TITLE: **Quick Look Data Analysis Of LFI IST1 Test**

DOC. TYPE: **Test Report**

PROJECT REF.: **PL-LFI-PST-RP-029** **PAGE: I of V, 28**

ISSUE/REV.: **1.0** **DATE: February 2008**

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CHANGE RECORD

Issue	Date	Sheet	Description of Change	Release
0.1	February 08	All	First Draft of Document	Draft

TABLE OF CONTENTS

1 ACRONYMS

AIV	Assembly, Integration, Verification
ASW	Application Software
BEM	Back End Module
BEU	Back End Unit
CCS	Central Check-out System
CDMU	Central Data Management Unit
DAE	Data Acquisition Electronics
DPU	Digital Processing Unit
EGSE	Electrical ground Support Equipment
FEM	Front End Module
I-EGSE	Instrument EGSE
IST	Integrated Satellite Test
OBC	On Board Clock
RAA	Radiometer Array Assembly
REBA	Radiometric Electronic Box Assembly
S/C	Spacecraft
SCOE	Spacecraft Control and Operation System
SPU	Signal Processing Unit
SUSW	Start- Up Software
SVM	Service Module
TBC	To Be Checked
TBW	To Be Written
TC	Telecommand
TM	Telemetry
UFT	Unit Functional Test

2 INTRODUCTION

This document has been issued in the frame of ASI contract that has been released for the activities of Planck-LFI Phase E2

2.1 Purpose and Scope

Scope of this document is to give a first quick look analysis response of the functionality of the LFI instrument during the IST Test Campaign.
The objective of Planck IST is two fold:
- to verify the correct performance of the satellites and the compatibility between all the integrated electrical subsystems and instruments,
- to mimic the operation procedures which will be exercised during the different phases of the satellite mission.

The document is divided in two sections. The first section is related to the description of the work done that is to say the description of the LFI Log Book and the description of the performed tests. The second section is the summary of the results of each test coming from both real time and offline data analysis.

2.2 Test configuration

The test configuration is the following

SCOS 2 K HPCCS Version
LFI Gateway Version
TQL TBC
LIFE Machine version OM

LFI Personnel involved during the test is:

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3 APPLICABLE AND REFERENCE DOCUMENTS

3.1 Applicable Documents

[AD1] Herschel/Planck Instrument Interface document Part A
SCI-PT-IIDA-04624 Issue 3.3

[AD2] Herschel/Planck Instrument Interface document Part B
SCI-PT-IIDB-04142 Issue 3.1

[AD3] Herschel/Planck Instrument Interface document Part B
SCI-PT-IIDB-04142 Issue 3.1, Annex 3, ICD 750800115

[AD4] Herschel/Planck Instrument Interface document Part A
SCI-PT-IIDA-04624 Issue 3.3 Annex 10

3.2 Reference Documents

[RD1] Planck Instrument Testing at PFM S/C levels
H-P-3-ASP-TN-0676, Issue 1.0

[RD2] Planck LFI User Manual
PL-LFI-PST-MA-001 Issue 2.1

[RD3] Planck LFI REBA Herschel PACS SPU: LFI REBA FMs User's Manual
FPL-MA-1214-04 CRS Issue 1.0

[RD4] LFI- REBA application Software User Manual (SUM)
DS/UM_FIR/178v.4

[RD5] LFI Warm Functional Test Procedure (WFT)
PL-LFI-PST-PR-017_2_1

[RD6] PLM SIT Test Specification
H-P-3-ASP-TS-1421 Issue 2.0

[RD7] IST1 and IST2 Combined LFI HFI tests
PL-LFI-PST-PR-019 Issue 3.1

[RD8] Quick Look Data Analysis Of LFI performed during SIT
PL-LFI-PST-RP-024 Issue 1.0

4 IST Test Execution

For each modular block of procedure test results and conclusions are presented.

4.1 LFI Commissioning (science Production)

The ability to perform the commissioning has been exercised. The procedure is only a subset of the one that will be used in flight.

