Title: **Instrument Thermal Behaviour Test and Straylight investigation on PLM EQM Level**

CI-No: 153000

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Distribution: See Distribution List (last page)

Issue	Date	Sheet	Description of Change	Release
1	09/12/ 2005		First Issue	

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1 Scope

1.1 Objective

This test report describes the results of the Instrument Thermal Behaviour Test and Straylight investigation on PLM EQM Level. These are extra tests executed at the end of the EQM phase.

The test was performed at ASED in Ottobrunn from 5/12/2005 to 9/12/2005.

1.2 Summary

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

The following NCR's have been raised:

- HP-113000-ASED-NC-1831 - DEC_MEC not responding to commands

The following NCR's have been altered:

- N/A

An overview can be found in chapter 10.2

Conclusion:

All tests were completed successfully. No major problems were found on the operations side of the test. Detailed analysis of the straylight and thermal tests will be described in separate reports (see TRR and PTR minutes).

Extra Comments:

- In the night of Wednesday to Thursday, the PLM SCOE and CDMU DFE restarted. The cause is unknown, but it is believed that this was due to a temporarily power cut, since both workstations restarted at the same time. No further investigations will be done since this behaviour has not occurred before and seems to be caused by an accident.

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

SPECIFIC TEST PROCEDURE

HP-2-ASED-TP-0093, Issue 1.0 from 01.12.2005

2.2 Reference Documents

N/A

2.3 Other Documents

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
EGSE Operator	Stijn Ilsen
Instrument Engineer	A. Nader, H. Feuchtgruber
PA Responsible	D. Hendry
ESA/Alcatel Representative	B. Collaudin, W. Pinter-Krainer, C. Scharmberg

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

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

Software

HIFI

SW Ident	Issue /Version	Responsible	Comment
Inst ICU OBS	3.2	Inst	
Inst LCU OBS	17.0	Inst	01.10.2004

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	7.65	Inst	
Inst DPU Boot OBSW	1.0	Inst	

SPIRE

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

IEGSE Configuration PACS

SW Ident	Issue /Version	Responsible	Comment

MIB on I-EGSE	7_18	Inst	
HCSS Build Version	687	Inst	
PACS Build	20050706A	Inst	

IEGSE Configuration SPIRE

SW Ident	Issue /Version	Responsible	Comment
MIB on I-EGSE	SPIRE_MIB_CQM2_2.0.A2_after_WUC_08	Inst	
HCSS Build Version	644	Inst	
SPIRE Build	159	Inst	

IEGSE Configuration HIFI

SW Ident	Issue /Version	Responsible	Comment
MIB on I-EGSE	57	Inst	
HCSS Build Version	644	Inst	
HIFI Build	249	Inst	

CCS Configuration

SW Ident	Issue /Version	Responsible	Comment
TCL Scripts HIFI	ist_cus_0.9_tcl.zip	Inst	Delivered on 02.12.2005
TCL Scripts PACS	PACS_TCL_20051109_B.zip	Inst	Delivered on 09.11.2005
TCL Scripts SPIRE	SPIRE_EQM_IMT_1_1.tar.gz	Inst	Delivered on 23.09.2005 Some scripts have been changed during IMT. SPIRE has version control.
CCS MIB Bridge files	CCS_Her_PLM__01_v1_2.zip	ASP	2005-09-08 Some dat files have been changed by ASED. All changes are included in the test reports
CCS S/W Release	2.0.637	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	2.4.0.0	SSBV	Part of CDMU DFE Workstation

P7001)			
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

4.4.1 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.

- TMD.DAT – The CCS specific SPID of all type 1 packets have been added to the tmd.dat file. This is a workaround for ASED-NC-1619

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

The CCS session was still running from the EMC tests. All SCOE's and EGSE are configured as defined in HP-2-ASED-PR-0035 (EGSE Configuration Procedure)

The CCS test session name is: 2005_12_05_07_14_ilsens_hpws42_REALTIME_ESA_SYS_1

The bus profile loaded on the bus at the start of the test is: Inst_sdby.pst

6 Step by Step Procedure: Power On Instruments

All instrument were already in STANDBY from last weeks EMC test (SPIRE)

7 Step by Step Procedure: Instrument Thermal Behaviour

7.1 Test Preparation

7.1.1 EGSE and Cryostat Setup

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Set-up PLM EGSE & CCS.			As per RD 01 **CCS is restarted on morning of first test day (05/12/2005).**	**X**	
2	Ensure that all cryostat related activities (dewar exchanges, etc.) and cryostat parameters (mass flows, temperatures, etc.) are recorded throughout the test.			**OK**	**X**	
3	Adjust mass flow through heat shields.	200 mg/s (TBC)	**131.1 mg/s**	**He flow through the cover is 131.1 mg/s**	**X**	
4	Adjust mass flow through cryocover to achieve the required cover temperature:	< 20 K (TBC), stable	**45.50 K**	Cryo cover temperature to b decided prior to test.	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
5	Adjust mass flow through AXT to achieve the required L0, L1 and L2 temperatures: HIFI L0 HIFI L1 HIFI L2 PACS L0 PACS L1 SPIRE L0 SPIRE L1	 < 2 K < 6 K < 20 K < 1.8 K < 5 K < 1.8 K < 5 K	 1.83 K 4.93 K 13.3 K 1.75 K 4.74 1.75 K **5.84 K**			**X**
6	Allow shield temperatures, L0, L1 and L2 temperatures and cryocover temperature to stabilise. In case of exceeding of the limits repeat steps 3 to 5 above.				**X**	

7.1.2 Switch HIFI from Off to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load HIFI_prime_inst.pst bus profile on CDMU DFE.			**N/A** **HIFI was already in STANDBY mode from previous EMC tests**	**X**	
2	Execute TCL script HIFI_POWER_ON.tcl. from CCS.			**N/A**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
3	Switch HK rate to once every 5 sec by a manual stack command from CCS.			**N/A**	**X**	

7.1.3 Switch PACS from Off to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load PACS_prime_inst.pst bus profile on CDMU DFE.			**N/A** **PACS was already in STANDBY mode from previous EMC tests**	**X**	
2	Execute TCL script PACS_POWER_ON.tcl from CCS			**N/A**	**X**	

7.1.4 Switch SPIRE from Off to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load SPIRE_prime_inst.pst bus profile on CDMU DFE			**N/A** **SPIRE was already in STANDBY mode from previous EMC tests**	**X**	
2	Execute TCL script SFT-SPIRE-CCS-DPU-ON.tcl from CCS			**N/A** See RD 5, Appendix 1	**X**	
3	Execute TCL script SFT-SPIRE-CCS-DRCU-ON.tcl from CCS			**N/A** See RD 5, Appendix 1	**X**	
4	Execute TCL script SFT-SPIRE-CCS-FUNC-SCU-03.tcl from CCS			**N/A** See RD 5, Appendix 1	**X**	
5	Execute TCL script SFT-SPIRE-CCS-FUNC-SCU-06.tcl from CCS			**N/A** See RD 5, Appendix 1	**X**	

