comments	Check
1	PACS warm electronics is mounted on the SVM		**OK**
2	28 V power is connected to CCS power supplies		**OK**
3	PACS OBT interface is connected to CCS OBT simulator		**OK**
4	DPU 1553 interface is connected to CDMU DFE		**OK**
5	The CDMU DFE is up and running bus list "nominal"	**SPIRE_prime_inst.pst**	**OK**
6	PACS+EGSE grounding has been verified against AD-7		**OK**
7	Check that all TOPE-Tcl scripts (sec.10) are accessible via the CCS		**OK**

Remark: During the power on multiple out of limits were reported. This is a known ASED NCR 1276.

Step #	Action	Comments	Check
1	Execute script: PACS_POWER_ON_NonPrime.tcl (log see Appendix 4)	PACS is sending regular non-Prime HK packets and essential HK packets	**OK**
		1355 links DPU-SPUS, DPU-SPUL, DPU-DMC, DMC-SPUS, DMC-SPUL, DMC-BOLC are on and communicating	**OK**
		Counters for TM(1,2), TM(1,8) and NACKs shall be 0	**OK**
		28 V power is on for all 4 sub-systems	**OK**

8.2 Power on HIFI to STANDBY Mode

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 10)**
- **SRON-G/HIFI/PR/2005-101 chapter 2.4.1 & 2.4.5**

Remark: Before power on of HIFI, the bus profile is switched to the HIFI prime PST file. This is done to speed up the upload of the OBSW.

Remark: The actual switching of the LCL's (PLM SCOE switches) is done with the INSTR_POWER_ON.tcl script. The log file of this script can be found in Appendix 5

Remark: To speed up the booting of the ICU, it is decided by HIFI that chapter 2.4.5 should be executed instead of 2.4.1 (nominal power on procedure). Chapter 2.4.5 powers on the ICU, uploads new OBSW and boots from this new OBSW.

Step #	Action	Comments	Check
1	Apply power to ICU	Select ICU_housekeeping AND	**OK**
		Check voltage in the range 26V – 29V Actual value = **27.9 V**	**OK**
		Check ICU current draw is 480 - 560 mA Actual value = **0.52 A**	**OK**
		Check for receipt of (5,2) event packet after power-on	**OK**
2	Upload new OBSW	The stack file (OBS2_22.hpws42) containing the OBSW is adapted since a new version of the MIB is used on the CCS. The version is 07092005. This is entered in the first line of the stack file.	**OK**
		Load stack file "OBS2_22.hpws42"	**OK**
		Arm All -> Send	**OK**
		Send Command HIFI_load_boot No reply (as expected by HIFI)	**OK**
		Bus is cycled and no HK is coming in.	**OK**
		RESET button is pressed and HK is coming in	**OK**
		Continue 2.4.1 after POWER ICU	**OK**
		Check for receipt of HK packets every 3 sec	**OK**
		Check OBS version **Result: 2.16hex = 2.22dec**	**OK**
		Compare HK (secondary supply voltages) with previous results **This could not be done since HIFI is not present. No out-of-limits have been crossed, so it is assumed that all values are OK.**	**OK**
2	Manual Stack command: HIFI_Housekeeping_on HIF_HK_rate=5_pkt_per_s	Select ICU_housekeeping and HRH_analog AND's	**OK**
		Check for HK updates every 5 sec	**OK**

	ec	**(1,1) packet arrived causing a SSC error. This is a result from the OBSW upload.**	
		Check FCU HK received and no limit errors **This could not be done since HIFI is not present. No out-of-limits have been crossed, so it is assumed that all values are OK.**	**OK**
3	Apply power to FCU	Check power supply HK fields are green (FCU SCOE display). **This is done by ASED personnel according to procedure: SRON-G/HIFI/PR/2005-102**	**OK**
4	Manual Stack command: HIFI_notify_PDU_status HIF_FCU_s=on	Check that the voltages and currents are within the following ranges PS1: "+15V": +15.6V – +16.4V, 107mA – 131mA; **15.853 0.114** "-15V": -16.4V – -15.6V, 78mA – 96mA; **-15.824 0.086** "+5V": +5.5V – +6.0V, 119mA – 147mA. **5.946 0.133** PS2: "+18V": +17.0V – +19.0V, 120mA – 148mA; **18.007 0.132** "-18V": -18.0V – -17.0V, 104mA – 128mA; **-18.014 0.116** "+8V": +7.0V – +9.0V, 16mA – 26mA. **8.003 0.021**	**OK**
5	Apply power to HRH	*Select ICU_housekeeping and HRH_analog AND's*	**OK**
		Check voltage in the range 26V – 29V Actual value = **27.7 V**	**OK**
		Check HRH current draw is 2.2A – 2.8A Actual value = **2.4 A**	**OK**
6	Manual Stack command: HIFI_notify_PDU_status HIF_FCU_s=on HIF_HRSH_s=on	Check HRH HK received and no limit errors	**OK**
7	Apply power to WEH	*Select ICU_housekeeping and WBS_H AND's* **Temperature out of limit (soft):** **HM075192** **HM076192** **This is due a faulty calibration** **This known error is already traced in ASED-NCR-1261**	**OK**
		Check voltage in the range 26V – 29V Actual value = **27.9 V**	**OK**
		Check WEH current draw is 0.9A – 1.0A Actual value = **0.95 A**	**OK**
8	Manual Stack command: HIFI_notify_PDU_status HIF_FCU_s=on HIF_HRSH_s=on	Check WBS_H HK received and no limit errors	**OK**

	HIF_WBSH_s=on		
9	Apply power to LCU **In procedure HRH is mentioned, this is a type error, it should be LCU. This known error is already traced in ASED-NCR-1260**	*Select ICU_housekeeping and LCU_status AND's*	**OK**
		Check voltage in the range 26V – 29V Actual value = **27.92 V**	**OK**
		Check WEH current draw is 0.69A – 0.72A Actual value = **0.75 A**	**OK**
10	Manual Stack command: HIFI_notify_PDU_status HIF_FCU_s=on HIF_HRSH_s=on HIF_WBSH_s=on HIF_LCU_s=on	Check LCU HK received and no limit errors	**OK**

9 Step by Step Procedure: SPIRE IMT part 2 results

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 11)**
- **SPIRE-RAL-PRC-002512**

Remark : The bus profile is switched back to SPIRE_prim_inst.pst

9.1 SPIRE-IMT-CREC

Purpose: Cooler Recycle – same procedure to be run for all subsequent recycles. This procedure will be run manually from the CCS to determine the parameters needed to prepare an automated TCL script. This automated script can then be run overnight as necessary.

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	Level 0 Detector Box and Pump are at 2 K and the Level 0 Evaporator is at 1.85 K		**OK**

Initial Conditions:

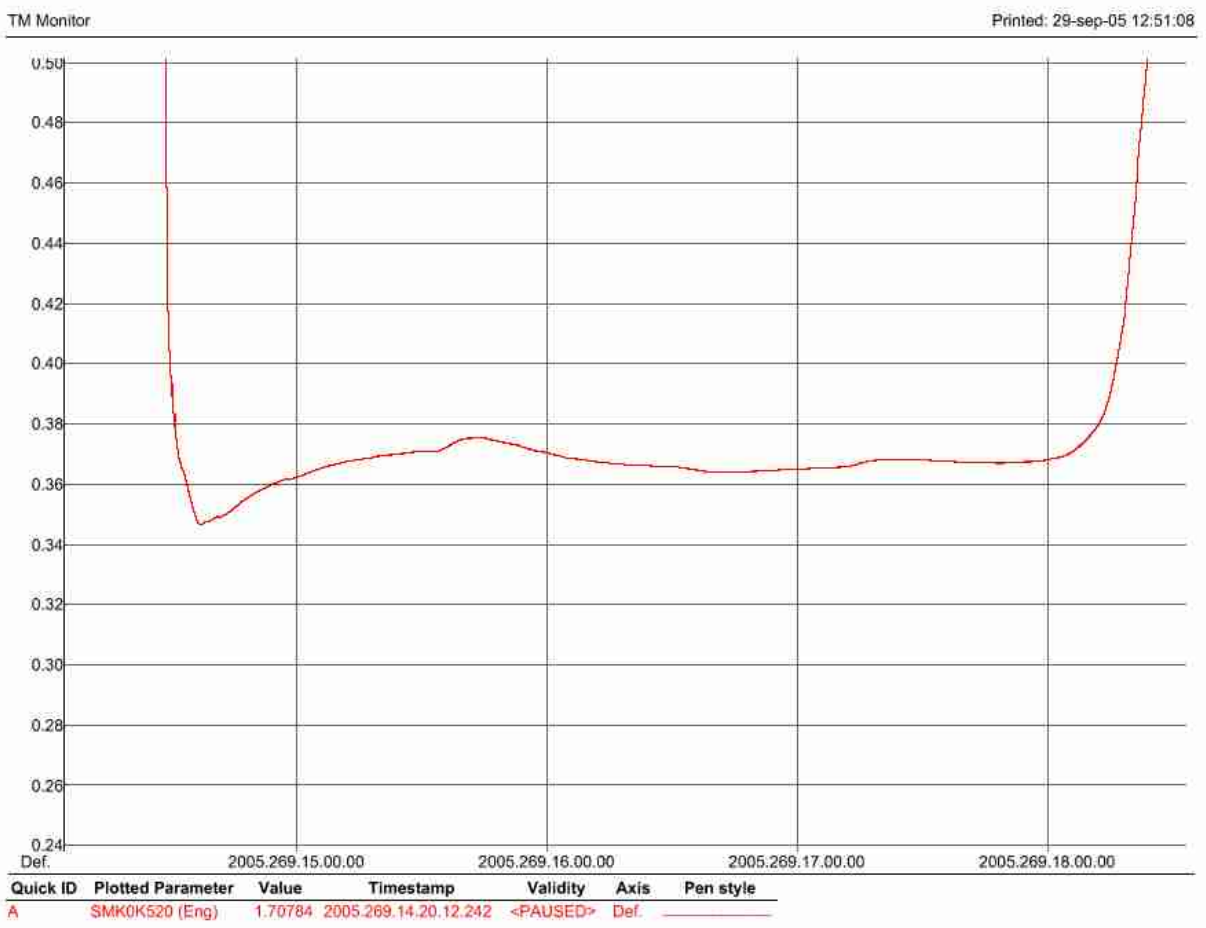
- SPIRE DPU is on and generating HK
- SCU PARAMETERS display is selected on the CCS

Step #	Action	Comments		Check
Extra	Execute: SPIRE-IMT-START-TEST.tcl	**This step was included on demand of SPIRE personnel**		**OK**
1	Execute: SPIRE-IMT-CREC.tcl	STEP Time (UT) SPHSV PUMPHSTEMP EVAPHSTEMP	**1** **13h08m46s** **~ 565 mV** **~ 3.0 K** **~ 3.0 K**	**OK**
2	Wait for PUMPHSTEMP to go just below 12 K and then click on OK to apply	**This step is only needed in case the cooler has been recycled recently. In this case, the 300 mW can be applied to the pump heater immediately.**		**OK**

	300 mW power to Pump Heater	STEP Time (UT) ΔTime (minutes) SPHTRV	**2** **13h11m44s** **~3min** **~ 10.8 V**	
3	Wait for PUMPHTRTEMP to increase to 45 K and then click on OK to reduce power to Pump Heater to 40mW	STEP Time (UT) ΔTime (minutes) SPHTRV PUMPHTRTEMP	**3** **13h59m53s** **~48 min** **~ 4 V** **~ 45 K**	**OK**
4	Wait for SUBKTEMP to fall below 2 K and then click on OK to switch off power to the Pump Heater and Evaporator Heat Switch. IMPORTANT: This step should be executed even if SUBKTEMP is above 2 K but more than an hour has elapsed since the start of the recycle procedure.	STEP Time (UT) ΔTime (minutes) SPHSV SPHTRV PUMPHSTEMP EVAPHSTEMP	**4** **14h05m00s** **~5 min** **~ 0 mV** **~ 0 V** **~ 4.1 K** **~ 19.3 K**	**OK**
5	Wait for EVAPHSTEMP to fall below ~ 16 K and then click on OK to switch on power to the Pump Heat Switch The TCL script ends after execution of this step	STEP Time (UT) ΔTime (minutes) EVHSV SUBKTEMP PUMPHSTEMP	**5** **14h10m24s** **~ 5 min** **~565 mV** **~1.9 K** **~13 K**	**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: A0C411D3	**The command is requested by SPIRE since the SUBKTEMP does not react as expected.** **The value of EVGSV should have increased, but it dropped.**		**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: A04C0DEB	**Command is repeated to tune the configuration.** **Parameter contained a typing error.**		**NOK**
Extra	Execute a Manual Stack command:	**Command is repeated to tune the configuration.**		**OK**

	SCD06505 with value: A0C40DEB			
Extra	Execute a Manual Stack command: SCD06505 with value: A0C40EEB	**Command is repeated to tune the configuration.**		**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: A0C40FEB	**Command is repeated to tune the configuration.**		**OK**
6	Monitor SUBKTEMP and PUMPHSTEMP. Cooler recycle procedure completes when SUBKTEMP reaches ~ 0.285 K and PUMPHSTEMP reaches ~16.5 K.	Time (UT) ΔTime (minutes) SUBKTEMP PUMPHSTEMP	**15h25m** **0.37 (too high, should be ~ 0.285 K)** **18.13 (too high, should be ~16.5 K)**	**NOK**
Extra	Execute: SPIRE-IMT-END-TEST.tcl	**This step was included on demand of SPIRE personnel**		**OK**

Final Configuration: SPIRE is in REDY mode



9.2 SPIRE-IMT-PHOTSTBY

Purpose: Switch on the Photometer detectors and reset offsets.