4.1.1 Procedure/ Test sequence

LFI Commissioning (Science Production)						0.89	
	Go to Stand By Mode					0.49	
		Startup DPU SUSW		0.02	1	0.02	0.02
		EEPROM Check Sum		0.05	1	0.05	0.07
		Dump Activity DPU Memories		0.08	1	0.08	0.15
		Start up DPU ASW		0.05	1	0.05	0.20
		Reba Synchronization		0.05	1	0.05	0.25
		Event packet enabling		0.02	1	0.02	0.27
		Commissioning of SPU Memories		0.20	1	0.20	0.47
		Start up SPU SUSW		0.02	1	0.02	0.49
		Start Up SPU ASW		0.05	1	0.05	0.54
	Go to DAE Set up					0.27	
		Switch on DAE		0.05	1	0.05	0.59
		DAE Synchronization		0.02	1	0.02	0.61
		DAE memory commissioning		0.20	1	0.20	0.81
	Science production					0.08	
		Set Telemetry Rate		0.02	1	0.02	0.83
		Changing processing to Type 1		0.02	1	0.02	0.85
		Definition of science parameters	N Averaging set to 256(Dec)	0.02	1	0.02	0.87
		SPU connection		0.02	1	0.02	0.89

4.1.2 Results and Conclusions

The procedure was run on February the 12th. A problem in applying the "Commissioning of SPU memories" occurred in the test sequence (TS) and produced a DPU-SPU connection error. The problem was solved by first applying the "Start up SPU SUSW" test sequence and then "Commissioning of SPU memories" (as previously done for FM tests in Laben). An NCR was raised (NCR 15845, see below) and the solution was already applied: the test sequence worked fine. The corresponding procedure in (PL-LFI-PST-PR-019, par. 4.1) needs to be corrected.

Another problem occurred during the first memory dump TS. The Thales procedure inserted a waiting time of 3 s between the TC and the corresponding

TM(6,6). This waiting time can be longer than the time needed for the production and transmission of the packet, which was therefore missed causing a failure. To solve the problem, the "memory dump" test sequences were changed to avoid this waiting time.

Pass and Fail Criteria

No errors from the REBA HW Self check	
No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
EEPROM Check Sum passed	
REBA synchronization achieved	
DAE Power Consumption within the ranges of expected values	
DAE Synchronization achieved	

A comparison with results from previous tests is not possible, because it is the first time this procedure is run: actually, being each power group switched on separately, adding one ACA per time, the expected currents and voltages are far different from the already known conditions. Due to the voltage drop in the lines, related with the common ground return in the harness, also a guess could not be done in advance. We just expected that currents flowing in the FEMs decrease once a new ACA is added: this feature was indeed observed. The verification on Ids can be performed just when the condition LFI all ON is reached.

One NCR was raised:

NCR	Description
15845	LFI : TC SPU dump memory failed in completion

4.2 LFI Commissioning (AMB test)

4.2.1 Procedure/ Test sequence

LFI Commissioning (AMB test)						5.30.00	
	Preparation to Test configuration				1	5.30.00	
		Switch on Power Group 2		3.00.00	1	3.00.00	3.00.00
		Switch On Power Group 4		2.00.00	1	2.00.00	5.00.00
		LFI complete Switch on		0.30.00	1	0.30.00	5.30.00

4.2.2 Results and Conclusions

The procedure was run on February the 12th with many problems, mostly related to the way the LFI test sequences (TS) were inplemented:

- The procedure started without applying the switch on of the first power group (Power Group #2) and it was stopped and changed accordingly (NCR 15859).
- While checking the TM related to Power Groups / DC-DC converters (LM106332/LM109332), a (false) problem arised due to the fact that power group 1 corresponds to Science2 Vout and power group 2 to Science1 Vout. In fact this is correct and is due to the fact that power group 1 corresponds to DC/DC converter 2 and power group 2 to DC/DC converter 1. Anyway we understand this can be misleading for the operator and, as suggested, we propose to update the test spec anticipating this peculiar behaviour for the operator (see NCR 15857). An NCR was raised on this point (see also old NCR 14341).
- When switching on power group and RCA one by one, some checks of Idrain were false (out of spec) but this is normal in this configuration. When all the RCA are on, the values are correct. An NCR (see below NCR 15857) was raised on this point. It was proposed to update the test spec in order to anticipate this peculiar behaviour for the operator.
- When re-applying the new TS, as soon as the first RCA, #19, was tested, the TS started an initialization procedure (not foreseen) causing a reset of all RCA parameters. The TS was stopped and changed accordingly. An NCR (see below NCR 15859) was raised on this point.
- When re-applying the new TS, as soon as the first RCA, #19, was tested, the TS switched off power group 2 and (wrongly) switched on another power group. The TS was stopped and changed accordingly. An NCR (see below NCR 15859) was raised on this point.
- When LFI was on, a wrong sequence ("LFI to Nominal Science-type 5") was sent and this caused the science to be de-activated. The TS "Science Activation Type 1" was re-sent and the test continued.
- When power group 2 and 4 were finally tested, the other two power groups were switched on but a problem occurred in the configuration of the

remaining RCAs since this procedure was forgotten in the TS. This was corrected during the TS and the test continued. An NCR (see below NCR 15859) was raised on this point.

- When applying the TS "DPRAM dump" (required to analyse the problem on RCA25), an error occurred due to a wrong value of parameters. An NCR was raised (see below NCR 15857), the TS was corrected and re-run.

When in Nominal Science, TQL was used to check the behaviour of RCA25. No peculiar behaviour was noticed, eventually just a minor effect. We decided to apply at least part of the procedure forseen for the investigation and the four offset values have been changed from 255 to 245 and back to 255.

Pass and Fail Criteria

No un-expected event Packets	
The FEM I Drain Currents obtained from Telemetry are within the ranges expected (5%)	
The DC voltages Outputs (Science Telemetry) are within the ranges expected. (10%)	