7.2 Thermal Behaviour Test

7.2.1 Switch HIFI from Stand-by to Primary Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that cryostat temperatures have stabilised: HIFI L0 HIFI L1 HIFI L2 PACS L0 PACS L1 SPIRE L0 SPIRE L1 Cryocover	 < 2 K < 6 K < 20 K < 1.8 K < 5 K < 1.8 K < 5 K < 20 K	 1.83 K 4.93 K 13.3 K 1.75 K 4.74 1.75 K **5.84 K** **45.50 K**	**Cover is not stable below 20 K.**		**X**
2	Load HIFI_prime_inst.pst bus profile on CDMU DFE.				**X**	
3	Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.			**Execution Time:** **11h52m41s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.			This script is included because the LOU simulator integration was wrong and needs to be corrected. For these activities HIFI should be in STANBDY mode. Execution Time: 12h14m04s UTC	X	
Extra	Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.			Execution Time: 12h28m47s UTC Problem detected: Hard of limits on HM082194. Action required: Goto Standby and retry script		X

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	**Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.**			**Execution Time: 12h32m33s UTC**	**X**	
Extra	**Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.**			**Execution Time: 12h34m36s UTC**	**X**	
4	Switch RF on.				**X**	
Extra	**Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__60.tcl. This takes about 18 sec.**			**Execution Time: 12h42m14s UTC**	**X**	
5	Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__63.tcl. This takes about 18 sec.			**Execution Time: 12h45m12s UTC**	**X**	
6	Execute script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__575.tcl. This takes around 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference).			**Execution Time: 12h54m54s UTC**	**X**	
7	Execute script IST_WU_Init_FPU__Band0.config.tcl. This is to switch to band0 without resetting any of the other subsystems.			**Execution Time: 13h18m19s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
8	Execute script IST_HIFI_Thermal_Void_30.tcl. Repeat script until FPU temperatures have stabilized (about 1/2 hr). Use different parameters as required: IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60 (xx expresses the minutes how long the script shall run). The script performs the record of the temperatures.			**Execution Time: 13h19m25s UTC**	**X**	
Extra	Execute script IST_HIFI_Thermal_Void_10.tcl.			**Execution Time: 13h58m17s UTC**	**X**	
9	Execute again script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__575.tcl. This takes around 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference).			**Execution Time: 14h13m39s UTC**	**X**	

7.2.2 Switch HIFI from Primary to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that temperatures (switching transients) have stabilised.				X	
2	Switch LSU simulator RF off.				X	
3	Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.			**Execution Time: 14h45m05s UTC**	X	

7.2.3 PACS Cooler Recycle

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load PACS_prime_inst.pst bus profile on CDMU DFE.				X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
2	Execute TCL script BOLO_cooler_OBS_shell.tcl from CCS			**Execution Time:** **14h47m46s UTC** **During the execution of the script, type (1,8) packets from PACS arrived on the CCS. Looking into the DPU HK showed that the link with DEC/MEC was lost. (known NCR HP-113000-ASED-NC-1494)** **PACS (Erich Wiezorrek) is contacted and he advised to power down PACS and power back on again. This was also the recovery action during previous occurrences of the NCR.**		**X**

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	PACS_POWER_OFF.tcl			Execution Time: 14h51m59s UTC	X	
Extra	PACS_POWER_ON.tcl			Execution Time: 14h53m20s UTC Link to DEC/MEC seems to be alright (ON in HK)	X	
Extra	Execute TCL script BOLO_cooler_OBS_shell.tcl from CCS			Execution Time: 14h57m03s UTC	X	

7.2.4 Switch PACS to Prime Mode (Dual-Band Photometry)

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script PHOT_setup_OBS_shell.tcl from CCS			**Execution Time: 17h03m58s UTC**	**X**	
2	Execute TCL script PACS_PHOT_SPU_setup.tcl from CCS			**Execution Time: 17h12m10s UTC**	**X**	
3	Execute TCL script Chop_mov_abs_obs_shell.tcl from CCS			**Execution Time: 17h12m35s UTC**	**X**	

7.2.5 Switch PACS from Prime (Dual-Band Photometry) to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that temperatures (switching transients) have stabilised.				**X**	
2	Execute TCL script ENTER_SAFE_Mode_Shell.tcl from CCS			**Execution Time: 17h23m24s UTC**	**X**	

7.2.6 Switch HIFI from Stand-by to Primary Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load HIFI_prime_inst.pst bus profile on CDMU DFE.				X	
2	Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.			**Execution Time: 17h24m57s UTC**	X	
3	Switch RF on.				X	
Extra	Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__60.tcl. This takes about 18 sec.			**Execution Time: 17h27m54s UTC**	X	
4	Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__63.tcl. This takes about 18 sec.			**Execution Time: 17h28m39s UTC**	X	
5	Execute script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__575.tcl. This takes around 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference).			**Execution Time: 17h29m12s UTC**	X	
Extra	Switch RF off.					
6	Execute script IST_WU_Init_FPU__Band0.config.tcl. This is to switch to band0 without resetting any of the other subsystems.			**Execution Time: 17h50m54s UTC**	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
7	Execute script IST_HIFI_Thermal_Void_**60**.tcl. Repeat script until FPU temperatures have stabilized (about 1/2 hr). Use different parameters as required: IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60 (xx expresses the minutes how long the script shall run). The script performs the record of the temperatures.			**Execution Time: 17h52m08s UTC**	**X**	
End of Day 1 (5/12/2005) and start of day 2 (6/12/2005)						
Extra	**Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.**			**Execution Time: 07h08m52s UTC**	**X**	
Extra	**Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.**			**Execution Time: 07h11m29s UTC**	**X**	
Extra	**Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__60.tcl. This takes about 18 sec.**			**Execution Time: 07h20m05s UTC**	**X**	
Extra	**Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__63.tcl. This takes about 18 sec.**			**Execution Time: 07h21m23s UTC**	**X**	
8	Execute again script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__**880**.tcl. **This script is selected on demand of HIFI instead of the 575 script. This to have some more observation-time.**			**Execution Time: 07h23m05s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
9 (extra)	Switch LSU simulator RF off. **Step added on demand of N. Whyborn (HIFI) before the start of the test. This since it is not allowed to leave the LO on, unattended.**				**X**	