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are off		**OK**
3	DPU and OBS PARAMETERS display is elected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check

1	Execute: SPIRE-IMT-PDET-ON-STEP1.tcl	Check if the following parameters change value: SCUDCDCSTAT 0/1 (before/after) This step was not executed since the instrument was already in a correct configuration (from the SFT)	**N/A**
2	Execute: SPIREIMT- PDET-ON-STEP2.tcl Wait for I-EGSE staff to execute manual procedure to set equivalent power in BSM coils	Check if the following parameters change value: MODE REDY/ PHOTSTBY (before/after)	**OK**
3	Wait for the I-EGSE staff to confirm the success or failure of step 2	**SPIRE personnel indicated that the temperature is too high to perform this test. This step is aborted.**	**NOK**
	Contingency:If step 2 is a failure then execute steps 5 and then 6		**N/A**
5	Execute: SPIRE-IMT-JFET-OFFP.tcl. (Consult with IEGSE staff)		**N/A**
6	Execute: SPIREIMT-PDET-ON-STEP2.tcl This requires the I-EGSE to switch on the JFET heater by updating CUS script input parameter.		**N/A**

Final Configuration: SPIRE mode PHOTSTBY

9.3 SPIRE-IMT-LC-P

Purpose: Load curve at fixed frequency and phase

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are on		**OK**
3	DPU and OBS PARAMETERS display is elected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
2	Execute: SPIRE-IMT-LC-P.tcl	**This script did not execute correctly. This was due to NCR 889 (limit of 1000 packets). The script contains 1011 commands. SPIRE has adapted the TCL file and the script is repeated.**	**NOK**
Extra	Execute (again): SPIRE-IMT-LC-P.tcl	**During the execution SPIRE discovered that the value were wrong. The script is stopped and SPIRE made some changes on the IEGSE.**	**NOK**
Extra	Execute (again): SPIRE-IMT-SETUP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute (again): SPIRE-IMT-LC-P.tcl	**The script failed because the number of TC's in the TCL did not match the number of TC's that were actually send by the IEGSE. SPIRE adapted the TCL to correct this.**	**NOK**
Extra	Execute (again): SPIRE-IMT-LC-P.tcl		**OK**
Extra	Execute (again): SPIRE-IMT-SETUP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: 843C0000	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: 843E0001	**This step was included on demand of SPIRE personnel**	**OK**

Final Configuration: SPIRE mode PHOTSTBY

Remark: At this point, day 1 of SPIRE IMT (26/09/05) ended.

9.4 SPIRE-IMT-CREC

Remark: This is the start of day 2 of SPIRE IMT (27/09/05). It is now clear that the cooler recycle failed during day 1. The cooler only reached ~0.35 K while the expected temperature should be < 0.3K. During the daily briefing, it is decided that the turbopumps will be powered to evacuate the cryostat. This solution successfully worked at RAL to solve cooler recycle problems.

Too prepare for the new cooler recycle, the following steps are needed

Step #	Action	Comments	Check
Extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	
Extra	Execute: SPIRE-IMT-PDET-OFF.tcl	**This step was included on demand of SPIRE personnel**	**OK**

Purpose: Cooler Recycle – same procedure to be run for all subsequent recycles. This procedure will be run manually from the CCS to determine the parameters needed to prepare an automated TCL script. This automated script can then be run overnight as necessary.

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	Level 0 Detector Box and Pump are at 2 K and the Level 0 Evaporator is at 1.85 K		**OK**

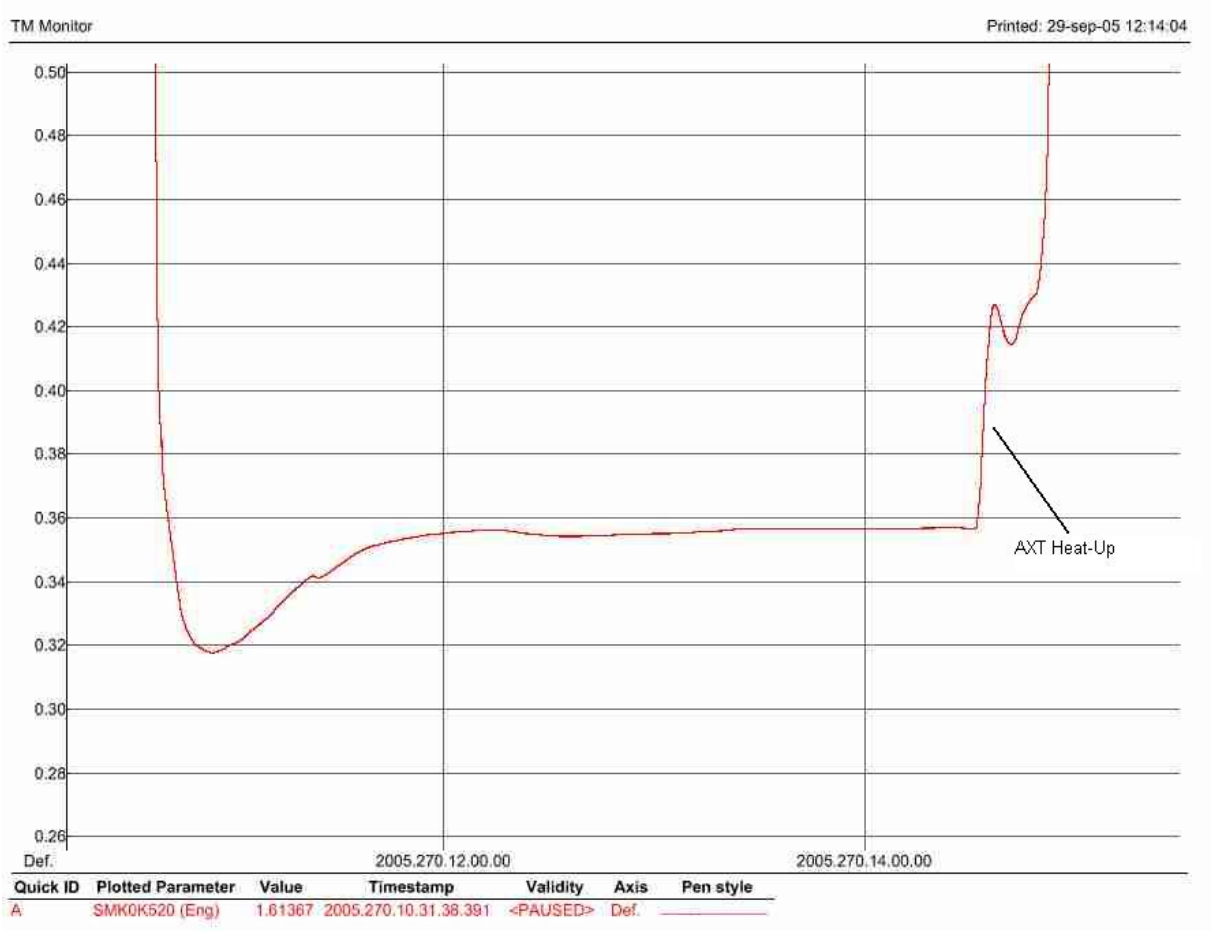
Initial Conditions:

- SPIRE DPU is on and generating HK
- SCU PARAMETERS display is selected on the CCS

Step #	Action	Comments		Check
Extra	Execute: SPIRE-IMT-START-TEST.tcl	**This step was included on demand of SPIRE personnel**		**OK**
1	Execute: SPIRE-IMT-CREC.tcl	STEP Time (UT) SPHSV PUMPHSTEMP EVAPHSTEMP	**1** **09h10m04s** **~ 565 mV** **~ 18.22K instead of 3.0 K** **~ 3.0 K**	**OK**
2	Wait for PUMPHSTEMP to go just below 12 K and then click on OK to apply 300 mW power to Pump Heater	STEP Time (UT) ΔTime (minutes) SPHTRV	**2** **09h17m43s** **~ 7 min** **~ 10.8 V**	**OK**
3	Wait for PUMPHTRTEMP to increase to 45 K and	STEP Time (UT) ΔTime (minutes)	**3** **10h04m43s** **~47 min**	**OK**

	then click on OK to reduce power to Pump Heater to 40mW	SPHTRV PUMPHTRTEMP	**~ 4 V** **~ 45 K**	
4	Wait for SUBKTEMP to fall below 2 K and then click on OK to switch off power to the Pump Heater and Evaporator Heat Switch. IMPORTANT: This step should be executed even if SUBKTEMP is above 2 K but more than an hour has elapsed since the start of the recycle procedure.	STEP Time (UT) ΔTime (minutes) SPHSV SPHTRV PUMPHSTEMP EVAPHSTEMP	**4** **10h14m56s** **~ 10 min** **~ 0 mV** **~ 0 V** **~ 4.43 K** **~ 19 K**	**OK**
5	Wait for EVAPHSTEMP to fall below ~ 16 K and then click on OK to switch on power to the Pump Heat Switch The TCL script ends after execution of this step	STEP Time (UT) ΔTime (minutes) EVHSV SUBKTEMP PUMPHSTEMP	**5** **10h20m08s** **~ 6 min** **~ 565 mV** **~ 1.9 K** **~ 8K instead of 13 K**	
6	Monitor SUBKTEMP and PUMPHSTEMP. Cooler recycle procedure completes when SUBKTEMP reaches ~ 0.285 K and PUMPHSTEMP reaches ~16.5 K.	Time (UT) ΔTime (minutes) SUBKTEMP PUMPHSTEMP	**-** **0.32 (too high, should be ~ 0.285 K)** **18.13 (too high, should be ~16.5 K)**	
Extra	Execute: SPIRE-IMT-END-TEST.tcl	**This step was included on demand of SPIRE personnel**		

Final Configuration: SPIRE is in REDY mode



9.5 SPIRE-IMT-LC-P

Purpose: Load curve at fixed frequency and phase

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are on		**OK**
3	DPU and OBS PARAMETERS display is elected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
extra	Execute: SPIRE-IMT-END-	**This step was included on demand of SPIRE personnel**	**OK**

	TEST.tcl		
extra	Execute: SPIRE-IMT-PDET-ON-STEP2.tcl	**This step was included on demand of SPIRE personnel**	**OK**
extra	Execute: SPIRE-IMT-SETUP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
1	Execute (again): SPIRE-IMT-LC-P.tcl		**OK**
Extra	Execute (again): SPIRE-IMT-NOMINAL-BIAS-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**

Final Configuration: SPIRE mode PHOTSTBY

Remark: At this point, it is clear that the cooler recycle failed again. An NRB is held to determine the way forward and an NCR is raised to track the problem.
Conclusion from the NRB is to warm up the AXT to 4.2 K, continue pumping and then cool down again. After these activities (in ~36 hours), a new cooler recycle will be done to see if the problem is resolved. The SPIRE instrument is left in STANDBY until then.

9.6 SPIRE-IMT-LC-P

Purpose: Load curve at fixed frequency and phase

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are on		**OK**
3	DPU and OBS PARAMETERS display is elected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
1	Execute (again): SPIRE-IMT-LC-P.tcl		**OK**
Extra	Execute (again): SPIRE-IMT-NOMINAL-	**This step was included on demand of SPIRE personnel**	**OK**

	BIAS-P.tcl		

Final Configuration: SPIRE mode PHOTSTBY

To configure SPIRE to a STANDBY MODE, the following commands are send:

Extra	Execute a Manual Stack command: SCD06505 with value: A0870000	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute a Manual Stack command: SC002500 with value: 200	**This step was included on demand of SPIRE personnel**	**OK**

Remark: This end day 2 of IMT (27/09/05)

9.7 Preparations Day 3 of IMT

Remark: This is the start of day 3 of IMT (28/09/05)

Remark: The temperature of the FPU's is now ~ 4.2 K.

Step #	Action	Comments	Check
Extra	Execute: SPIRE-IMT-LOAD-COMMAND-LIST.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-PCAL-FLASH.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-PCAL-FLASH.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-BIAS-AMPL-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute a Manual Stack command: SCD06505 with value: A0C40000	**This step was included on demand of SPIRE personnel**	**OK**

Important Remark: The CCS is restarted in the beginning of the afternoon of the 3rd day of SPIRE IMT (28/09/05).
The new session name is: 2005_09_28_12_19_ilsens_REALTIME_S_IMT_1
After starting the new session, connection are re-established with:

- PLM SCOE
- CDMU DFE

- IEGSE
- EQM CRYO SCOE

9.8 SPIRE-IMT-PCAL-LEVEL

Step #	Action	Comments	Check
Extra	Execute: SPIRE-IMT-PCAL-LEVEL.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SPIRE-IMT-BIAS-AMPL-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**

Remark: This is the end of day 3 of IMT (28/09/05)

9.9 SPIRE-IMT-CREC

Remark: This is the start of day 4 of IMT (29/09/05). During Day 3 the AXT was heated up to 4.2K while the vacuum-pumps kept pumping to extract the helium from the vacuum. In the night of Day 3- Day 4, the AXT is cooled down again so the FPU's are again at He 2 temperatures (~1,7 K).

Purpose: Cooler Recycle – same procedure to be run for all subsequent recycles. This procedure will be run manually from the CCS to determine the parameters needed to prepare an automated TCL script. This automated script can then be run overnight as necessary.

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	Level 0 Detector Box and Pump are at 2 K and the Level 0 Evaporator is at 1.85 K		**OK**

Initial Conditions:

- SPIRE DPU is on and generating HK
- SCU PARAMETERS display is selected on the CCS

Step #	Action	Comments		Check
Extra	Execute: SPIRE-IMT-START-TEST.tcl	**This step was included on demand of SPIRE personnel**		**OK**
1	Execute: SPIRE-IMT-CREC.tcl	STEP Time (UT) SPHSV PUMPHSTEMP EVAPHSTEMP	**1** **06h40m40s** **~ 565 mV** **~ 3.0 K** **~ 3.0 K**	**OK**
2	Wait for PUMPHSTEMP to go just below 12 K and then click on OK to apply 300 mW power to Pump Heater	STEP Time (UT) ΔTime (minutes) SPHTRV	**2** **06h42m04s** **~ 1 min** **~ 10.8 V**	**OK**
3	Wait for PUMPHTRTEMP to increase to 45 K and then click on OK to reduce power to Pump Heater to 40mW	STEP Time (UT) ΔTime (minutes) SPHTRV PUMPHTRTEMP	**3** **07h29m32s** **~ 48 min** **~ 4 V** **~ 45 K**	**OK**
4	Wait for SUBKTEMP to fall below 2 K and then click on OK to switch off power to the Pump Heater and Evaporator Heat Switch. IMPORTANT: This step should be executed even if SUBKTEMP is above 2 K but more than an hour has elapsed since the start of the recycle procedure.	STEP Time (UT) ΔTime (minutes) SPHSV SPHTRV PUMPHSTEMP EVAPHSTEMP	**4** **07h32m15s** **~ 3 min** **~ 0 mV** **~ 0 V** **~ 4.43 K** **~ 19 K**	**OK**
5	Wait for EVAPHSTEMP to fall below ~ 16 K and then click on OK to switch on power to the Pump Heat Switch The TCL script ends after execution of this step	STEP Time (UT) ΔTime (minutes) EVHSV SUBKTEMP PUMPHSTEMP	**5** **07h37m08s** **~ 5 min** **~ 565 mV** **~ 1.9 K** **~ 13 K**	
6	Monitor SUBKTEMP and PUMPHSTEMP. Cooler recycle procedure	Time (UT) ΔTime (minutes) SUBKTEMP	**08h36m00s** **~ 1h** **0.284**	

	completes when SUBKTEMP reaches ~ 0.285 K and PUMPHSTEMP reaches ~16.5 K.	PUMPHSTEMP	**16.25** **Immediately after the lowest point (0.2839 K) was reached, the temperature went back up considerably. (0.291 K after 25 minutes). This can also be seen in the graph below.**	
Extra	Execute: SPIRE-IMT-END-TEST.tcl	**This step was included on demand of SPIRE personnel**		

Final Configuration: SPIRE is in REDY mode

9.10 SPIRE-IMT-PHOTSTBY

Step #	Action	Comments	Check
1	Execute: SPIRE-IMT-PDET-ON-STEP1.tcl		**OK**
2	Execute: SPIRE-IMT-PDET-ON-STEP2.tcl		**OK**

Final Configuration: SPIRE mode PHOTSTBY

9.11 SPIRE-IMT-LC-P

Purpose: Load curve at fixed frequency and phase

Preconditions:

Step #	Action	Comments	Check
1	SCU AC and DC thermometry is on		**OK**
2	The Photometer detectors are on		**OK**
3	DPU and OBS PARAMETERS display is elected on the CCS		**OK**

Initial Conditions: SPIRE is in REDY mode

Step #	Action	Comments	Check
extra	Execute: SPIRE-IMT-STOP-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**
1	Execute: SPIRE-IMT-LC-P.tcl		**OK**
Extra	Execute: SPIRE-IMT-LC-P.tcl	**This step was included on demand of SPIRE personnel**	**OK**

9.12 SET SPIRE to STANDBY

Extra	Execute: SPIRE-IMT-PDET-OFF.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute: SFT-SPIRE-CCS-DRCU-ON-STEP1.tcl	**This step was included on demand of SPIRE personnel**	**OK**

Extra	Execute: SFT-SPIRE-CCS-DRCU-ON-STEP2-STBY.tcl	**This step was included on demand of SPIRE personnel**	**OK**
Extra	Execute a Manual Stack command: SC002500 with value: 200	**This step was included on demand of SPIRE personnel**	**OK**

Important Remark: Since the cooler recycle did not succeed 3 times in a row, the IMT is stopped at this point. Further investigation is required to determine the cause.