7.2.7 Switch HIFI from Primary to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that temperatures (switching transients) have stabilised.				**X**	
~~2~~	~~Switch LSU simulator RF off.~~ **This step is not executed on demand of N. Whyborn (HIFI) since the LO should be switched of the previous day.**				**X**	
3	Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.			**Execution Time:** **07h58m00s UTC**	**X**	

7.2.8 SPIRE Cooler Recycle

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load SPIRE_prime_inst.pst bus profile on CDMU DFE.				X	
2	Execute TCL script SPIRE-IMT-CREC.tcl from CCS			**Execution Time:** **08h02m33s UTC**	X	

7.2.9 Switch SPIRE to Observe Mode (Photometry)

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script SPIRE-IMT-PHOTSTBY.tcl from CCS. This step is actually composed of 3 different scripts: 1.SPIRE-IMT-PDET-ON-STEP1 2.SPIRE-IMT-PDET-ON-STEP2 3.SPIRE-IMT-NOMINAL-BIAS-P			**Execution Time:** **10h20m50s UTC** **10h21m54s UTC** **10h23m36s UTC**	X	

7.2.10 Switch SPIRE from Observe Mode (Photometry) to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that temperatures (switching transients) have stabilised.				X	
2	Execute TCL script SPIRE-IMT-PHOTREDY.tcl from CCS. This step should be SPIRE-IMT-STOP-P (Comments from SPIRE, A. Aramburu) SPIRE-IMT-PDET-OFF (Comments from SPIRE, A. Aramburu)			**Execution Time:** **11h02m28s UTC** **11h03m03s UTC** **The STOP-P script had to be executed twice because the CCShandler was not configured correct the first time. This caused that the**	X	

7.2.11 Switch HIFI from Stand-by to Primary Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load HIFI_prime_inst.pst bus profile on CDMU DFE.				X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
2	Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.			**Execution Time: 11h08m17s UTC**	**X**	
3	Switch RF on.				**X**	
Extra	**Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__60.tcl. This takes about 18 sec.**			**Execution Time: 11h13m32s UTC**	**X**	
4	Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__63.tcl. This takes about 18 sec.			**Execution Time: 11h15m05s UTC**	**X**	
5	Execute script IST_HIFI_Thermal_Test__Band3cold.config__wb2__**B**__807__575.tcl. This takes around 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference).			**Execution Time: 11h15m41s UTC The script with option B is executed to use BOTH polarisations. This is done to generate more heat during the test**	**X**	

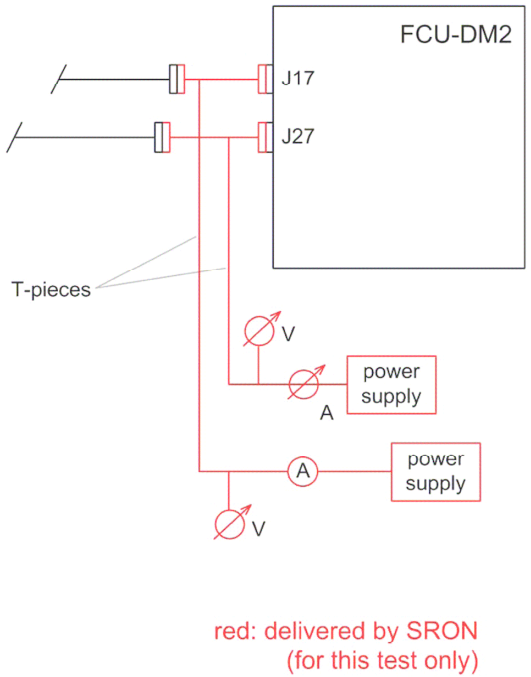
Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute script IST_HIFI_Thermal_Void_10.tcl			Execution Time: 12h40m03s UTC This script is included to mark the data for the upcoming demagnetisation heater test.	X	
Extra	Manual Stack Command: HC091289 (Parameter: 20000 ms) HC095289 (Parameter: 20000 ms)			Execution Time: 12h43m19s UTC 12h43m42s UTC This step is included to heat up L0 with a quite considerable heat load (coming from the demagnetisation heaters).	X	
The following steps are skipped on demand of HIFI. They are not necessary anymore after the previous procedure variations.						

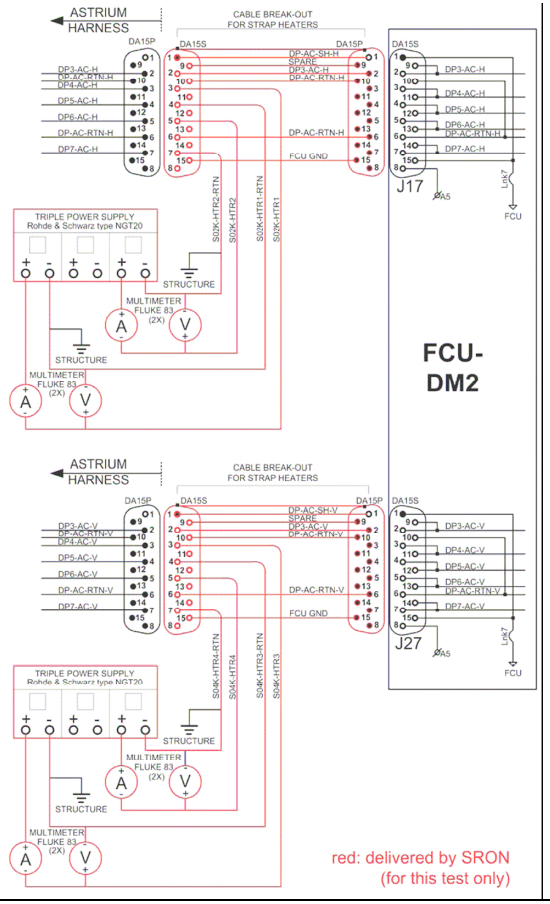
Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
~~6~~	~~Execute script IST_WU_Init_FPU__Band0.config.tcl. This is to switch to band0 without resetting any of the other subsystems.~~					
~~7~~	~~Execute script IST_HIFI_Thermal_Void_30.tcl. Repeat script until FPU temperatures have stabilized (about 1/2 hr). Use different parameters as required: IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60 (xx expresses the minutes how long the script shall run). The script performs the record of the temperatures.~~					
~~8~~	~~Execute again script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__575.tcl. This takes around 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference).~~					

7.2.12 Switch HIFI from Primary to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Check that temperatures (switching transients) have stabilised.				X	
2	Switch LSU simulator RF off.				X	
3	Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. This takes about 58 sec.			**Execution Time: 13h06m10s UTC**	X	

7.2.13 HIFI FPU Thermal Tests

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Connect power supplies for the heaters as shown below. 			See also RD 07	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
					X	
2						