9.13 PACS Cooler Recycle and additional tests

To do further investigations on the Cooler Recycle problem PACS has executed a cooler recycle on day 5 of SPIRE IMT. Details can be found in HP-2-ASED-SD-0059.

10 Step by Step Procedure: Switch Off Instruments

10.1 Switch Off SPIRE

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 10)**
- **SPIRE-RAL-PRC-002494 (Issue 1.1 Appendix 2 – 09/09/05)**

10.1.1 SFT-SPIRE-CCS-FUNC-THO

Purpose: Switch off SCU DC and AC thermometry – if necessary

Step #	Action	Comments				Check
1	Execute TCL script SFT-SPIRE-CCS-FUNC-THO.tcl					**OK**
2	A few seconds later record the value of parameter SCUTEMPSTAT	Check if the following parameters change value:				
		Parameter	**Start**	**During**	**End**	
		SCUTEMPSTAT	FFFF	-	0	**OK**
3	A few seconds later record the value of parameter SUBKSTAT	Check if the following parameters change value:				
		Parameter	**Start**	**During**	**End**	
		SUBKSTAT	1	-	0	**OK**
4	Note down the value of the MODE parameter on the DPU AND OBS PARAMETERS Display	Check if the following parameters change value:				
		Parameter	**Start**	**During**	**End**	
		MODE	REDY	-	ON	**OK**

10.1.2 SFT-SPIRE-CCS-DRCU-OFF

Purpose: Switch off the DRCU

Step #	Action	Comments	Check
1	Execute TCL script SFT-SPIRE-CCS-DRCU-ON-STEP1.tcl		**OK**
2	Check that THSK parameter is not refreshing anymore		**OK**
3	Check that TM2N parameter is not incrementing anymore		**OK**
4	Manual Switch off of the DRCU by the I-EGSE staff: • Switch off all 5 remote DCU switches in ANY order (see Figure 4) • Switch off secondary power to the SPIRE Power Bench (see Figure 5) • Switch off primary power to the SPIRE Power Bench (see Figure 2)		**OK**

10.1.3 SFT-SPIRE-CCS-DPU-OFF

Purpose: Switch off the DPU

Step #	Action	Comments	Check
1	Request the CCS staff to power off the SPIRE DPU using the CCS 28V Power Supply	**This action is performed from the Manual Stack**	**OK**

10.2 Switch Off HIFI

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 12)**
- **SRON-G/HIFI/PR/2005-101 chapter 2.4.3**

Step #	Action	Comments	Check
1	Select LCU_status AND	Verify LCU is in standby mode. Do not continue if this is not so!	**N/A**
2	Switch off power to LCU	Check voltage and current go to zero.	**N/A**
3	Switch off power to WEH	Check voltage and current go to zero.	**N/A**
4	Switch off power to HRH	Check voltage and current go to zero.	**N/A**
5	Switch off power to ICU	Check voltage and current go to zero.	**OK**
6	Switch off power to FCU manually (executed by HIFI)	Check voltage and current go to zero.	**OK**

10.3 Switch Off PACS

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 10)**
- **PACS-ME-TP-026 (Issue 1.0 – 29/08/05)**

Remark: This action is done on 03/10/2005 (after the weekend). This to get a better idea what the hold time is of the PACS cooler recycle.

Step #	Action	Comments	Check
1	Execute: PACS_POWER_OFF.tcl (see Appendix 4)	PACS is sending no TM packets anymore	**OK**
		28 V power is off	**OK**

11 Step by Step Procedure: Set EGSE to OFFLINE

According to Procedure(s):

- **HP-2-ASED-PR-0035 (Chapter 3: Order of Execution – Step 13 to 15)**

Remark: This step is done manually.

Step #	Action	Comments	Check
1	Execute: "WARNING_LAMP_POWER_OFF.tcl"		**N/A**
2	Execute: "EGSE_OFFLINE_AUTO.tcl"	Check: PLM SCOE HK packets stopped	**N/A**
		Check: CDMU DFE HK packets stopped	**N/A**
3	Shut down PLM EGSE		**N/A**

12 Summary Sheets

12.1 Procedure Variation Summary

	Test Change		Curr. No.: Date Page of
Test designation	Test Procedure	Issue	Rev.
Test step changed	Reason for Change		
Prepared by:	Resp. Test Leader	Project Engineer	
PA/QA	Prime	Customer	

Table 12.1-1: Procedure Variation Sheet

12.2 Non Conformance Report (NCR) Summary

NCR - No.	NCR - Title	Date	Open Closed	PA sig.
1513	SPIRE EQM Cooler recycling	27/09/05	Open	

Table 12.2-1: Non-Conformance Record Sheet

12.3 Sign-off Sheet

	Name	Date	Signature
Test Manager	S. Idle	17.10.05	
Operator	S. ILSEN	04.10.05	
PA Responsible	D. HENDRY	04/10/05	

Appendix 1: SPIRE Nominal Bus Profile (SPIRE_prime_inst.PST)

```
;Nominal HERSCHEL/SPIRE Prime bus profile
;SPIRE is RT 21: 25TM, 2TC
;PACS is RT 25: 2TM, 1TC
;HIFI is RT 16: 2TM, 1TC

[Config]
NumberOfSubFrames=64

[SubFrame1]
1=RTaccessSA

[SubFrame2]
1=RTaccessSA

[SubFrame3]
1=RTaccessSA

[SubFrame4]
1=TMpoll,25     ;TM poll from: PACS
2=RTaccessSA

[SubFrame5]
1=TMpacket,25  ;TM packet from: PACS
2=TMpoll,16    ;TM poll from: HIFI
3=RTaccessSA

[SubFrame6]
1=TMpacket,16  ;TM packet from: HIFI
2=TMpoll,21    ;TM poll from: SPIRE
3=RTaccessSA

[SubFrame7]
1=TMpacket,21  ;TM packet from: SPIRE
2=TMpoll,25    ;TM poll from: PACS
3=RTaccessSA

[SubFrame8]
1=TMpacket,25  ;TM packet from: PACS
2=TMpoll,16    ;TM poll from: HIFI
3=RTaccessSA

[SubFrame9]
1=TMpacket,16  ;TM packet from: HIFI
2=TMpoll,21    ;TM poll from: SPIRE
3=RTaccessSA

[SubFrame10]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame11]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame12]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame13]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame14]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame15]
```

```
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame16]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame17]
1=TCpacket     ;TC packet to: SPIRE
2=RTaccessSA

[SubFrame18]
1=TCpacket     ;TC packet to: PACS
2=TMpoll,21    ;TM poll from: SPIRE
3=RTaccessSA

[SubFrame19]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame20]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame21]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame22]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame23]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame24]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame25]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame26]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame27]
1=TMpacket,21  ;TM packet from: SPIRE
2=TMpoll,25    ;TM poll from: PACS
3=RTaccessSA

[SubFrame28]
1=TMpacket,25  ;TM packet from: PACS
2=TMpoll,21    ;TM poll from: SPIRE
3=RTaccessSA

[SubFrame29]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame30]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame31]
1=TMpacket,21  ;TM packet from: SPIRE
2=TMpoll,16    ;TM poll from: HIFI
3=RTaccessSA
```

```
[SubFrame32]
1=TMpacket,16  ;TM packet from: HIFI
2=RTaccessSA

[SubFrame33]
1=TimeSync     ;Time distribution broadcast
2=TCpacket     ;TC packet to: SPIRE
3=TMpoll,21    ;TM poll from: SPIRE
4=RTaccessSA

[SubFrame34]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame35]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame36]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame37]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame38]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame39]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame40]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame41]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame42]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame43]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame44]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame45]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame46]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame47]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame48]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame49]
```

```
1=TCpacket  ;TC packet to: HIFI
2=TMpoll,21    ;TM poll from: SPIRE
3=RTaccessSA

[SubFrame50]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame51]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame52]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame53]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame54]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame55]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame56]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame57]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame58]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame59]
1=TMpoll,21    ;TM poll from: SPIRE
2=RTaccessSA

[SubFrame60]
1=TMpacket,21  ;TM packet from: SPIRE
2=RTaccessSA

[SubFrame61]
1=RTreadSA,21,1 ;RT status from: SPIRE
2=TMpoll,21    ;TM poll from: SPIRE

[SubFrame62]
1=RTreadSA,25,1 ;RT status from: PACS
2=TMpacket,21  ;TM packet from: SPIRE

[SubFrame63]
1=RTreadSA,16,1 ;RT status from: HIFI
```

Appendix 2: Log of EGSE_CONFIG_AUTO.tcl

```
*******************************************************************************
2005.269.06.43.38.195171 EGSE CONFIG Sequence
*******************************************************************************
2005.269.06.43.38.195645
*******************************************************************************
2005.269.06.43.38.196245 Check of CDMU DFE and PLM SCOE
*******************************************************************************
2005.269.06.43.38.196557
2005.269.06.43.38.196787
2005.269.06.43.38.197019 Connecting to CDMU DFE
2005.269.06.43.40.202525 Attaching to CMDU DFE
2005.269.06.43.41.208028
2005.269.06.43.41.208397 Checking if CDMU DFE BIST was OK
2005.269.06.43.43.213194
2005.269.06.43.43.306050 >>> RESULT : CDMU DFE BIST OK, continuing EGSE_CONFIG.
2005.269.06.43.45.308447
2005.269.06.43.45.308816 Connecting to PLM SCOE
2005.269.06.43.47.312237 Attaching to PLM SCOE
2005.269.06.43.48.315867
2005.269.06.43.48.316244 Checking if PLM SCOE BIST was OK
2005.269.06.43.50.319105
2005.269.06.43.50.406378 >>> RESULT : PLM SCOE BIST OK, continuing EGSE_CONFIG.
*******************************************************************************
2005.269.06.43.52.408801 Configuring CDMU DFE
*******************************************************************************
2005.269.06.43.52.409202
2005.269.06.43.52.409726 Switching CDMUDFE to ONLINE mode
2005.269.06.43.53.470363
2005.269.06.43.53.470755
2005.269.06.43.53.471350
2005.269.06.43.53.471888 Available PST tables:
2005.269.06.43.53.472446 1. HIFI_prime_inst.PST
2005.269.06.43.53.473079 2. SPIRE_prime_inst.PST
2005.269.06.43.53.473660 3. PACS_prime_inst.PST
2005.269.06.43.53.474252 4. PACS_burst_mode.PST
2005.269.06.43.53.474841 5. PACS_SPIRE_par.PST
2005.269.06.43.53.475416
2005.269.06.43.53.510097  >>> Please enter the number of the required PST table. Enter 0 for
an unlisted.
2005.269.06.43.58.563949
2005.269.06.43.58.564319 You have selected 2 : SPIRE_prime_inst.PST
2005.269.06.43.58.564928
2005.269.06.43.58.565730 Loading SPIRE_prime_inst.PST file on CDMU DFE
2005.269.06.43.58.566333
2005.269.06.44.03.683187 The PST table is loaded on the CDMU DFE.
2005.269.06.44.03.683616
2005.269.06.44.03.684262 Enabling PST file execution.
2005.269.06.44.04.716802
2005.269.06.44.04.717170 Enabling TM Queue.
2005.269.06.44.05.749592
2005.269.06.44.05.749957 Enabling TM Polling.
2005.269.06.44.06.784415
2005.269.06.44.06.784781 Enabling TC Queue.
2005.269.06.44.07.858310
2005.269.06.44.07.858685 Enabling SA Queue.
2005.269.06.44.08.961460
2005.269.06.44.08.961828 Enabling SA Reading.
2005.269.06.44.09.994276
2005.269.06.44.09.994643 Enabling Low Level Time Synchronisation.
2005.269.06.44.11.029105
2005.269.06.44.11.064204 ******************* USER INFORMATION *******************
2005.269.06.44.11.064961 User Info>: >>> Please Enable the Busmonitor (Set Online Mode and
Start New Acquisition) and press OK.
2005.269.06.44.11.065578 *********************************************************
2005.269.06.44.54.239882 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.06.44.54.240271 >>>>>>>>  Reading out CDMUDFE Settings
2005.269.06.44.54.240860 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

```
2005.269.06.44.54.241449
2005.269.06.44.54.243401 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.269.06.44.54.245137 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.269.06.44.54.246860 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.269.06.44.54.248629 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.269.06.44.54.250357 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.269.06.44.54.252094 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.269.06.44.54.253213 Status_CDMU_PSTfileName is SPIRE_prime_inst... (extracted from TLM
YM809944)
2005.269.06.44.54.254952 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
********************************************************************************
2005.269.06.44.57.258909 Configuring PLM SCOE
********************************************************************************
2005.269.06.44.57.259360
2005.269.06.44.57.259976 Switching PLM SCOE to ONLINE mode
2005.269.06.44.58.357643
2005.269.06.45.03.361888 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.06.45.03.362272 >>>>>>>>  Reading out PLM SCOE Settings
2005.269.06.45.03.362884 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.06.45.03.363484
2005.269.06.45.03.365449 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.06.45.03.367239 Status_PLM_PSU1_Master is currently 0 (extracted from TLM YM129942)
2005.269.06.45.03.369013 Status_PLM_PSU1_Slave is currently 0 (extracted from TLM YM145942)
2005.269.06.45.03.370768 Status_PLM_PSU2_Master is currently 0 (extracted from TLM YM177942)
2005.269.06.45.03.372536 Status_PLM_PSU2_Slave is currently 0 (extracted from TLM YM193942)
2005.269.06.45.03.375521 Status_PLM_LCL1_V is currently 0.00697093131021 (extracted from TLM
YM228942)
2005.269.06.45.03.378407 Status_PLM_LCL1_I is currently 0.000101930265373 (extracted from TLM
YM232942)
2005.269.06.45.03.381867 Status_PLM_LCL2_V is currently 0.0627383813262 (extracted from TLM
YM244942)
2005.269.06.45.03.384550 Status_PLM_LCL2_I is currently 0.000506599550135 (extracted from TLM
YM248942)
2005.269.06.45.03.387586 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.269.06.45.03.390175 Status_PLM_LCL3_I is currently 0.000506599550135 (extracted from TLM
YM264942)
2005.269.06.45.03.393277 Status_PLM_LCL4_V is currently 0.034854657948 (extracted from TLM
YM276942)
2005.269.06.45.03.395929 Status_PLM_LCL4_I is currently 0.000506599550135 (extracted from TLM
YM280942)
2005.269.06.45.03.400610 Status_PLM_LCL5_V is currently 0.0302073694766 (extracted from TLM
YM292942)
2005.269.06.45.03.403355 Status_PLM_LCL5_I is currently 0.000253299775068 (extracted from TLM
YM296942)
2005.269.06.45.03.406551 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.06.45.03.409297 Status_PLM_LCL6_I is currently 0.000253299775068 (extracted from TLM
YM312942)
2005.269.06.45.03.412859 Status_PLM_LCL7_V is currently 0.034854657948 (extracted from TLM
YM324942)
2005.269.06.45.03.419474 Status_PLM_LCL7_I is currently 0.000506599550135 (extracted from TLM
YM328942)
2005.269.06.45.03.422759 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.06.45.03.425430 Status_PLM_LCL8_I is currently 0.000506599550135 (extracted from TLM
YM344942)
2005.269.06.45.03.428588 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.06.45.03.431310 Status_PLM_LCL9_I is currently 0.00101319910027 (extracted from TLM
YM360942)
2005.269.06.45.03.434469 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.06.45.03.437153 Status_PLM_LCL10_I is currently 0.000253299775068 (extracted from TLM
YM376942)
2005.269.06.45.03.440428 Status_PLM_LCL11_V is currently 0.00929457508028 (extracted from TLM
YM388942)
2005.269.06.45.03.443226 Status_PLM_LCL11_I is currently 0.000506599550135 (extracted from TLM
YM392942)
2005.269.06.45.03.446453 Status_PLM_LCL12_V is currently 0.00697093131021 (extracted from TLM
YM404942)
```

```
2005.269.06.45.03.449178 Status_PLM_LCL12_I is currently 0.000506599550135 (extracted from TLM
YM408942)
2005.269.06.45.03.452386 Status_PLM_LCL13_V is currently 0.0185891501606 (extracted from TLM
YM420942)
2005.269.06.45.03.455159 Status_PLM_LCL13_I is currently 0.000506599550135 (extracted from TLM
YM424942)
2005.269.06.45.03.458413 Status_PLM_LCL14_V is currently 0.0952693969011 (extracted from TLM
YM436942)
2005.269.06.45.03.461330 Status_PLM_LCL14_I is currently 0.000253299775068 (extracted from TLM
YM440942)
```

Appendix 3: Log of INSTR_POWER_ON.tcl (Used for SPIRE power on)

```
2005.269.07.38.29.976482
*******************************************************************************
2005.269.07.38.29.977413 Start of Instrument POWER ON sequence.
*******************************************************************************
2005.269.07.38.29.977729
2005.269.07.38.29.977957  To run this script, the CDMU DFE and PLM SCOE should be
2005.269.07.38.29.978191  powered and configured.
2005.269.07.38.29.978418  To initiate, this script will connect and attach to the CDMUDFE
2005.269.07.38.29.978649  and PLM SCOE.
2005.269.07.38.29.978885
2005.269.07.38.29.979116 Connecting to CDMU DFE
2005.269.07.38.31.986362 Attaching to CMDU DFE
2005.269.07.38.32.993807
2005.269.07.38.32.994170 Connecting to PLM SCOE
2005.269.07.38.34.997102 Attaching to PLM SCOE
2005.269.07.38.36.001039 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.001517 >>>>>>>>  Reading out CDMUDFE Settings
2005.269.07.38.36.001950 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.002369
2005.269.07.38.36.096362 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.269.07.38.36.098144 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.269.07.38.36.099774 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.269.07.38.36.101390 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.269.07.38.36.103021 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.269.07.38.36.104709 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.269.07.38.36.106470 Status_CDMU_PSTfileName is SPIRE_prime_inst... (extracted from TLM
YM809944)
2005.269.07.38.36.108776 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
2005.269.07.38.36.109442
2005.269.07.38.36.109950 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.110481 >>>>>>>>  Reading out PLM SCOE Settings
2005.269.07.38.36.111023 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.111556
2005.269.07.38.36.241369 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.07.38.36.243554 Status_PLM_PSU1_Master is currently 0 (extracted from TLM YM129942)
2005.269.07.38.36.245694 Status_PLM_PSU1_Slave is currently 0 (extracted from TLM YM145942)
2005.269.07.38.36.247915 Status_PLM_PSU2_Master is currently 0 (extracted from TLM YM177942)
2005.269.07.38.36.250076 Status_PLM_PSU2_Slave is currently 0 (extracted from TLM YM193942)
2005.269.07.38.36.253489 Status_PLM_LCL1_V is currently 0.00697093131021 (extracted from TLM
YM228942)
2005.269.07.38.36.256621 Status_PLM_LCL1_I is currently 0.000101930265373 (extracted from TLM
YM232942)
2005.269.07.38.36.259783 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.269.07.38.36.262380 Status_PLM_LCL2_I is currently 0.000506599550135 (extracted from TLM
YM248942)
2005.269.07.38.36.265400 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.269.07.38.36.268002 Status_PLM_LCL3_I is currently 0.000506599550135 (extracted from TLM
YM264942)
2005.269.07.38.36.271040 Status_PLM_LCL4_V is currently 0.0325310118496 (extracted from TLM
YM276942)
2005.269.07.38.36.273722 Status_PLM_LCL4_I is currently 0.000506599550135 (extracted from TLM
YM280942)
2005.269.07.38.36.276736 Status_PLM_LCL5_V is currently 0.0325310118496 (extracted from TLM
YM292942)
2005.269.07.38.36.279340 Status_PLM_LCL5_I is currently 0.000253299775068 (extracted from TLM
YM296942)
2005.269.07.38.36.282463 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.07.38.36.285179 Status_PLM_LCL6_I is currently 0.000253299775068 (extracted from TLM
YM312942)
2005.269.07.38.36.288317 Status_PLM_LCL7_V is currently 0.0371783003211 (extracted from TLM
YM324942)
```