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
3	Power the heaters sequentially with 2, 4, 6 and 0 mW, both L0 and L1. Wait after each power step until temperatures have stabilised. This takes about 90 minutes. During that time execute and repeat script IST_HIFI_Thermal_Void_xx.tcl. with xx = 10, 20, 30, 40, 50 or 60 as required (xx expresses the minutes how long the script shall run).			**Execution Time:** **13h06m10s UTC** **The script with a duration of 60 is used.** **The steps are 2,4,6 and 10 mW**	**X**	
4	Execute script IST_HIFI_Thermal_Init__Band3cold.config__wb2__807.tcl. This takes about 80 sec.			**Execution Time:** **14h48m00s UTC**	**X**	
5	Switch RF on.				**X**	
6	Execute script IST_HIFI_SPT_LO_tune__Band3cold.config__807__63.tcl. This takes about 18 sec.			**Execution Time:** **14h54m04s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
7	Execute script IST_HIFI_Thermal_Void_**20**.tcl. Repeat script until FPU temperatures have stabilized (about 1/2 hr). Use different parameters as required: IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60, xx expresses the minutes how long the script shall run. The script performs the record of the temperatures.			**Execution Time:** **14h55m40s UTC** **The script with duration 20 is used instead of duration 30 on request of HIFI**	**X**	
8	Power heaters of L0 with **0.24** mW equal to an active band (heaters of L1 are kept on 0 mW). Continue execution of script IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60 as required (xx expresses the minutes how long the script shall run), until temperature has stabilized. **Procedure adaptation: TBD mW replaced by 0.24 mW before the start of the test. This change was requested by N. Whyborn (HIFI).**				**X**	
9	Switch off heaters.				**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
10	Execute script IST_HIFI_Thermal_Test__Band3cold.config__wb2__B__807__575.tcl. This takes about 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference). This script switches on both polarizations to get a representative dissipation in the FPU.			**This step failed because HIFI implemented the wrong power setting. Some additional steps are included to repeat this step**	**X**	
Extra	**Execute script IST_WU_Init_FPU__Band0.config.tcl. This is to switch to band0 without resetting any of the other subsystems.**			**Execution Time: 15h48m30s UTC**	**X**	
Extra	Execute script IST_HIFI_Thermal_Void_**10**.tcl. Repeat script until FPU temperatures have stabilized (about 1/2 hr). Use different parameters as required: IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60, xx expresses the minutes how long the script shall run. The script performs the record of the temperatures.			**Execution Time: 15h54m42s UTC**	**X**	
Extra	Power heaters of L0 with **0.24** mW equal to an active band (heaters of L1 are kept on 0 mW). Continue execution of script IST_HIFI_Thermal_Void_xx.tcl with xx = 10, 20, 30, 40, 50 or 60 as required (xx expresses the minutes how long the script shall run), until temperature has stabilized.				**X**	
11	Execute IST_WU_Init_FPU__Band0.config.tcl. This is to switch to band0 without resetting any of the other subsystems. **Steps 11 to 17 have been changed before the start of the test on request from N. Whyborn (HIFI).**				**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
12	Power heaters of L0 with 0.24mW equal to an active band (heaters of L1 are kept on 0 mW). Execute script IST_HIFI_Thermal_Void_10.tcl or as required until temperature has stabilized.			Execution Time: 16h29m57s UTC	X	
13	Switch heaters off.				X	
14	Execute script IST_HIFI_Thermal_Test__Band3cold.config__wb2__H__807__575.tcl. This takes about 20 min. of integration, with 30 extra seconds between the switch on of the FPU and the effective start (this is mostly due to the time needed to do the Hot/Cold reference). This script switches on only horizontal polarization to allow acquisition of valid spectra.			Execution Time: 16h42m40s UTC	X	
15	Switch RF off (was originally at step 11)				X	
16	Execute TCL script IST_HIFI_standby_internal_source_ON__Band0.config__807__wb2.tcl. (was step 12)			Execution Time: 17h06m02s UTC	X	
Extra	To see the influence of a heat load on L1 better, some extra tests are done. The heater on L1 is powered with incrementing steps of 2 mA (1 mA on the 2 heaters). This is done on request of B. Collaudin (Alcatel).				X	
17	Remove T-adapters etc (was step 13).				X	

8 Step by Step Procedure: Straylight

Important remark: At the beginning of the test, PACS noticed that the data rate of SPIRE and HIFI was too high for STANDBY mode. This is solved by sending manual commands from the CCS. These commands should actually be included in the TCL scripts.

- **HIFI:**
  - **HC011289 (Housekeeping_on) with parameter 0 (= once every 5 seconds)**
- **SPIRE**
  - **CLEAR_HK_REPORT with parameter 0x301**
  - **DEFINE_NEW_HK_REPORT with parameters 0x301,0x301,0xFA0,1,1**

8.1 Straylight Measurement II (LO Windows)

Make sure HIFI is in STANDBY before executing this test! (This check is added on request of N. Whyborn, HIFI)

8.1.1 Cryostat Setup

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Ensure that all cryostat related activities (dewar exchanges, etc.) and cryostat parameters (mass flows, temperatures, etc.) are recorded throughout the test.				**X**	
2	Adjust mass flow through heat shields.	200 mg/s (TBC)	**131.1 mg/s**	**He flow through the cover is 131.1 mg/s**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
3	Adjust mass flow through AXT to achieve the required L0 and L1 temperatures to allow proper PACS cooler recycle and PACS operation PACS L0 PACS L1	 < 1.8 K < 5 K	 **1.73 K** **4.15 K**		**X**	
4	Adjust mass flow through cryocover to achieve the required cover temperature:	< 20 K, stable	**19.6 K**	**Cover temperature is 19.6 K and stable**	**X**	

8.1.2 PACS Cooler Recycle

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Load PACS_prime_inst.pst bus profile on CDMU DFE.			**This step was actually done after the cooler recycle (step 2)**	**X**	
2	Execute TCL script BOLO_cooler_OBS_shell.tcl from CCS			**Execution Time:** **07h42m15s UTC**	**X**	