```
2005.269.07.38.36.290982 Status_PLM_LCL7_I is currently 0.000506599550135 (extracted from TLM
YM328942)
2005.269.07.38.36.294110 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.07.38.36.296769 Status_PLM_LCL8_I is currently 0.000506599550135 (extracted from TLM
YM344942)
2005.269.07.38.36.300138 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.07.38.36.302895 Status_PLM_LCL9_I is currently 0.00101319910027 (extracted from TLM
YM360942)
2005.269.07.38.36.306126 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.07.38.36.308817 Status_PLM_LCL10_I is currently 0.000253299775068 (extracted from TLM
YM376942)
2005.269.07.38.36.312053 Status_PLM_LCL11_V is currently 0.00929457508028 (extracted from TLM
YM388942)
2005.269.07.38.36.315219 Status_PLM_LCL11_I is currently 0.000506599550135 (extracted from TLM
YM392942)
2005.269.07.38.36.318436 Status_PLM_LCL12_V is currently 0.00697093131021 (extracted from TLM
YM404942)
2005.269.07.38.36.321225 Status_PLM_LCL12_I is currently 0.000506599550135 (extracted from TLM
YM408942)
2005.269.07.38.36.324423 Status_PLM_LCL13_V is currently 0.0185891501606 (extracted from TLM
YM420942)
2005.269.07.38.36.327173 Status_PLM_LCL13_I is currently 0.000506599550135 (extracted from TLM
YM424942)
2005.269.07.38.36.330395 Status_PLM_LCL14_V is currently 0.090622112155 (extracted from TLM
YM436942)
2005.269.07.38.36.333164 Status_PLM_LCL14_I is currently 0.000253299775068 (extracted from TLM
YM440942)
2005.269.07.38.36.333896
2005.269.07.38.36.334551
*******************************************************************************
2005.269.07.38.36.335571 Power On Instruments
*******************************************************************************
2005.269.07.38.36.336390
2005.269.07.38.36.337036
2005.269.07.38.36.337653
2005.269.07.38.36.338431 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.339109 >>>>>>>>  Start Up Instruments
2005.269.07.38.36.339745 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.38.36.340406
2005.269.07.38.36.370448  Which instrument needs to be Powered? PACS, SPIRE, HIFI, CCU?
2005.269.07.38.42.312041  You have selected to power SPIRE.
2005.269.07.38.42.312632
2005.269.07.38.42.313316  The current power on order is:
2005.269.07.38.42.313940  --------------------------------
2005.269.07.38.42.315765  1. LCL 1    SPIRE HSDPU    Primary    Voltage: 0.00697093131021 V
Current: 0.000101930265373 A
2005.269.07.38.42.316613  2. LCL 0    N/A    Primary    Voltage: N/A V     Current: N/A A
2005.269.07.38.42.317275
2005.269.07.38.42.345510  Do you want to change this order? : Choose Yes or No
2005.269.07.38.43.943340  User has chosen NO
2005.269.07.38.45.946824
2005.269.07.38.45.975810  Do you want to enable the PSU(s)? : Choose Yes or No
2005.269.07.38.48.212310  User has chosen YES
2005.269.07.38.50.217012
2005.269.07.38.50.360778  Sending Telecommand YC036942
2005.269.07.38.50.361159  Synchronizing on SEV...
2005.269.07.38.50.362312  Synchronised on SEV for TC(s): YC036942
2005.269.07.38.50.362987
2005.269.07.38.50.363580  >>> Checking
2005.269.07.38.56.366187  PSU 1 Master status is currently 1 (from YM129942)
2005.269.07.38.56.366581  PSU 1 Slave status is currently 1 (from YM145942)
2005.269.07.38.56.367206
2005.269.07.38.56.396251 ******************** USER INFORMATION ********************
2005.269.07.38.56.397095 User Info>: Check Successful! PSU 1 has been enabled.
2005.269.07.38.56.397727 ************************************************************
2005.269.07.38.59.855586
2005.269.07.38.59.855996  >>> Start Enabling LCL's
2005.269.07.38.59.856615
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2005.269.07.38.59.884251  Do you want to enable LCL 1? : Choose Yes or No
2005.269.07.39.00.949742  User has chosen YES
2005.269.07.39.02.953132
2005.269.07.39.03.088246  Sending Telecommand YC040942 to Enable Limiter
2005.269.07.39.03.088632  Synchronizing on SEV...
2005.269.07.39.03.106900  Synchronised on SEV for TC(s): YC040942
2005.269.07.39.03.107301
2005.269.07.39.03.155379  Sending Telecommand YC043942 to Set Limiter
2005.269.07.39.03.155755  Synchronizing on SEV...
2005.269.07.39.03.192462  Synchronised on SEV for TC(s): YC043942
2005.269.07.39.03.193024
2005.269.07.39.03.193616  >>> Checking
2005.269.07.39.09.196308  LCL 1 has currently a voltage of 27.858165741.(from YM228942)
2005.269.07.39.09.196827  LCL 1 has currently a current of 0.46062284708.(from YM232942)
2005.269.07.39.09.197436
2005.269.07.39.09.227794 ******************** USER INFORMATION ********************
2005.269.07.39.09.228595 User Info>: Check Successful! LCL 1 has been enabled.
2005.269.07.39.09.229190 ************************************************************
2005.269.07.39.28.438103
2005.269.07.39.28.465013 ******************** USER INFORMATION ********************
2005.269.07.39.28.465717 User Info>: No LCL is selected to be switched on as second
2005.269.07.39.28.466313 ************************************************************
2005.269.07.39.29.122047
2005.269.07.39.29.122447
2005.269.07.39.29.123059  All selected LCL's for SPIRE are powered.
2005.269.07.39.29.123636
2005.269.07.39.29.151159  Do you want to power on another instrument? : Choose Yes or No
2005.269.07.39.31.271421  User has chosen NO
2005.269.07.39.33.276229
2005.269.07.39.33.276934 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.39.33.277552 >>>>>>>>  Reading out PLM SCOE Settings
2005.269.07.39.33.278136 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.07.39.33.278727
2005.269.07.39.33.279982 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.07.39.33.281268 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.269.07.39.33.282526 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.269.07.39.33.283824 Status_PLM_PSU2_Master is currently 0 (extracted from TLM YM177942)
2005.269.07.39.33.285094 Status_PLM_PSU2_Slave is currently 0 (extracted from TLM YM193942)
2005.269.07.39.33.286386 Status_PLM_LCL1_V is currently 27.8628120422 (extracted from TLM
YM228942)
2005.269.07.39.33.287690 Status_PLM_LCL1_I is currently 0.434222906828 (extracted from TLM
YM232942)
2005.269.07.39.33.289011 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.269.07.39.33.290325 Status_PLM_LCL2_I is currently 0.00607919460163 (extracted from TLM
YM248942)
2005.269.07.39.33.291634 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.269.07.39.33.292944 Status_PLM_LCL3_I is currently 0.00709239346907 (extracted from TLM
YM264942)
2005.269.07.39.33.294319 Status_PLM_LCL4_V is currently 0.034854657948 (extracted from TLM
YM276942)
2005.269.07.39.33.295683 Status_PLM_LCL4_I is currently 0.00607919460163 (extracted from TLM
YM280942)
2005.269.07.39.33.297013 Status_PLM_LCL5_V is currently 0.0325310118496 (extracted from TLM
YM292942)
2005.269.07.39.33.298351 Status_PLM_LCL5_I is currently 0.000759899325203 (extracted from TLM
YM296942)
2005.269.07.39.33.299687 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.07.39.33.301005 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.269.07.39.33.302315 Status_PLM_LCL7_V is currently 0.034854657948 (extracted from TLM
YM324942)
2005.269.07.39.33.303630 Status_PLM_LCL7_I is currently 0.00506599526852 (extracted from TLM
YM328942)
2005.269.07.39.33.304953 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.07.39.33.306273 Status_PLM_LCL8_I is currently 0.000506599550135 (extracted from TLM
YM344942)
```

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2005.269.07.39.33.307684 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.07.39.33.309013 Status_PLM_LCL9_I is currently 0.00101319910027 (extracted from TLM
YM360942)
2005.269.07.39.33.310345 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.07.39.33.312665 Status_PLM_LCL10_I is currently 0.000253299775068 (extracted from TLM
YM376942)
2005.269.07.39.33.314114 Status_PLM_LCL11_V is currently 0.00929457508028 (extracted from TLM
YM388942)
2005.269.07.39.33.315458 Status_PLM_LCL11_I is currently 0.000253299775068 (extracted from TLM
YM392942)
2005.269.07.39.33.316793 Status_PLM_LCL12_V is currently 0.00697093131021 (extracted from TLM
YM404942)
2005.269.07.39.33.318134 Status_PLM_LCL12_I is currently 0.000506599550135 (extracted from TLM
YM408942)
2005.269.07.39.33.319575 Status_PLM_LCL13_V is currently 0.0185891501606 (extracted from TLM
YM420942)
2005.269.07.39.33.321194 Status_PLM_LCL13_I is currently 0.000506599550135 (extracted from TLM
YM424942)
2005.269.07.39.33.322690 Status_PLM_LCL14_V is currently 0.092945754528 (extracted from TLM
YM436942)
2005.269.07.39.33.324042 Status_PLM_LCL14_I is currently 0.000253299775068 (extracted from TLM
YM440942)
2005.269.07.39.33.324766 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2005.269.07.39.33.325411 <<<<<<<  Power Sequence Ended!
2005.269.07.39.33.326045 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

Appendix 4: Log of PACS_POWER_ON_NonPrime.tcl (used for PACS power on)

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2005.269.12.06.32.984255
********************************************************************************
2005.269.12.06.32.985217 Start of PACS POWER ON sequence.
********************************************************************************
2005.269.12.06.32.985542
2005.269.12.06.32.985773 To run this script, the CDMU DFE and PLM SCOE should be
2005.269.12.06.32.986009 powered and configured.
2005.269.12.06.32.986237 To initiate, this script will connect and attach to the CDMUDFE
2005.269.12.06.32.986473 and PLM SCOE.
2005.269.12.06.32.986699
2005.269.12.06.32.986947 >>> Connecting to CDMU DFE.
2005.269.12.06.35.992208 >>> Attaching to CDMU DFE.
2005.269.12.06.38.999033
2005.269.12.06.38.999397 >>> Connecting to PLM SCOE.
2005.269.12.06.42.003911 >>> Attaching to PLM SCOE.
2005.269.12.06.45.006855
2005.269.12.06.45.007222 >>> Reading out CDMUDFE Settings
2005.269.12.06.45.007639
2005.269.12.06.45.104860 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.269.12.06.45.106652 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.269.12.06.45.108309 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.269.12.06.45.109917 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.269.12.06.45.111525 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.269.12.06.45.113170 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.269.12.06.45.114681 Status_CDMU_PSTfileName is SPIRE_prime_inst... (extracted from TLM
YM809944)
2005.269.12.06.45.116429 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
2005.269.12.06.45.116986
2005.269.12.06.45.117480 >>> Reading out PLM SCOE Settings
2005.269.12.06.45.117994
2005.269.12.06.45.249510 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.12.06.45.251633 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.269.12.06.45.253804 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.269.12.06.45.255963 Status_PLM_PSU2_Master is currently 0 (extracted from TLM YM177942)
2005.269.12.06.45.258115 Status_PLM_PSU2_Slave is currently 0 (extracted from TLM YM193942)
2005.269.12.06.45.261581 Status_PLM_LCL1_V is currently 27.8604888916 (extracted from TLM
YM228942)
2005.269.12.06.45.264573 Status_PLM_LCL1_I is currently 0.436363458633 (extracted from TLM
YM232942)
2005.269.12.06.45.267996 Status_PLM_LCL2_V is currently 0.0627383813262 (extracted from TLM
YM244942)
2005.269.12.06.45.271092 Status_PLM_LCL2_I is currently 0.00557259470224 (extracted from TLM
YM248942)
2005.269.12.06.45.274548 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.269.12.06.45.277591 Status_PLM_LCL3_I is currently 0.00709239346907 (extracted from TLM
YM264942)
2005.269.12.06.45.281082 Status_PLM_LCL4_V is currently 0.034854657948 (extracted from TLM
YM276942)
2005.269.12.06.45.284178 Status_PLM_LCL4_I is currently 0.00607919460163 (extracted from TLM
YM280942)
2005.269.12.06.45.287694 Status_PLM_LCL5_V is currently 0.0302073694766 (extracted from TLM
YM292942)
2005.269.12.06.45.290815 Status_PLM_LCL5_I is currently 0.000759899325203 (extracted from TLM
YM296942)
2005.269.12.06.45.294947 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.12.06.45.298080 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.269.12.06.45.301637 Status_PLM_LCL7_V is currently 0.034854657948 (extracted from TLM
YM324942)
2005.269.12.06.45.304741 Status_PLM_LCL7_I is currently 0.00506599526852 (extracted from TLM
YM328942)
2005.269.12.06.45.308307 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
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2005.269.12.06.45.311459 Status_PLM_LCL8_I is currently 0.000506599550135 (extracted from TLM
YM344942)
2005.269.12.06.45.315045 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.12.06.45.318228 Status_PLM_LCL9_I is currently 0.00101319910027 (extracted from TLM
YM360942)
2005.269.12.06.45.321821 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.12.06.45.325339 Status_PLM_LCL10_I is currently 0.000253299775068 (extracted from TLM
YM376942)
2005.269.12.06.45.382567 Status_PLM_LCL11_V is currently 0.00929457508028 (extracted from TLM
YM388942)
2005.269.12.06.45.385781 Status_PLM_LCL11_I is currently 0.000506599550135 (extracted from TLM
YM392942)
2005.269.12.06.45.389436 Status_PLM_LCL12_V is currently 0.00697093131021 (extracted from TLM
YM404942)
2005.269.12.06.45.392773 Status_PLM_LCL12_I is currently 0.000506599550135 (extracted from TLM
YM408942)
2005.269.12.06.45.397638 Status_PLM_LCL13_V is currently 0.0185891501606 (extracted from TLM
YM420942)
2005.269.12.06.45.400860 Status_PLM_LCL13_I is currently 0.000506599550135 (extracted from TLM
YM424942)
2005.269.12.06.45.404555 Status_PLM_LCL14_V is currently 0.092945754528 (extracted from TLM
YM436942)
2005.269.12.06.45.408127 Status_PLM_LCL14_I is currently 0.000253299775068 (extracted from TLM
YM440942)
2005.269.12.06.45.408907
2005.269.12.06.45.409544 >>> Switch ON PSU(s)
2005.269.12.06.45.410178
2005.269.12.06.45.505302 >>> Sending Telecommand YC036942
2005.269.12.06.45.505674
2005.269.12.06.45.506408 >>> Checking
2005.269.12.06.51.509783 PSU 2 Master status is currently 1 (from YM177942)
2005.269.12.06.51.510172 PSU 2 Slave status is currently 1 (from YM193942)
2005.269.12.06.51.510841
2005.269.12.06.51.511481 >>> Switch ON DPU
2005.269.12.06.51.512098
2005.269.12.06.51.576001 >>> Sending Telecommand YC040942 to Enable Limiter 13 -> PACS DPU
2005.269.12.06.51.576383
2005.269.12.06.51.679676 >>> Sending Telecommand YC043942 to Set Limiter 13 -> PACS DPU
2005.269.12.06.51.680072
2005.269.12.06.51.680707 >>> Checking
2005.269.12.06.57.685438 LCL 13 has currently a voltage of 27.9418182373.(from YM420942)
2005.269.12.06.57.685842 LCL 13 has currently a current of 0.554726481438.(from YM424942)
2005.269.12.06.57.686480
2005.269.12.07.14.692677 Force Boot DPU
2005.269.12.07.15.830153 ******************** USER INFORMATION ********************
2005.269.12.07.15.830627 User Info>: Please check if the force boot has been executed
correctly and press OK.
2005.269.12.07.15.831265 ************************************************************
2005.269.12.07.24.690050
2005.269.12.07.24.690400
2005.269.12.07.24.691049 >>> Switch ON DEC/MEC
2005.269.12.07.24.691666
2005.269.12.07.24.832475 >>> Sending Telecommand YC040942 to Enable Limiter 12 -> PACS DEC/MEC
2005.269.12.07.24.832855
2005.269.12.07.24.902362 >>> Sending Telecommand YC043942 to Set Limiter 12 -> PACS DEC/MEC
2005.269.12.07.24.902815
2005.269.12.07.24.903434 >>> Checking
2005.269.12.07.30.909090 LCL 12 has currently a voltage of 27.9116096497.(from YM404942)
2005.269.12.07.30.909492 LCL 12 has currently a current of 0.538008749485.(from YM408942)
2005.269.12.07.30.910137
2005.269.12.07.50.915359 DPU reset of 1355
2005.269.12.07.53.016225 Establish DPU --> DMC connection (DPU-START-OBCP, n=19)
2005.269.12.07.57.050087 Copy DMC SW from EEPROM to RAM
2005.269.12.07.59.121657 DMC_LLSW_LOAD_EEPROM
2005.269.12.08.01.156225 Start DMC HLSW
2005.269.12.08.12.228882 DPU starts link with DMC with DPU as slave
2005.269.12.08.15.335344
2005.269.12.08.15.335722
2005.269.12.08.15.336305 >>> Switch ON BOLC
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2005.269.12.08.15.336912
2005.269.12.08.15.439391 >>> Sending Telecommand YC040942 to Enable Limiter 11 -> PACS BOLC
2005.269.12.08.15.439773
2005.269.12.08.15.506414 >>> Sending Telecommand YC043942 to Set Limiter 11 -> PACS BOLC
2005.269.12.08.15.506805
2005.269.12.08.15.507373 >>> Checking
2005.269.12.08.21.511994 LCL 11 has currently a voltage of 27.967376709.(from YM388942)
2005.269.12.08.21.512396 LCL 11 has currently a current of 0.044580757618.(from YM392942)
2005.269.12.08.21.513007
2005.269.12.08.36.517908 DMC_RESET_SMCS_CHIP_2
2005.269.12.08.40.657198 Execute BOLC initialisation including frequency setting
2005.269.12.08.47.799492 set image frequence to 20 Hz
2005.269.12.08.48.939629
2005.269.12.08.48.939992
2005.269.12.08.48.940566 >>> Switch ON SPU
2005.269.12.08.48.941124
2005.269.12.08.49.040933 >>> Sending Telecommand YC040942 to Enable Limiter 14 -> PACS SPU
2005.269.12.08.49.041392
2005.269.12.08.49.152422 >>> Sending Telecommand YC043942 to Set Limiter 14 -> PACS SPU
2005.269.12.08.49.152798
2005.269.12.08.49.153366 >>> Checking
2005.269.12.08.55.157420 LCL 14 has currently a voltage of 28.0463829041.(from YM436942)
2005.269.12.08.55.157820 LCL 14 has currently a current of 0.447327405214.(from YM440942)
2005.269.12.08.55.158451
2005.269.12.09.15.164029 DPU reset of 1355
2005.269.12.09.19.261946 DPU starts link with DMC with DPU as slave
2005.269.12.09.29.368156 DPU starts link with (blue) SPUS with DPU as master
2005.269.12.09.33.442952 DPU starts link with (red) SPUL with DPU as master
2005.269.12.09.37.549061 LOAD SPU RED HLSW FROM EEPROM TO RAM
2005.269.12.09.43.726686 LOAD SPU BLUE HLSW FROM EEPROM TO RAM
2005.269.12.09.51.938993 Start SPUS HLSW
2005.269.12.09.54.977065 DPU starts link with (blue) SPUS with DPU as slave
2005.269.12.09.59.118307 Start SPUL HLSW
2005.269.12.10.02.228648 DPU starts link with (red) SPUL with DPU as slave
2005.269.12.10.07.328501 Establish connection SPUL-DMC, DMC as master
2005.269.12.10.08.437564 Establish connection SPUS-DMC, DMC as master
2005.269.12.10.10.540401 Establish connection DMC-SPURS DMC Master
2005.269.12.10.11.610352 Establish connection DMC-SPURL DMC Master
2005.269.12.10.14.751887 FPU T-sensors are activated
2005.269.12.10.14.752265
2005.269.12.10.14.752867
2005.269.12.10.14.753424 >>> Reading out CDMUDFE Settings
2005.269.12.10.14.753990
2005.269.12.10.14.755159 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.269.12.10.14.756227 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.269.12.10.14.757278 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.269.12.10.14.758328 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.269.12.10.14.759353 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.269.12.10.14.760485 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.269.12.10.14.761556 Status_CDMU_PSTfileName is SPIRE_prime_inst... (extracted from TLM
YM809944)
2005.269.12.10.14.762611 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
2005.269.12.10.14.763268
2005.269.12.10.14.763853 >>> Reading out PLM SCOE Settings
2005.269.12.10.14.764437
2005.269.12.10.14.765848 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.12.10.14.767024 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.269.12.10.14.768195 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.269.12.10.14.769399 Status_PLM_PSU2_Master is currently 1 (extracted from TLM YM177942)
2005.269.12.10.14.770471 Status_PLM_PSU2_Slave is currently 1 (extracted from TLM YM193942)
2005.269.12.10.14.772093 Status_PLM_LCL1_V is currently 27.8604888916 (extracted from TLM
YM228942)
2005.269.12.10.14.773630 Status_PLM_LCL1_I is currently 0.436057686806 (extracted from TLM
YM232942)
2005.269.12.10.14.774775 Status_PLM_LCL2_V is currently 0.0627383813262 (extracted from TLM
YM244942)
2005.269.12.10.14.775959 Status_PLM_LCL2_I is currently 0.00607919460163 (extracted from TLM
YM248942)
2005.269.12.10.14.777047 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
```