8.1.3 Perform Background Radiation Measurements with PACS during LO window illumination

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script PHOT_setup_OBS_shell.tcl from CCS			**Execution Time: 09h52m36s UTC**	**X**	
2	Put in front of LO window band 3 a heat source (e. g. metal halide lamp) and remove it after 1 minute. Then put a reflecting metal plate in front of the window. Repeat that several times. Switch off on clean room lights. Record CCS time for all activities.				**X**	
3	In parallel to step 2 perform background radiation spectrum measurements by PACS. Execute TCL script PACS_PHOT_SPU_Setup.tcl. Eventually it will require also another script, which is new: PACS_PHOT_CHOP_CS2_obs_shell.tcl. Ensure proper synchronisation of activities in step 2 and step 3 (e. g. generate separate telemetry files for heat source, metal plate and clean room lights switching).			**Execution Time: 10h13m45s UTC**	**X**	
4	In parallel to step 2 perform focal plane map during each illumination and after removal of illumination. For each focal plane map perform steps 5 to 10.			This test step is optional and pending the results of step 3.	**X**	
The expected result of the test (influence of the external light on the bolometers) was not detected. The test is stopped at this point.						
Extra	ENTER_SAFE_MODE_shell.tcl			**Execution Time: 11h10m45s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
5	Phot_Focal_Map_Obs_shell.tcl FOV scan with 50 chopper steps in both filters Duration =0.15h			**N/A**		
6	Enter SAFE mode			**N/A**		
7	Phot_Setup_Obs_Shell.tcl Nominal photometry setup Duration=0.45h			**N/A**		
8	Phot_Focal_Map_Obs_shell.tcl FOV scan with 50 chopper steps in both filters Duration=0.15h			**N/A**		
9	PHOT_Stray_Light_Obs_shell.tcl Detailed FOV scan with 500 chopper steps in both filters Duration =0.6h			**N/A**		
10	Phot_Stray_Light_A_Obs_Shell.tcl Phot_Stray_Light_B_Obs_Shell.tcl Detailed FOV scan with 500 chopper steps in both filters Duration =0.6h			**N/A**		

8.1.4 Switch PACS from Prime to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script ENTER_SAFE_Mode_Shell.tcl from CCS					

8.2 Straylight Measurement III (Heat Shield)

8.2.1 Cryostat Setup

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Ensure that all cryostat related activities (dewar exchanges, etc.) and cryostat parameters (mass flows, temperatures, etc.) are recorded throughout the test.				**X**	
2	Stop mass flow through heat shield and allow warm up during night.		**131.1 mg/s**		**X**	
3	Adjust mass flow through AXT to achieve the required L0 and L1 temperatures to allow proper PACS cooler recycle and PACS operation PACS L0 PACS L1	 < 1.8 K < 5 K	 **1.73 K** **4.15 K**		**X**	
4	Adjust mass flow through cryocover to achieve the required cover temperature:	< 20 K, stable	**19.6 K**	Objective is to decontaminate the cryocover mirrors. **The cover is now at 19.6 K and stable.**	**X**	

8.2.2 Perform Background Radiation Measurements with PACS versus Heat Shield and HTT Temperature

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script SetupSpectroscopyEQMIMT_Shell.tcl from CCS.			**Execution Time: 11h11m05s UTC**	**X**	
2	Adjust mass flow through heat shield to After heat shield coll down warm up HTT by switching the heaters for valves 102 and 104 and the heaters on the bottom of the HTT.	250 mg/sec (TBC)		**He flow through the shields is stopped**	**X**	
3	Perform straylight spectrum measurements during heat shield cool down and HTT warm up: Execute TCL script Background_Adjustment_Shell_01.tcl for TBD heat shield temperatures (each execution takes about 950 sec).				**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 11h24m50s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h21m51s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h38m33s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h59m32s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h16m04s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h33m41s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h51m10s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 14h09m45s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 14h34m29s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 14h52m38s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 15h09m24s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 15h26m48s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 15h46m47s UTC	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **16h13m20s UTC**	**X**	
4	In parallel to step 2 perform Planck curve measurements at TBD cryocover temperatures. Most of the test requires manual commanding since the grating is not performing correctly. At each step we wait 30 seconds to acquire data for the selected grating positions/wavelengths. The entire set of grating positions will allow reconstructing a rough spectral shape of the cryostat background. The data shall be recorded on the I-EGSE in one single telemetry file. For each Planck curve measurement open telemetry file and perform steps 5 to 16.			This test step is optional and pending the results of step 3. It is recommended to record the Planck curve three times, for hot, intermediate and cold cryocover.		
5	Execute TCL scripts : a) rsrf_SPEC_cre_setup.tcl b) rsrf_SPEC_spu_setup.tcl These scripts configure the spectroscopy detectors and the on-board data processing.			**Execution Time:** **16h32m11s UTC** **16h34m11s UTC**	**X**	
6	Step 1 - gratpos 250000 : samples 101 um and 202 um DMC_MOVE_GRAT_ABS 250000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds			**Execution Time:** **16h35m21s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
7	Step 2 - gratpos 350000 : samples 96 um and 193 um DMC_MOVE_GRAT_ABS 350000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
8	Step 3 - gratpos 450000 : samples 91 um and 182 um DMC_MOVE_GRAT_ABS 450000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
9	Step 4 - gratpos 550000 : samples 85 um and 171 um DMC_MOVE_GRAT_ABS 550000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
10	Step 5 - gratpos 650000 : samples 79 um and 158 um DMC_MOVE_GRAT_ABS 650000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
11	Step 6 - gratpos 750000 : samples 72 um and 145 um DMC_MOVE_GRAT_ABS 750000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
12	Step 7 - gratpos 850000 : samples 131 um DMC_MOVE_GRAT_ABS 850000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				**X**	
13	Step 8 - gratpos 950000 : samples 116 um DMC_MOVE_GRAT_ABS 950000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
14	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 500000				**X**	
15	Step 10 - CRE is already in default configuration, stop SPU dataflow Execute tcl scripts: ~~rsrf_SPEC_spu_reset.tcl~~ **SPEC_spu_reset_obs_Shell.tcl** End of the procedure			**Execution Time:** **16h46m34s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **16h48m58s UTC**	**X**	
16	Close telemetry file recording on I-EGSE				**X**	

8.2.3 Switch PACS from Prime to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script ENTER_SAFE_Mode_Shell.tcl from CCS			**Execution Time: 17h07m19s UTC**	**X**	

This is the end of the day (8/12/2005).

8.3 Straylight Measurement I (Cryocover Contamination)

Important remark: This is the start of the day (8/12/2005). Last night, the CDMU DFE and PLM SCOE workstations restarted just after the operators left. The result of this is that no HK packets from the instruments arrived on the CCS during the night. The connection was restarted at 8h00. The PLM SCOE workstation cannot reinitiate the connection with the power scoe front end. No attempts are made to restore this connection since this might result in a power cut of the instruments power lines. Further recovery actions will be done at the end of the straylight tests.

8.3.1 Cryostat Setup

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Ensure that all cryostat related activities (dewar exchanges, etc.) and cryostat parameters (mass flows, temperatures, etc.) are recorded throughout the test.				X	
2	Adjust mass flow through heat shields.	200 mg/s (TBC)	**121.1 mg/s**	**The shields are not stable! They are cooling down after last tests warm up.**	X	
3	Adjust mass flow through AXT to achieve the required L0 and L1 temperatures to allow proper PACS cooler recycle and PACS operation PACS L0 PACS L1	 < 1.8 K < 5 K	 **1.73 K** **4.47 K**		X	
4	Adjust high cryocover temperature by flushing with normal helium from pressurised bottle.	> 200 K	**19.8 K**	Objective is to decontaminate the cryocover mirrors. **The cover is now at 19.6 K and stable.**		X

8.3.2 Perform Background Radiation Measurements with PACS versus Cryocover Temperature

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
1	Execute TCL script SetupSpectroscopyEQMIMT_Shell.tcl from CCS.			**Execution Time: 07h12m42s UTC**	**X**	
2	Decrease cryocover temperature from > 200 K to < 20 K with a rate of approx. 100 K per hour by appropriate flushing.			**Not done. First a reference measurement is taken to investigate the shields influence further**		**X**
3	In parallel to step 2 perform straylight spectrum measurements by PACS: Execute TCL script Background_Adjustment_Shell_01.tcl as many times as needed (each execution takes about 950 sec).			**Execution Time: 07h12m42s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
4	In parallel to step 2 perform Planck curve measurements at TBD cryocover temperatures. Most of the test requires manual commanding since the grating is not performing correctly. At each step we wait 30 seconds to acquire data for the selected grating positions/wavelengths. The entire set of grating positions will allow reconstructing a rough spectral shape of the cryostat background. The data shall be recorded on the I-EGSE in one single telemetry file. For each Planck curve measurement open telemetry file and perform steps 5 to 16.			This test step is optional and pending the results of step 3. It is recommended to record the Planck curve three times, for hot, intermediate and cold cryocover.	**X**	
5	Execute TCL scripts : a) rsrf_SPEC_cre_setup.tcl b) rsrf_SPEC_spu_setup.tcl These scripts configure the spectroscopy detectors and the on-board data processing.			**Execution Time:** **08h20m50s UTC** **08h22m19s UTC**	**X**	
6	Step 1 - gratpos 250000 : samples 101 um and 202 um DMC_MOVE_GRAT_ABS 250000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds			**Execution Time:** **08h22m57s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
7	Step 2 - gratpos 350000 : samples 96 um and 193 um DMC_MOVE_GRAT_ABS 350000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
8	Step 3 - gratpos 450000 : samples 91 um and 182 um DMC_MOVE_GRAT_ABS 450000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
9	Step 4 - gratpos 550000 : samples 85 um and 171 um DMC_MOVE_GRAT_ABS 550000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
10	Step 5 - gratpos 650000 : samples 79 um and 158 um DMC_MOVE_GRAT_ABS 650000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
11	Step 6 - gratpos 750000 : samples 72 um and 145 um DMC_MOVE_GRAT_ABS 750000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
12	Step 7 - gratpos 850000 : samples 131 um DMC_MOVE_GRAT_ABS 850000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				**X**	
13	Step 8 - gratpos 950000 : samples 116 um DMC_MOVE_GRAT_ABS 950000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
14	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 500000				**X**	
15	Step 10 - CRE is already in default configuration, stop SPU dataflow Execute tcl scripts: ~~rsrf_SPEC_spu_reset.tcl~~ **SPEC_spu_reset_obs_Shell.tcl** End of the procedure			**Execution Time:** **08h32m28s UTC**	**X**	
16	Close telemetry file recording on I-EGSE				**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **08h35m15s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **08h53m50s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 09h12m04s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 09h33m42s UTC**	**X**	
Extra	Execute TCL scripts : a) rsrf_SPEC_cre_setup.tcl b) rsrf_SPEC_spu_setup.tcl These scripts configure the spectroscopy detectors and the on-board data processing.			**Execution Time: 09h50m24s UTC 09h50m42s UTC**	**X**	
Extra	Step 1 - gratpos 250000 : samples 101 um and 202 um DMC_MOVE_GRAT_ABS 250000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds			**Execution Time: 09h51m02s UTC**	**X**	
Extra	Step 2 - gratpos 350000 : samples 96 um and 193 um DMC_MOVE_GRAT_ABS 350000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Step 3 - gratpos 450000 : samples 91 um and 182 um DMC_MOVE_GRAT_ABS 450000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				**X**	
Extra	Step 4 - gratpos 550000 : samples 85 um and 171 um DMC_MOVE_GRAT_ABS 550000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
Extra	Step 5 - gratpos 650000 : samples 79 um and 158 um DMC_MOVE_GRAT_ABS 650000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				**X**	
Extra	Step 6 - gratpos 750000 : samples 72 um and 145 um DMC_MOVE_GRAT_ABS 750000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
Extra	Step 7 - gratpos 850000 : samples 131 um DMC_MOVE_GRAT_ABS 850000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Step 8 - gratpos 950000 : samples 116 um DMC_MOVE_GRAT_ABS 950000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
Extra	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 500000				**X**	
Extra	Step 10 - CRE is already in default configuration, stop SPU dataflow Execute tcl scripts: ~~rsrf_SPEC_spu_reset.tcl~~ **SPEC_spu_reset_obs_Shell.tcl** End of the procedure			**Execution Time:** **10h00m30s UTC**	**X**	
Extra	Close telemetry file recording on I-EGSE				**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **10h01m12s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **10h19m03s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **10h41m21s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **11h05m58s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h02m37s UTC**	**X**	
Extra	Execute TCL scripts : rsrf_SPEC_spu_setup.tcl			**Execution Time: 12h20m39s UTC**	**X**	
Extra	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS -5000			**Execution Time: 12h21m13s UTC**	**X**	
Extra	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 5000			**Execution Time: 12h21m48s UTC**	**X**	
Extra	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 0			**Execution Time: 12h23m03s UTC**	**X**	
Extra	Execute tcl scripts: SPEC_spu_reset_obs_Shell.tcl			**Execution Time: 12h23m39s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h23m59s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h40m33s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 12h57m20s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h13m53s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h30m21s UTC During the execution multiple (1,8) packets arrived. DEC/MEC appeared to be non-responsive although it was still sending HK. A new NCR is raised to track this problem: NC-113000-ASED-NC-1831		X
Extra	Manual Stack command DPU_SET_FUNC (103, Enabled)			Goal: Restore link with DEC/MEC. Execution Time: 13h37m47s UTC Link OK in HK	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 13h38m04s UTC This script fails again. The reason why DEC/MEC is malfunctioning is unknown.		X
Extra	Manual Stack command DPU_SET_FUNC (103, Enabled)			Goal: Restore link with DEC/MEC. Execution Time: 13h42m34s UTC Link OK in HK	X	
Extra	Manual Stack command DMC_SET_OBSID (0)			Execution Time: 13h43m13s UTC This command failed and the DEC/MEC link was lost again		X

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Manual Stack command DPU_SET_FUNC (103, Enabled)			Goal: Restore link with DEC/MEC. Execution Time: 13h44m00s UTC Link OK in HK	X	
Since the PLMSCOE lost control over the switched this morning, the PLM SCOE is restarted to regain this control. Since this might switch off all LCLs, all instruments' HK is checked to make sure they are in safe mode.						
Extra	ENTER_SAFE_Mode_Shell.tcl			Execution Time: 13h52m34s UTC Only a part of PACS is in SAFE mode, DEC/MEC does not react to the commands. PACS indicates it is however safe to power down.		X
The PLM SCOE is restarted without resetting the LCLs. All instruments stayed on during the restart.						