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2005.269.12.10.14.778179 Status_PLM_LCL3_I is currently 0.00709239346907 (extracted from TLM
YM264942)
2005.269.12.10.14.779298 Status_PLM_LCL4_V is currently 0.034854657948 (extracted from TLM
YM276942)
2005.269.12.10.14.780407 Status_PLM_LCL4_I is currently 0.00607919460163 (extracted from TLM
YM280942)
2005.269.12.10.14.781497 Status_PLM_LCL5_V is currently 0.0325310118496 (extracted from TLM
YM292942)
2005.269.12.10.14.782595 Status_PLM_LCL5_I is currently 0.000759899325203 (extracted from TLM
YM296942)
2005.269.12.10.14.783759 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.12.10.14.784862 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.269.12.10.14.785962 Status_PLM_LCL7_V is currently 0.0325310118496 (extracted from TLM
YM324942)
2005.269.12.10.14.787079 Status_PLM_LCL7_I is currently 0.0045593958348 (extracted from TLM
YM328942)
2005.269.12.10.14.788285 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.12.10.14.789389 Status_PLM_LCL8_I is currently 0.00405279640108 (extracted from TLM
YM344942)
2005.269.12.10.14.790500 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.12.10.14.791664 Status_PLM_LCL9_I is currently 0.00253299763426 (extracted from TLM
YM360942)
2005.269.12.10.14.793064 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.12.10.14.794232 Status_PLM_LCL10_I is currently 0.00278629735112 (extracted from TLM
YM376942)
2005.269.12.10.14.795563 Status_PLM_LCL11_V is currently 27.9650535583 (extracted from TLM
YM388942)
2005.269.12.10.14.796708 Status_PLM_LCL11_I is currently 0.044580757618 (extracted from TLM
YM392942)
2005.269.12.10.14.797831 Status_PLM_LCL12_V is currently 27.8906974792 (extracted from TLM
YM404942)
2005.269.12.10.14.798994 Status_PLM_LCL12_I is currently 0.759392678738 (extracted from TLM
YM408942)
2005.269.12.10.14.800109 Status_PLM_LCL13_V is currently 27.9464645386 (extracted from TLM
YM420942)
2005.269.12.10.14.801250 Status_PLM_LCL13_I is currently 0.491654872894 (extracted from TLM
YM424942)
2005.269.12.10.14.802428 Status_PLM_LCL14_V is currently 28.0208206177 (extracted from TLM
YM436942)
2005.269.12.10.14.803621 Status_PLM_LCL14_I is currently 0.751033782959 (extracted from TLM
YM440942)
2005.269.12.10.14.804373
2005.269.12.10.14.805014
*********************************************************************************
2005.269.12.10.14.806015 PACS Power On Sequence has ended
*********************************************************************************
2005.269.12.10.14.806780
```

Appendix 5: Log of INSTR_POWER_ON.tcl (used for HIFI power on)

```
2005.269.12.17.01.102062
*******************************************************************************
2005.269.12.17.01.102974 Start of Instrument POWER ON sequence.
*******************************************************************************
2005.269.12.17.01.103305
2005.269.12.17.01.103542  To run this script, the CDMU DFE and PLM SCOE should be
2005.269.12.17.01.103780  powered and configured.
2005.269.12.17.01.104001  To initiate, this script will connect and attach to the CDMUDFE
2005.269.12.17.01.104231  and PLM SCOE.
2005.269.12.17.01.104450
2005.269.12.17.01.104671 Connecting to CDMU DFE
2005.269.12.17.03.108773 Attaching to CMDU DFE
2005.269.12.17.04.116257
2005.269.12.17.04.116618 Connecting to PLM SCOE
2005.269.12.17.06.119511 Attaching to PLM SCOE
2005.269.12.17.07.123111 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.123507 >>>>>>>>  Reading out CDMUDFE Settings
2005.269.12.17.07.123918 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.124332
2005.269.12.17.07.220829 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.269.12.17.07.222579 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.269.12.17.07.224201 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.269.12.17.07.225823 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.269.12.17.07.227478 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.269.12.17.07.229187 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.269.12.17.07.230781 Status_CDMU_PSTfileName is HIFI_prime_inst.... (extracted from TLM
YM809944)
2005.269.12.17.07.232641 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
2005.269.12.17.07.233240
2005.269.12.17.07.233738 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.234281 >>>>>>>>  Reading out PLM SCOE Settings
2005.269.12.17.07.234796 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.235322
2005.269.12.17.07.454390 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.12.17.07.510233 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.269.12.17.07.512417 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.269.12.17.07.514579 Status_PLM_PSU2_Master is currently 1 (extracted from TLM YM177942)
2005.269.12.17.07.516785 Status_PLM_PSU2_Slave is currently 1 (extracted from TLM YM193942)
2005.269.12.17.07.520270 Status_PLM_LCL1_V is currently 27.8604888916 (extracted from TLM
YM228942)
2005.269.12.17.07.523358 Status_PLM_LCL1_I is currently 0.46887922287 (extracted from TLM
YM232942)
2005.269.12.17.07.526881 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.269.12.17.07.529841 Status_PLM_LCL2_I is currently 0.00607919460163 (extracted from TLM
YM248942)
2005.269.12.17.07.532920 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.269.12.17.07.535878 Status_PLM_LCL3_I is currently 0.00709239346907 (extracted from TLM
YM264942)
2005.269.12.17.07.539623 Status_PLM_LCL4_V is currently 0.0371783003211 (extracted from TLM
YM276942)
2005.269.12.17.07.542721 Status_PLM_LCL4_I is currently 0.00607919460163 (extracted from TLM
YM280942)
2005.269.12.17.07.546090 Status_PLM_LCL5_V is currently 0.0302073694766 (extracted from TLM
YM292942)
2005.269.12.17.07.548761 Status_PLM_LCL5_I is currently 0.000759899325203 (extracted from TLM
YM296942)
2005.269.12.17.07.551853 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.12.17.07.554538 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.269.12.17.07.557680 Status_PLM_LCL7_V is currently 0.034854657948 (extracted from TLM
YM324942)
2005.269.12.17.07.560403 Status_PLM_LCL7_I is currently 0.00506599526852 (extracted from TLM
YM328942)
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2005.269.12.17.07.563559 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.12.17.07.566278 Status_PLM_LCL8_I is currently 0.00405279640108 (extracted from TLM
YM344942)
2005.269.12.17.07.569485 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.12.17.07.572305 Status_PLM_LCL9_I is currently 0.00253299763426 (extracted from TLM
YM360942)
2005.269.12.17.07.575541 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.12.17.07.578272 Status_PLM_LCL10_I is currently 0.00278629735112 (extracted from TLM
YM376942)
2005.269.12.17.07.581633 Status_PLM_LCL11_V is currently 27.9650535583 (extracted from TLM
YM388942)
2005.269.12.17.07.584515 Status_PLM_LCL11_I is currently 0.0448340587318 (extracted from TLM
YM392942)
2005.269.12.17.07.587748 Status_PLM_LCL12_V is currently 27.8906974792 (extracted from TLM
YM404942)
2005.269.12.17.07.590512 Status_PLM_LCL12_I is currently 0.749767303467 (extracted from TLM
YM408942)
2005.269.12.17.07.593757 Status_PLM_LCL13_V is currently 27.9511127472 (extracted from TLM
YM420942)
2005.269.12.17.07.596544 Status_PLM_LCL13_I is currently 0.490135043859 (extracted from TLM
YM424942)
2005.269.12.17.07.599810 Status_PLM_LCL14_V is currently 28.0254669189 (extracted from TLM
YM436942)
2005.269.12.17.07.602606 Status_PLM_LCL14_I is currently 0.748247563839 (extracted from TLM
YM440942)
2005.269.12.17.07.603380
2005.269.12.17.07.604022
*********************************************************************************
2005.269.12.17.07.605055 Power On Instruments
*********************************************************************************
2005.269.12.17.07.605792
2005.269.12.17.07.606427
2005.269.12.17.07.607090
2005.269.12.17.07.607728 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.608375 >>>>>>>>  Start Up Instruments
2005.269.12.17.07.609013 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.17.07.609646
2005.269.12.17.07.645506  Which instrument needs to be Powered? PACS, SPIRE, HIFI, CCU?
2005.269.12.17.12.325302  You have selected to power HIFI.
2005.269.12.17.12.325891
2005.269.12.17.12.326550  The current power on order is:
2005.269.12.17.12.327404  --------------------------------
2005.269.12.17.12.342172  1. LCL 3    HIFI ICU    Primary    Voltage: 0.00929457508028 V
Current: 0.00709239346907 A
2005.269.12.17.12.343807  2. LCL 7    HIFI HRH    Primary    Voltage: 0.034854657948 V
Current: 0.00506599526852 A
2005.269.12.17.12.345351  3. LCL 5    HIFI WEH    Primary    Voltage: 0.0302073694766 V
Current: 0.000759899325203 A
2005.269.12.17.12.346897  4. LCL 4    HIFI LCU    Primary    Voltage: 0.0371783003211 V
Current: 0.00607919460163 A
2005.269.12.17.12.347662  5. LCL 0    N/A    Primary    Voltage: N/A V     Current: N/A A
2005.269.12.17.12.348351  6. LCL 0    N/A    Primary    Voltage: N/A V     Current: N/A A
2005.269.12.17.12.349006
2005.269.12.17.12.383219  Do you want to change this order? : Choose Yes or No
2005.269.12.17.14.732267  User has chosen NO
2005.269.12.17.16.735347
2005.269.12.17.16.769438  Do you want to enable the PSU(s)? : Choose Yes or No
2005.269.12.17.17.892986  User has chosen YES
2005.269.12.17.19.896461
2005.269.12.17.19.992569  Sending Telecommand YC036942
2005.269.12.17.19.992938  Synchronizing on SEV...
2005.269.12.17.19.994103  Synchronised on SEV for TC(s): YC036942
2005.269.12.17.19.994771
2005.269.12.17.19.995362  >>> Checking
2005.269.12.17.26.000727  PSU 1 Master status is currently 1 (from YM129942)
2005.269.12.17.26.001121  PSU 1 Slave status is currently 1 (from YM145942)
2005.269.12.17.26.002035
2005.269.12.17.26.039728 ******************* USER INFORMATION *******************
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2005.269.12.17.26.040537 User Info>: Check Successful! PSU 1 has been enabled.
2005.269.12.17.26.041169 ********************************************************
2005.269.12.17.27.570591
2005.269.12.17.27.652066  Sending Telecommand YC036942
2005.269.12.17.27.652437  Synchronizing on SEV...
2005.269.12.17.27.675216  Synchronised on SEV for TC(s): YC036942
2005.269.12.17.27.675703
2005.269.12.17.27.676369  >>> Checking
2005.269.12.17.33.681915  PSU 2 Master status is currently 1 (from YM177942)
2005.269.12.17.33.682303  PSU 2 Slave status is currently 1 (from YM193942)
2005.269.12.17.33.683024
2005.269.12.17.33.713553 ******************** USER INFORMATION ********************
2005.269.12.17.33.714276 User Info>: Check Successful! PSU 2 has been enabled.
2005.269.12.17.33.714882 ********************************************************
2005.269.12.17.35.389017
2005.269.12.17.35.389419  >>> Start Enabling LCL's
2005.269.12.17.35.390016
2005.269.12.17.35.485420  Do you want to enable LCL 3? : Choose Yes or No
2005.269.12.17.36.788216  User has chosen YES
2005.269.12.17.38.792634
2005.269.12.17.38.931554  Sending Telecommand YC040942 to Enable Limiter
2005.269.12.17.38.931928  Synchronizing on SEV...
2005.269.12.17.38.933040  Synchronised on SEV for TC(s): YC040942
2005.269.12.17.38.933670
2005.269.12.17.38.998468  Sending Telecommand YC043942 to Set Limiter
2005.269.12.17.38.998846  Synchronizing on SEV...
2005.269.12.17.39.049659  Synchronised on SEV for TC(s): YC043942
2005.269.12.17.39.050173
2005.269.12.17.39.050747  >>> Checking
2005.269.12.17.45.053096  LCL 3 has currently a voltage of 27.9371700287.(from YM260942)
2005.269.12.17.45.053501  LCL 3 has currently a current of 0.524837136269.(from YM264942)
2005.269.12.17.45.054102
2005.269.12.17.45.083654 ******************** USER INFORMATION ********************
2005.269.12.17.45.084373 User Info>: Check Successful! LCL 3 has been enabled.
2005.269.12.17.45.084967 ********************************************************
2005.269.12.17.50.438979
2005.269.12.17.50.492914  Do you want to enable LCL 7? : Choose Yes or No
2005.269.12.49.57.672091  User has chosen YES
2005.269.12.49.59.675991
2005.269.12.49.59.793630  Sending Telecommand YC040942 to Enable Limiter
2005.269.12.49.59.794003  Synchronizing on SEV...
2005.269.12.49.59.795078  Synchronised on SEV for TC(s): YC040942
2005.269.12.49.59.795717
2005.269.12.49.59.861820  Sending Telecommand YC043942 to Set Limiter
2005.269.12.49.59.862207  Synchronizing on SEV...
2005.269.12.49.59.886136  Synchronised on SEV for TC(s): YC043942
2005.269.12.49.59.886668
2005.269.12.49.59.887255  >>> Checking
2005.269.12.50.05.892445  LCL 7 has currently a voltage of 27.7350139618.(from YM324942)
2005.269.12.50.05.892854  LCL 7 has currently a current of 2.42965149879.(from YM328942)
2005.269.12.50.05.893457
2005.269.12.50.05.924879 ******************** USER INFORMATION ********************
2005.269.12.50.05.925643 User Info>: Check Successful! LCL 7 has been enabled.
2005.269.12.50.05.926254 ********************************************************
2005.269.12.50.21.664505
2005.269.12.50.21.692053  Do you want to enable LCL 5? : Choose Yes or No
2005.269.12.50.26.155398  User has chosen YES
2005.269.12.50.28.160073
2005.269.12.50.28.247210  Sending Telecommand YC040942 to Enable Limiter
2005.269.12.50.28.247579  Synchronizing on SEV...
2005.269.12.50.28.259085  Synchronised on SEV for TC(s): YC040942
2005.269.12.50.28.259488
2005.269.12.50.28.314223  Sending Telecommand YC043942 to Set Limiter
2005.269.12.50.28.314592  Synchronizing on SEV...
2005.269.12.50.28.358423  Synchronised on SEV for TC(s): YC043942
2005.269.12.50.28.358880
2005.269.12.50.28.359472  >>> Checking
2005.269.12.50.34.363052  LCL 5 has currently a voltage of 27.9394931793.(from YM292942)
2005.269.12.50.34.363456  LCL 5 has currently a current of 0.951900541782.(from YM296942)
2005.269.12.50.34.364124
2005.269.12.50.34.412135 ******************** USER INFORMATION ********************
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2005.269.12.50.34.412970 User Info>: Check Successful! LCL 5 has been enabled.
2005.269.12.50.34.413576 ********************************************************
2005.269.12.50.46.181827
2005.269.12.50.46.210027  Do you want to enable LCL 4? : Choose Yes or No
2005.269.12.51.03.777590  User has chosen YES
2005.269.12.51.05.781658
2005.269.12.51.05.916817  Sending Telecommand YC040942 to Enable Limiter
2005.269.12.51.05.917189  Synchronizing on SEV...
2005.269.12.51.05.918254  Synchronised on SEV for TC(s): YC040942
2005.269.12.51.05.918903
2005.269.12.51.05.985691  Sending Telecommand YC043942 to Set Limiter
2005.269.12.51.05.986164  Synchronizing on SEV...
2005.269.12.51.06.008575  Synchronised on SEV for TC(s): YC043942
2005.269.12.51.06.009076
2005.269.12.51.06.009680  >>> Checking
2005.269.12.51.12.014924  LCL 4 has currently a voltage of 27.9371700287.(from YM276942)
2005.269.12.51.12.015325  LCL 4 has currently a current of 0.75179374218.(from YM280942)
2005.269.12.51.12.015928
2005.269.12.51.12.043930 ******************** USER INFORMATION ********************
2005.269.12.51.12.044704 User Info>: Check Successful! LCL 4 has been enabled.
2005.269.12.51.12.045312 ********************************************************
2005.269.12.51.36.407758
2005.269.12.51.36.436844 ******************** USER INFORMATION ********************
2005.269.12.51.36.437614 User Info>: No LCL is selected to be switched on as fifth
2005.269.12.51.36.438227 ********************************************************
2005.269.12.51.36.887199
2005.269.12.51.36.914045 ******************** USER INFORMATION ********************
2005.269.12.51.36.914764 User Info>: No LCL is selected to be switched on as sixth
2005.269.12.51.36.915374 ********************************************************
2005.269.12.51.37.239413
2005.269.12.51.37.239806
2005.269.12.51.37.240415  All selected LCL's for HIFI are powered.
2005.269.12.51.37.241011
2005.269.12.51.37.267953  Do you want to power on another instrument? : Choose Yes or No
2005.269.12.51.38.376007  User has chosen NO
2005.269.12.51.40.379083
2005.269.12.51.40.379786 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.51.40.380418 >>>>>>>>  Reading out PLM SCOE Settings
2005.269.12.51.40.381028 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.269.12.51.40.381646
2005.269.12.51.40.382918 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.269.12.51.40.384205 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.269.12.51.40.385354 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.269.12.51.40.386739 Status_PLM_PSU2_Master is currently 1 (extracted from TLM YM177942)
2005.269.12.51.40.394995 Status_PLM_PSU2_Slave is currently 1 (extracted from TLM YM193942)
2005.269.12.51.40.396342 Status_PLM_LCL1_V is currently 27.8604888916 (extracted from TLM
YM228942)
2005.269.12.51.40.397810 Status_PLM_LCL1_I is currently 0.474587321281 (extracted from TLM
YM232942)
2005.269.12.51.40.398955 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.269.12.51.40.400111 Status_PLM_LCL2_I is currently 0.00557259470224 (extracted from TLM
YM248942)
2005.269.12.51.40.401251 Status_PLM_LCL3_V is currently 27.9394931793 (extracted from TLM
YM260942)
2005.269.12.51.40.402362 Status_PLM_LCL3_I is currently 0.491908162832 (extracted from TLM
YM264942)
2005.269.12.51.40.403463 Status_PLM_LCL4_V is currently 27.9394931793 (extracted from TLM
YM276942)
2005.269.12.51.40.404571 Status_PLM_LCL4_I is currently 0.72139775753 (extracted from TLM
YM280942)
2005.269.12.51.40.405688 Status_PLM_LCL5_V is currently 27.9394931793 (extracted from TLM
YM292942)
2005.269.12.51.40.406834 Status_PLM_LCL5_I is currently 0.953420341015 (extracted from TLM
YM296942)
2005.269.12.51.40.407965 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.269.12.51.40.409100 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.269.12.51.40.410224 Status_PLM_LCL7_V is currently 27.7303638458 (extracted from TLM
YM324942)
```