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	PACS_POWER_OFF_withBOLC.tcl			Execution Time: 13h52m34s UTC Only a part of PACS is in SAFE mode, DEC/MEC does not react to the commands. PACS indicates it is however safe to power down.		X
Extra	PACS_POWER_ON.tcl			Execution Time: 14h02m11s UTC	X	
The problem with DPU-DEC/MEC is traced by NCR 1831. An NCR which was raised during IMT (1494) appeared to be related to this DEC/MEC problem, but PACS indicates that this problem is different.						
Extra	SetupSpectroscopyEQMIMT_Shell.tcl			Execution Time: 14h06m25s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 14h09m36s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 14h29m16s UTC	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 14h47m12s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 15h05m59s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time: 15h27m01s UTC**	**X**	
Extra	Execute TCL scripts : a) rsrf_SPEC_cre_setup.tcl b) rsrf_SPEC_spu_setup.tcl These scripts configure the spectroscopy detectors and the on-board data processing.			**Execution Time: 16h00m31s UTC 16h00m44s UTC**	**X**	
Extra	Step 1 - gratpos 250000 : samples 101 um and 202 um DMC_MOVE_GRAT_ABS 250000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds			**Execution Time: 16h01m10s UTC**	**X**	
Extra	Step 2 - gratpos 350000 : samples 96 um and 193 um DMC_MOVE_GRAT_ABS 350000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Step 3 - gratpos 450000 : samples 91 um and 182 um DMC_MOVE_GRAT_ABS 450000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
Extra	Step 4 - gratpos 550000 : samples 85 um and 171 um DMC_MOVE_GRAT_ABS 550000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
Extra	Step 5 - gratpos 650000 : samples 79 um and 158 um DMC_MOVE_GRAT_ABS 650000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	
Extra	Step 6 - gratpos 750000 : samples 72 um and 145 um DMC_MOVE_GRAT_ABS 750000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				X	
Extra	Step 7 - gratpos 850000 : samples 131 um DMC_MOVE_GRAT_ABS 850000 wait 30 seconds DMC_MOVE_CHOP_ABS 25000 wait 30 seconds				X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Step 8 - gratpos 950000 : samples 116 um DMC_MOVE_GRAT_ABS 950000 wait 30 seconds DMC_MOVE_CHOP_ABS 0 wait 30 seconds				**X**	
Extra	Step 9 - Grating to default position DMC_MOVE_GRAT_ABS 500000				**X**	
Extra	Step 10 - CRE is already in default configuration, stop SPU dataflow Execute tcl scripts: ~~rsrf_SPEC_spu_reset.tcl~~ **SPEC_spu_reset_obs_Shell.tcl** End of the procedure			**Execution Time:** **16h10m41s UTC**	**X**	
Extra	Close telemetry file recording on I-EGSE				**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **16h11m01s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **16h32m27s UTC**	**X**	
Extra	**Execute TCL script Background_Adjustment_Shell_01.tcl**			**Execution Time:** **16h50m20s UTC**	**X**	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	ENTER_SAFE_Mode_Shell.tcl			Execution Time: 17h10m59s UTC	X	
Extra	BOLO_cooler_OBS_shell.tcl			Execution Time: 17h11m52s UTC	X	
This is the end of 08/12/2005						
This is the start of 09/12/2005						
Extra	SetupSpectroscopyEQMIMT_Shell.tcl			Execution Time: 07h04m12s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 07h50m23s UTC	X	
Extra	Execute TCL script rsrf_SPEC_spu_setup.tcl			Execution Time: 08h07m25s UTC	X	
Extra	Execute TCL script rsrf_SPEC_cre_setup.tcl			Execution Time: 08h07m36s UTC	X	
Extra	Execute TCL script SPEC_spu_reset_shell.tcl			Execution Time: 08h18m35s UTC	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script ENTER_SAFE_Mode_shell.tcl			Execution Time: 08h19m08s UTC	X	
Extra	Execute TCL script PHOT_setup_obs_shell.tcl			Execution Time: 08h19m59s UTC	X	
Extra	Execute TCL script PACS_PHOT_spu.tcl			Execution Time: 08h34m28s UTC	X	
Extra	Execute TCL script PACS_PHOT_CHOP_CS2_sobs_shell.tcl			Execution Time: 08h35m39s UTC	X	
Extra	Execute TCL script PACS_PHOT_CHOP_CS2_sobs_shell.tcl			Execution Time: 08h56m37s UTC	X	
Extra	Execute TCL script PHOT_stray_light_A_obs_Shell.tcl			Execution Time: 09h23m00s UTC	X	
Extra	Execute TCL script PHOT_stray_light_B_obs_Shell.tcl			Execution Time: 09h41m15s UTC	X	
The following test will heat up the harness to see the influence on the straylight.						
Extra	Execute TCL script PACS_PHOT_spu.tcl			Execution Time: 10h00m43s UTC	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	Execute TCL script PACS_PHOT_CHOP_CS2_sobs_shell.tcl			Execution Time: 10h01m21s UTC	X	
Extra	Heat the harness			Execution Time: ~10h03m00s UTC	X	
Extra	Execute TCL script PHOT_stray_light_A_obs_Shell.tcl			Execution Time: 10h22m53s UTC	X	
Extra	Execute TCL script PHOT_stray_light_B_obs_Shell.tcl			Execution Time: 10h41m41s UTC	X	
Extra	Execute TCL script PACS_PHOT_spu.tcl			Execution Time: 11h03m00s UTC	X	
Extra	Execute TCL script PACS_PHOT_CHOP_CS2_sobs_shell.tcl			Execution Time: 11h04m15s UTC	X	
Extra	Stop harness heating			Execution Time: ~11h04m00s UTC	X	
Extra	ENTER_SAFE_Mode_Shell.tcl			Execution Time: 11h47m30s UTC	X	

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
Extra	SetupSpectroscopyEQMIMT_Shell.tcl			Execution Time: 11h47m58s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 12h03m48s UTC	X	
Extra	Execute TCL script Background_Adjustment_Shell_01.tcl			Execution Time: 12h21m56s UTC	X	

8.3.3 Switch PACS from Prime to Stand-by Mode

Step-No.	Test-Step-Description	Nominal Value	Actual Value	Comments	P	N
17	Execute TCL script ENTER_SAFE_Mode_Shell.tcl from CCS			Execution Time: 12h38m55s UTC	X	

9 Step by Step Procedure: Switch Off Instruments

The instruments are left in STANDBY over the weekend.

10 Summary Sheets

10.1 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 10.1-1: Procedure Variation Sheet

10.2 Non Conformance Report (NCR) Summary

NCR - No.	NCR - Title	Date	Open Closed
HP-113000-ASED-NC-1831	DEC_MEC not responding to commands	8/12/05	OPEN

Table 10.2-1: Non-Conformance Record Sheet

10.3 Sign-off Sheet

	Name	Date	Signature
Test Manager	Siegmund Idler	12.12.05	
Operator	Stijn Ilsen	12/12/05	
PA Responsible	David Hendry	12.12.05	

Appendix 1: HP-113000-ASED-NC-1831 - DEC_MEC not responding to commands

Friday December 9 2005 8:20 AM

Company	Project Name	NCR-No: HP-113000-ASED-NC-1831
ESTEC	HERSCHEL-PLANCK	Related Internal NCR-No:
		Critical Item:Yes ☐ No ☒ Revision 0
		Page 1 of 1

Nonconformance Report

NCR Title DEC/MEC not responding to commands	
NC Item Identification PACS	
Next Higher Assembly HERSCHEL INSTRUMENTS AND TELESCOPE (CFE)	
Drawing No	Sr No.
Procedure No System Test (Straylight)	
Supplier MPI	Purchase Order
Subsystem	Model EQM
NC Observation Date: 09-DEC-05 Location: ASED OTN	NC Detected During Test

Description of Nonconformance — Requirements Violated

During the system tests (6-9/12/2005), this following problem was seen. During the execution of script Background_Adjustment_Shell_01.tcl, DEC/MEC did not react as normal and as a result of that the DPU HK showed
that the DPU-DEC/MEC link was OFF. The script was however executed over 20 times successfully during the same
day. The link was restored by sending (DPU_SET_FUNC with parameters 103, Enabled), but further TCL scripts
failed again (Type 1,8 packets received during execution). The only solution was, to power down PACS (except
BOLC to keep the cooler) and restart it. After this, PACS (and DEC/MEC) reacted normal again.

PACS states that this NCR is not related to NCR 1494, since that was a clear hardware problem. That problem
(NCR 1494) resulted in a dead link between DPU and DEC/MEC. No TC ot TM communication with DEC/MEC.
This problem is only on the TC side. DEC/MEC does not react to commands send to it by the DPU. Housekeeping
data from DEC/MEC is however OK.

PACS to investigate.

Initiator: Date, Name and Signature 09-DEC-05 S. ILSEN

Date:
Name:
Signature:

11 Distribution List

	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	AOE22		Schink Dietmar	AED44
	Barlage Bernhard	AED11	X	Schlosser Christian	OTN/AOA54
	Bayer Thomas	AOA52		Schmidt Rudolf	FAE22
	Brune Holger	AOA55		Schweickert Gunn	AOE22
	Fehringer Alexander	AOE13		Sonn Nico	AOE51
X	Fricke Wolfgang Dr.	AED 65		Steininger Eric	AED32
	Geiger Hermann	AOA52	X	Stritter Rene	AED11
	Gerner Willi	AED11		Suess Rudi	AOA54
X	Grasl Andreas	OTN/AOA54		Thörmer Klaus-Horst Dr.	OTN/AED65
	Grasshoff Brigitte	AET12		Wagner Klaus	AOE22
	Hauser Armin	AOE22	X	Wietbrock Walter	AET12
X	Hendry David	Terma Resid.		Wöhler Hans	AOE22
	Hengstler Reinhold	AOA 5		Wössner Ulrich	ASE442
	Hinger Jürgen	AOE22	X	Alcatel	ASP
	Hofmann Rolf	ASE442	X	ESA/ESTEC	ESA
X	Hohn Rüdiger	AED65		**Instruments:**	
	Hölzle Edgar Dr.	AED44	X	MPE (PACS)	MPE
	Huber Johann	AOA52	X	RAL (SPIRE)	RAL
	Hund Walter	ASE442	X	SRON (HIFI)	SRON
X	Idler Siegmund	AED312		**Subcontractors:**	
X	Ilsen Stijn	Terma Resid.		Air Liquide, Space Department	AIR
	Ivády von András	FAE22		Air Liquide, Space Department	AIRS
	Jahn Gerd Dr.	AOE22		Air Liquide, Orbital System	AIRT
	Kalde Clemens	APE3		Alcatel Bell Space	ABSP
X	Kameter Rudolf	OTN/AOA54		Astrium Sub-Subsyst. & Equipment	ASSE
	Kettner Bernhard	AET42		Austrian Aerospace	AAE
	Knoblauch August	AET32		Austrian Aerospace	AAEM
X	Koelle Markus	AOA53		APCO Technologies S. A.	APCO
	Koppe Axel	AED312		Bieri Engineering B. V.	BIER
	Kroeker Jürgen	AED65		BOC Edwards	BOCE
	Kunz Oliver Dr.	AOE22		Dutch Space Solar Arrays	DSSA
X	Lamprecht Ernst	OTN/ASI21		EADS CASA Espacio	CASA
	Lang Jürgen	ASE442		EADS CASA Espacio	ECAS
	Langenstein Rolf	AED15		EADS Space Transportation	ASIP
	Langfermann Michael	AOA51		Eurocopter	ECD
X	Mack Paul	OTN/AOA54		European Test Services	ETS
	Maute Thomas	AOA52		HTS AG Zürich	HTSZ
	Müller Jörg	AOA52		Linde	LIND
	Müller Martin	AOA53		Patria New Technologies Oy	PANT
	Müller Ralf	FAE22		Phoenix, Volkmarsen	PHOE
	Peltz Heinz-Willi	AOE13		Prototech AS	PROT
	Pietroboni Karin	AED65		QMC Instruments Ltd.	QMC
	Platzer Wilhelm	AED22		Rembe, Brilon	REMB
	Reichle Konrad	AOA52		Rosemount Aerospace GmbH	ROSE
	Reuß Friedhelm	AED62		RYMSA, Radiación y Microondas	RYM

	Name	Dep./Comp.		Name	Dep./Comp.
X	Rühe Wolfgang	AED6		SENER Ingenieria SA	SEN
X	Runge Axel	OTN/AOA54		Stöhr, Königsbrunn	STOE
	Sachsse Bernt	AED21		Terma A/S, Herlev	TER

END OF DOCUMENT