```
2005.269.12.51.40.411343 Status_PLM_LCL7_I is currently 2.49297642708 (extracted from TLM
YM328942)
2005.269.12.51.40.412507 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.269.12.51.40.413663 Status_PLM_LCL8_I is currently 0.00405279640108 (extracted from TLM
YM344942)
2005.269.12.51.40.414797 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.269.12.51.40.415934 Status_PLM_LCL9_I is currently 0.00253299763426 (extracted from TLM
YM360942)
2005.269.12.51.40.417079 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.269.12.51.40.418305 Status_PLM_LCL10_I is currently 0.00278629735112 (extracted from TLM
YM376942)
2005.269.12.51.40.419443 Status_PLM_LCL11_V is currently 27.967376709 (extracted from TLM
YM388942)
2005.269.12.51.40.420643 Status_PLM_LCL11_I is currently 0.0448340587318 (extracted from TLM
YM392942)
2005.269.12.51.40.421808 Status_PLM_LCL12_V is currently 27.8883743286 (extracted from TLM
YM404942)
2005.269.12.51.40.422949 Status_PLM_LCL12_I is currently 0.762432277203 (extracted from TLM
YM408942)
2005.269.12.51.40.424080 Status_PLM_LCL13_V is currently 27.9487876892 (extracted from TLM
YM420942)
2005.269.12.51.40.425240 Status_PLM_LCL13_I is currently 0.488615244627 (extracted from TLM
YM424942)
2005.269.12.51.40.426453 Status_PLM_LCL14_V is currently 28.0254669189 (extracted from TLM
YM436942)
2005.269.12.51.40.427620 Status_PLM_LCL14_I is currently 0.742928206921 (extracted from TLM
YM440942)
2005.269.12.51.40.428350 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2005.269.12.51.40.429010 <<<<<<<  Power Sequence Ended!
2005.269.12.51.40.429655 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
```

Appendix 6: Log of PACS_POWER_OFF.tcl

```
2005.273.13.06.58.491302
*******************************************************************************
2005.273.13.06.58.492210 Start of Instrument POWER OFF sequence.
*******************************************************************************
2005.273.13.06.58.492522
2005.273.13.06.58.492746  To run this script, the CDMU DFE and PLM SCOE should be
2005.273.13.06.58.492978  powered and configured.
2005.273.13.06.58.493201  To initiate, this script will connect and attach to the CDMUDFE
2005.273.13.06.58.493431  and PLM SCOE.
2005.273.13.06.58.493657
2005.273.13.06.58.493880 Connecting to CDMU DFE
2005.273.13.07.00.499526 Attaching to CMDU DFE
2005.273.13.07.01.505032
2005.273.13.07.01.505380 Connecting to PLM SCOE
2005.273.13.07.03.508372 Attaching to PLM SCOE
2005.273.13.07.04.511893 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.512256 >>>>>>>>  Reading out CDMUDFE Settings
2005.273.13.07.04.512671 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.513091
2005.273.13.07.04.647267 Status_CDMU_OnLine is 1 (extracted from TLM YM777944)
2005.273.13.07.04.650316 Status_CDMU_TMpolling is 1 (extracted from TLM YM780944)
2005.273.13.07.04.652902 Status_CDMU_SAreadActive is 1 (extracted from TLM YM781944)
2005.273.13.07.04.655391 Status_CDMU_SAqueueActive is 1 (extracted from TLM YM782944)
2005.273.13.07.04.657934 Status_CDMU_TMqueueActive is 1 (extracted from TLM YM783944)
2005.273.13.07.04.660485 Status_CDMU_TCqueueActive is 1 (extracted from TLM YM784944)
2005.273.13.07.04.662811 Status_CDMU_PSTfileName is PACS_prime_inst.... (extracted from TLM
YM809944)
2005.273.13.07.04.665360 Status_CDMU_PSTrunning is 1 (extracted from TLM YM829944)
2005.273.13.07.04.665977
2005.273.13.07.04.666481 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.667056 >>>>>>>>  Reading out PLM SCOE Settings
2005.273.13.07.04.667598 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.668121
2005.273.13.07.04.805816 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.273.13.07.04.808236 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.273.13.07.04.810816 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.273.13.07.04.813274 Status_PLM_PSU2_Master is currently 1 (extracted from TLM YM177942)
2005.273.13.07.04.815639 Status_PLM_PSU2_Slave is currently 1 (extracted from TLM YM193942)
2005.273.13.07.04.820163 Status_PLM_LCL1_V is currently 0.00697093131021 (extracted from TLM
YM228942)
2005.273.13.07.04.823467 Status_PLM_LCL1_I is currently 0.00101930263918 (extracted from TLM
YM232942)
2005.273.13.07.04.827813 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.273.13.07.04.831108 Status_PLM_LCL2_I is currently 0.00607919460163 (extracted from TLM
YM248942)
2005.273.13.07.04.835521 Status_PLM_LCL3_V is currently 27.9418182373 (extracted from TLM
YM260942)
2005.273.13.07.04.838869 Status_PLM_LCL3_I is currently 0.482789337635 (extracted from TLM
YM264942)
2005.273.13.07.04.843252 Status_PLM_LCL4_V is currently 27.9418182373 (extracted from TLM
YM276942)
2005.273.13.07.04.846668 Status_PLM_LCL4_I is currently 0.72139775753 (extracted from TLM
YM280942)
2005.273.13.07.04.851080 Status_PLM_LCL5_V is currently 27.9418182373 (extracted from TLM
YM292942)
2005.273.13.07.04.854420 Status_PLM_LCL5_I is currently 0.955446720123 (extracted from TLM
YM296942)
2005.273.13.07.04.858819 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.273.13.07.04.862132 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.273.13.07.04.866613 Status_PLM_LCL7_V is currently 27.7164230347 (extracted from TLM
YM324942)
2005.273.13.07.04.870003 Status_PLM_LCL7_I is currently 2.62671852112 (extracted from TLM
YM328942)
```

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2005.273.13.07.04.874440 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.273.13.07.04.877863 Status_PLM_LCL8_I is currently 0.0045593958348 (extracted from TLM
YM344942)
2005.273.13.07.04.882264 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.273.13.07.04.885767 Status_PLM_LCL9_I is currently 0.00253299763426 (extracted from TLM
YM360942)
2005.273.13.07.04.890355 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.273.13.07.04.893796 Status_PLM_LCL10_I is currently 0.00278629735112 (extracted from TLM
YM376942)
2005.273.13.07.04.898436 Status_PLM_LCL11_V is currently 27.967376709 (extracted from TLM
YM388942)
2005.273.13.07.04.902520 Status_PLM_LCL11_I is currently 0.0448340587318 (extracted from TLM
YM392942)
2005.273.13.07.04.907846 Status_PLM_LCL12_V is currently 27.8906974792 (extracted from TLM
YM404942)
2005.273.13.07.04.911595 Status_PLM_LCL12_I is currently 0.746221125126 (extracted from TLM
YM408942)
2005.273.13.07.04.916413 Status_PLM_LCL13_V is currently 27.9511127472 (extracted from TLM
YM420942)
2005.273.13.07.04.920092 Status_PLM_LCL13_I is currently 0.486335545778 (extracted from TLM
YM424942)
2005.273.13.07.04.924942 Status_PLM_LCL14_V is currently 28.0208206177 (extracted from TLM
YM436942)
2005.273.13.07.04.928657 Status_PLM_LCL14_I is currently 0.74267488718 (extracted from TLM
YM440942)
2005.273.13.07.04.929405
2005.273.13.07.04.930037
*************************************************************************
2005.273.13.07.04.931034 Power On Instruments
*************************************************************************
2005.273.13.07.04.931800
2005.273.13.07.04.932425
2005.273.13.07.04.933029
2005.273.13.07.04.933682 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.934318 >>>>>>>>  Start Up Instruments
2005.273.13.07.04.934948 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.07.04.935577
2005.273.13.07.04.963824  Which instrument needs to be Powered down? PACS, SPIRE, HIFI, CCU?
2005.273.13.07.08.503778  You have selected to power down HIFI.
2005.273.13.07.08.504338
2005.273.13.07.08.505020  The current power down order is:
2005.273.13.07.08.505652  --------------------------------
2005.273.13.07.08.507401  1. LCL 4    HIFI LCU     Voltage: 27.9418182373 V     Current:
0.72139775753 A
2005.273.13.07.08.508938  2. LCL 5    HIFI WEH     Voltage: 27.9418182373 V     Current:
0.956713199615 A
2005.273.13.07.08.510470  3. LCL 7    HIFI HRH     Voltage: 27.7187461853 V     Current:
2.62671852112 A
2005.273.13.07.08.511983  4. LCL 3    HIFI ICU     Voltage: 27.9418182373 V     Current:
0.485322386026 A
2005.273.13.07.08.512735  5. LCL 0    N/A     Voltage: N/A V     Current: N/A A
2005.273.13.07.08.513419  6. LCL 0    N/A     Voltage: N/A V     Current: N/A A
2005.273.13.07.08.514070
2005.273.13.07.08.540052  Do you want to change this order? : Choose Yes or No
2005.273.13.07.10.872977  User has chosen NO
2005.273.13.07.12.876548
2005.273.13.07.12.876937  >>> Disable LCL's
2005.273.13.07.12.877564
2005.273.13.07.12.913804  Do you want to disable LCL 4? : Choose Yes or No
2005.273.13.07.14.211961  User has chosen YES
2005.273.13.07.16.215326
2005.273.13.07.16.317286  Sending Telecommand YC041942 to Disable Limiter
2005.273.13.07.16.317666  Synchronizing on SEV...
2005.273.13.07.16.318809  Synchronised on SEV for TC(s): YC041942
2005.273.13.07.16.319481
2005.273.13.07.16.320071  >>> Checking
2005.273.13.07.22.325515  LCL 4 has currently a voltage of 0.034854657948.(from YM276942)
2005.273.13.07.22.325915  LCL 4 has currently a current of 0.00607919460163.(from YM280942)
```

```
2005.273.13.07.22.326533
2005.273.13.07.22.346709 ******************** USER INFORMATION ********************
2005.273.13.07.22.347485 User Info>: Check Successful! LCL 4 has been disabled.
2005.273.13.07.22.348133 ************************************************************
2005.273.13.07.23.170636
2005.273.13.07.23.196823  Do you want to disable LCL 5? : Choose Yes or No
2005.273.13.07.24.590462  User has chosen YES
2005.273.13.07.26.594807
2005.273.13.07.26.665472  Sending Telecommand YC041942 to Disable Limiter
2005.273.13.07.26.665843  Synchronizing on SEV...
2005.273.13.07.26.666905  Synchronised on SEV for TC(s): YC041942
2005.273.13.07.26.667627
2005.273.13.07.26.668194  >>> Checking
2005.273.13.07.32.673754  LCL 5 has currently a voltage of 0.0325310118496.(from YM292942)
2005.273.13.07.32.674153  LCL 5 has currently a current of 0.000759899325203.(from YM296942)
2005.273.13.07.32.674764
2005.273.13.07.32.695395 ******************** USER INFORMATION ********************
2005.273.13.07.32.696137 User Info>: Check Successful! LCL 5 has been disabled.
2005.273.13.07.32.696748 ************************************************************
2005.273.13.07.33.696916
2005.273.13.07.33.721517  Do you want to disable LCL 7? : Choose Yes or No
2005.273.13.07.34.783881  User has chosen YES
2005.273.13.07.36.786882
2005.273.13.07.36.912542  Sending Telecommand YC041942 to Disable Limiter
2005.273.13.07.36.912912  Synchronizing on SEV...
2005.273.13.07.36.913984  Synchronised on SEV for TC(s): YC041942
2005.273.13.07.36.914618
2005.273.13.07.36.915182  >>> Checking
2005.273.13.07.42.918567  LCL 7 has currently a voltage of 0.034854657948.(from YM324942)
2005.273.13.07.42.918966  LCL 7 has currently a current of 0.00506599526852.(from YM328942)
2005.273.13.07.42.919567
2005.273.13.07.42.950649 ******************** USER INFORMATION ********************
2005.273.13.07.42.951431 User Info>: Check Successful! LCL 7 has been disabled.
2005.273.13.07.42.952037 ************************************************************
2005.273.13.07.43.762324
2005.273.13.07.43.788015  Do you want to disable LCL 3? : Choose Yes or No
2005.273.13.07.45.250792  User has chosen YES
2005.273.13.07.47.254203
2005.273.13.07.47.365923  Sending Telecommand YC041942 to Disable Limiter
2005.273.13.07.47.366294  Synchronizing on SEV...
2005.273.13.07.47.367336  Synchronised on SEV for TC(s): YC041942
2005.273.13.07.47.367972
2005.273.13.07.47.368540  >>> Checking
2005.273.13.07.53.374165  LCL 3 has currently a voltage of 0.00929457508028.(from YM260942)
2005.273.13.07.53.374560  LCL 3 has currently a current of 0.00759899290279.(from YM264942)
2005.273.13.07.53.375171
2005.273.13.07.53.407256 ******************** USER INFORMATION ********************
2005.273.13.07.53.407981 User Info>: Check Successful! LCL 3 has been disabled.
2005.273.13.07.53.408583 ************************************************************
2005.273.13.07.54.553035
2005.273.13.07.54.590951 ******************** USER INFORMATION ********************
2005.273.13.07.54.591748 User Info>: No LCL is selected to be switched on as fifth
2005.273.13.07.54.592355 ************************************************************
2005.273.13.07.55.688854
2005.273.13.07.55.724032 ******************** USER INFORMATION ********************
2005.273.13.07.55.724792 User Info>: No LCL is selected to be switched on as sixth
2005.273.13.07.55.725404 ************************************************************
2005.273.13.07.56.325314
2005.273.13.07.56.350461  Do you want to disable PSU(s)? : Choose Yes or No
2005.273.13.07.58.362092  User has chosen NO
2005.273.13.08.00.365266
2005.273.13.08.00.366596  PSU 1 Master status is currently 1 (from YM129942)
2005.273.13.08.00.367260  PSU 1 Slave status is currently 1 (from YM145942)
2005.273.13.08.00.368563  PSU 2 Master status is currently 1 (from YM177942)
2005.273.13.08.00.369206  PSU 2 Slave status is currently 1 (from YM193942)
2005.273.13.08.00.369798
2005.273.13.08.00.370376  Power down of HIFI is done.
2005.273.13.08.00.371153
2005.273.13.08.00.405762  Do you want to power down another instrument? : Choose Yes or No
2005.273.13.08.02.200516  User has chosen NO
2005.273.13.08.04.203901
```

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2005.273.13.08.04.204575 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.08.04.205189 >>>>>>>>  Reading out PLM SCOE Settings
2005.273.13.08.04.205773 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
2005.273.13.08.04.206347
2005.273.13.08.04.207558 Status_PLM_OnLine is 1 (extracted from TLM YM018942)
2005.273.13.08.04.208617 Status_PLM_PSU1_Master is currently 1 (extracted from TLM YM129942)
2005.273.13.08.04.209680 Status_PLM_PSU1_Slave is currently 1 (extracted from TLM YM145942)
2005.273.13.08.04.210921 Status_PLM_PSU2_Master is currently 1 (extracted from TLM YM177942)
2005.273.13.08.04.211993 Status_PLM_PSU2_Slave is currently 1 (extracted from TLM YM193942)
2005.273.13.08.04.213088 Status_PLM_LCL1_V is currently 0.00697093131021 (extracted from TLM
YM228942)
2005.273.13.08.04.214172 Status_PLM_LCL1_I is currently 0.000917372351978 (extracted from TLM
YM232942)
2005.273.13.08.04.215301 Status_PLM_LCL2_V is currently 0.0650620236993 (extracted from TLM
YM244942)
2005.273.13.08.04.216395 Status_PLM_LCL2_I is currently 0.00607919460163 (extracted from TLM
YM248942)
2005.273.13.08.04.217493 Status_PLM_LCL3_V is currently 0.00929457508028 (extracted from TLM
YM260942)
2005.273.13.08.04.218828 Status_PLM_LCL3_I is currently 0.00759899290279 (extracted from TLM
YM264942)
2005.273.13.08.04.220294 Status_PLM_LCL4_V is currently 0.034854657948 (extracted from TLM
YM276942)
2005.273.13.08.04.221471 Status_PLM_LCL4_I is currently 0.00607919460163 (extracted from TLM
YM280942)
2005.273.13.08.04.222609 Status_PLM_LCL5_V is currently 0.0325310118496 (extracted from TLM
YM292942)
2005.273.13.08.04.223711 Status_PLM_LCL5_I is currently 0.000759899325203 (extracted from TLM
YM296942)
2005.273.13.08.04.224821 Status_PLM_LCL6_V is currently 0.0766802430153 (extracted from TLM
YM308942)
2005.273.13.08.04.225923 Status_PLM_LCL6_I is currently 0.00379949645139 (extracted from TLM
YM312942)
2005.273.13.08.04.227012 Status_PLM_LCL7_V is currently 0.034854657948 (extracted from TLM
YM324942)
2005.273.13.08.04.228107 Status_PLM_LCL7_I is currently 0.00506599526852 (extracted from TLM
YM328942)
2005.273.13.08.04.229222 Status_PLM_LCL8_V is currently 0.00929457508028 (extracted from TLM
YM340942)
2005.273.13.08.04.230376 Status_PLM_LCL8_I is currently 0.0045593958348 (extracted from TLM
YM344942)
2005.273.13.08.04.231544 Status_PLM_LCL9_V is currently 0.00697093131021 (extracted from TLM
YM356942)
2005.273.13.08.04.232680 Status_PLM_LCL9_I is currently 0.00253299763426 (extracted from TLM
YM360942)
2005.273.13.08.04.233848 Status_PLM_LCL10_V is currently 0.00929457508028 (extracted from TLM
YM372942)
2005.273.13.08.04.234972 Status_PLM_LCL10_I is currently 0.00278629735112 (extracted from TLM
YM376942)
2005.273.13.08.04.236085 Status_PLM_LCL11_V is currently 27.967376709 (extracted from TLM
YM388942)
2005.273.13.08.04.237489 Status_PLM_LCL11_I is currently 0.0448340587318 (extracted from TLM
YM392942)
2005.273.13.08.04.238930 Status_PLM_LCL12_V is currently 27.8930225372 (extracted from TLM
YM404942)
2005.273.13.08.04.240210 Status_PLM_LCL12_I is currently 0.742168307304 (extracted from TLM
YM408942)
2005.273.13.08.04.241364 Status_PLM_LCL13_V is currently 27.9511127472 (extracted from TLM
YM420942)
2005.273.13.08.04.242530 Status_PLM_LCL13_I is currently 0.486335545778 (extracted from TLM
YM424942)
2005.273.13.08.04.243674 Status_PLM_LCL14_V is currently 28.0231437683 (extracted from TLM
YM436942)
2005.273.13.08.04.244795 Status_PLM_LCL14_I is currently 0.74267488718 (extracted from TLM
YM440942)
2005.273.13.08.04.245492 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
2005.273.13.08.04.246134 <<<<<<<  Power Sequence Ended!
2005.273.13.08.04.246843 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
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Appendix 7: HP-111000-ASED-NC-1513 – SPIRE EQM Cooler recycling

Tuesday October 4 2005 9:59 AM

Company	Project Name	NCR-No: HP-112000-ASED-NC-1513
ESTEC	HERSCHEL-PLANCK	Related internal NCR-No:
		Critical Item: Yes ☐ No ☒ Revision 1
		Page 1 of 5

Nonconformance Report

NCR Title SPIRE EQM Cooler recycling

NC Item Identification SPIRE

Next Higher Assembly HERSCHEL INSTRUMENTS AND TELESCOPE (CFE)

Drawing No | Sr No. EQM

Procedure No

Supplier RAL | Purchase Order

Subsystem | Model EQM

NC Observation
Date: 27-SEP-05 Location: ASEDOTN

NC Detected During Test

Description of Nonconformance

The first SPIRE cooler recycling performed on 26.09.05 only achieved a temp of app 0.420 K and a hold time of
less than 3 hrs.
A second recycle was tried on 27.09.05 after the cryostat had been pumped/evacuated for 3 hrs.
The air lock had been closed for app 10 days when the PLM was moved to the tilting dolly prior to the start of IMT,Pump was still running following the reintegration.
The leak detection was 10-4mblt/sec.
The second recycle achieved a temp of 0.328k but this is not sufficient for performance tests.(Temp plots to
be attached).
Customer NRB to be held 27.09.05 (telecon ESA)

Requirements Violated

SPIRE IMT TP

Initiator: Date, Name and Signature 27-SEP-05 D.Hendry

Internal NRB Dispositions

27.09.05 ESA,ASP,ASED,RAL.
SPIRE consider that IMT cannot continue until cooler recycling can be successfully performed and a temp below 0.300k can be achieved.
The possible causes of the failure were identified as follows.
1)He 4 leak causing a He film on the detector surface.This was seen during ILT and the temp was increased to 4.2k to remove the film and was successful in achieving a good recycling and hold time.
2)He 3 problem with strap or heat switch.
The NRB agrees 2 parallel actions.
AI/1 SPIRE to analyse the load curves to investigate problems of strap and heat switch
AI/2 ASED to heat up AXT to 4.2k and continue pumping for 24 to 36 hrs (till 29.09.05 morning)to remove the He film from the detector and evaporator surfaces and remove the He.
Vacuum and leak detection will be monitored.
Temp,vacuum and leak detection values will be assessen prior to a further cooler recycle on 29.09.05 AM, the results of this test will be discussed in a follow on NRB to be reconvened after the test.

Ref. to MoMs

Classification:
Major ☒ **Minor** ☐

Customer Notification
27-SEP-05

Cause of NC Ref to Failure Report	Corrective/Preventative Actions	Verification

	PA	Engineering									
Date: Name: Signature:	27-SEP-05 D.Hendry	27-SEP-05 S.Idler	27-SEP-05 D.Hendry	27-SEP-05 C.Schlosser	27-SEP-05 S.Ilsen	27-SEP-05 G.Doubrovik	27-SEP-05 C.Jewell	27-SEP-05 C.Scharmberg	27-SEP-05 W.Pinter-Krainer	27-SEP-05 B.Swinyard	

13 Distribution List

	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	AOE22		Sonn Nico	AOE51
	Barlage Bernhard	AED11		Steininger Eric	AED44
	Bayer Thomas	AOA52	X	Stritter Rene	AED11
	Brune Holger	AOA55		Thörmer Klaus-Horst Dr.	OTN/AED65
	Fehringer Alexander	AOE13		Wagner Klaus	AOE22
X	Fricke Wolfgang Dr.	AED 65	X	Wietbrock Walter	AET12
	Geiger Hermann	AOA52		Wöhler Hans	AOE22
	Gerner Willi	AED11		Wössner Ulrich	ASE442
X	Grasl Andreas	OTN/AOA54			
	Grasshoff Brigitte	AET12			
	Hauser Armin	AOE22			
X	Hendry David	Terma Resid.			
	Hengstler Reinhold	AOA 5			
	Hinger Jürgen	AOE22	X	Alcatel	ASP
	Hofmann Rolf	ASE442	X	ESA/ESTEC	ESA
X	Hohn Rüdiger	AED65		**Instruments:**	
	Huber Johann	AOA52	X	MPE (PACS)	MPE
	Hund Walter	ASE442	X	RAL (SPIRE)	RAL
X	Idler Siegmund	AED432	X	SRON (HIFI)	SRON
X	Ilsen Stijn	Terma Resid.		**Subcontractors:**	
	Ivády von András	FAE22		Air Liquide, Space Department	AIR
	Jahn Gerd Dr.	AOE22		Air Liquide, Space Department	AIRS
	Kalde Clemens	APE3		Air Liquide, Orbital System	AIRT
	Kameter Rudolf	OTN/AOA54		Alcatel Bell Space	ABSP
	Kettner Bernhard	AET42		Astrium Sub-Subsyst. & Equipment	ASSE
X	Knoblauch August	AET32		Austrian Aerospace	AAE
X	Koelle Markus	AOA53		Austrian Aerospace	AAEM
X	Kroeker Jürgen	AED65		APCO Technologies S. A.	APCO
	Kunz Oliver Dr.	AOE22		Bieri Engineering B. V.	BIER
X	Lamprecht Ernst	OTN/ASI21		BOC Edwards	BOCE
	Lang Jürgen	ASE442		Dutch Space Solar Arrays	DSSA
	Langenstein Rolf	AED15		EADS CASA Espacio	CASA
	Langfermann Michael	AOA51		EADS CASA Espacio	ECAS
X	Mack Paul	OTN/AOA54		EADS Space Transportation	ASIP
	Müller Jörg	AOA52		Eurocopter	ECD
	Müller Ralf	FAE22		European Test Services	ETS
	Peltz Heinz-Willi	AOE13		HTS AG Zürich	HTSZ
	Pietroboni Karin	AED65		Linde	LIND
	Platzer Wilhelm	AED22		Patria New Technologies Oy	PANT
	Reichle Konrad	AOA52		Phoenix, Volkmarsen	PHOE
	Reuß Friedhelm	AED62		Prototech AS	PROT
X	Rühe Wolfgang	AED65		QMC Instruments Ltd.	QMC
	Runge Axel	OTN/AOA54		Rembe, Brilon	REMB
	Sachsse Bernt	AED21		Rosemount Aerospace GmbH	ROSE
	Schink Dietmar	AED44		RYMSA, Radiación y Microondas	RYM

	Name	Dep./Comp.		Name	Dep./Comp.
X	Schlosser Christian	OTN/AOA54		SENER Ingenieria SA	SEN
	Schmidt Rudolf	FAE22		Stöhr, Königsbrunn	STOE
	Schweickert Gunn	AOE22		Terma A/S, Herlev	TER

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