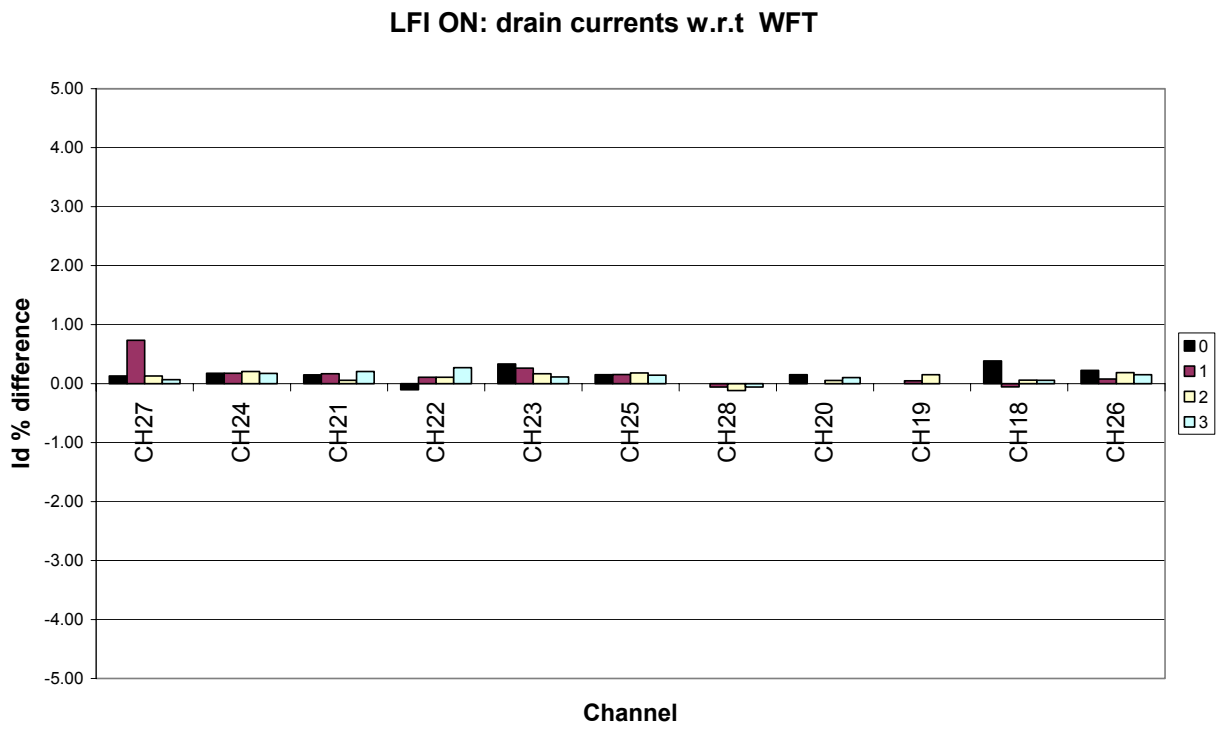

Figure 1 Drain currents with LFI – N on

Two NCRs were raised:

NCR	Description
15857	LFI Commissionning : DB or Test spec
15859	LFI Commisonning : Test Sequence are not correct

4.3 LFI Commissioning (Type 5)

4.3.1 Procedure/ Test sequence

LFI Commissioning (Type 5)						0.32.00	
	Recovering EMC configuration				1	0.17.00	
		Science De-Activation		0.02.00	1	0.02.00	0.02.00
		Definition of science Processing Parameters	Naverage set to Nominal	0.02.00	1	0.02.00	0.04.00
		Changing Processing Type to 5		0.02.00	1	0.02.00	0.06.00
		Science Activation Type 5		0.02.00	1	0.02.00	0.08.00
		Start Channel Switching		0.02.00	1	0.02.00	0.10.00
		Start Monitor function		0.02.00	1	0.02.00	0.12.00
		Check DAE Configuration	IOT Confirm	0.05.00	1	0.05.00	0.17.00

4.3.2 Results and Conclusions

The procedure was run on February the 12th without any problem and the test was finished successfully.

Pass and Fail Criteria

No un-expected event Packets	
Telemetry rate as expected	

4.4 LFI Commissioning (Fall Back)

4.4.1 Procedure/ Test sequence

LFI Commissioning (Fall Back)							
	Switch OFF LFI				1	0.20.00	
		Science De-Activation		0.05.00	1	0.05.00	0.05.00
		RCA De-Activation		0.05.00	1	0.05.00	0.10.00
		LFI to Standby		0.05.00	1	0.05.00	0.15.00
		Switch OFF		0.05.00	1	0.05.00	0.20.00

4.4.2 Results and Conclusions

The procedure was on February the 12th without any problem and the test was finished successfully.

Pass and Fail Criteria

No un-expected event Packets	
No more telemetry from LFI	

No NCRs have been raised.

4.5 PLM SIT - Switch on LFI in nominal science (Nominal Unit)

4.5.1 Procedure/ Test sequence

LFI SIT: Switch on (Nominal Unit)						1.00.00	
	Switch ON LFI				1	0.39.00	
		Go to Stand By Mode	OFF to standby	0.32.00	1	0.32.00	0.32.00
		Go to DAE Set Up Mode	Standby to DAE set up	0.07.00	1	0.07.00	0.39.00
	LFI in Normal Science (Warm test Config..)				1	0.19.00	
		Setting Telemetry Rate	Nominal Values	0.02.00	1	0.02.00	0.41.00
		Event Packet Enabling		0.02.00	1	0.02.00	0.43.00
		Definition of science Processing Parameters	Naverage set to 256	0.02.00	1	0.02.00	0.45.00
		Changing Processing Type to 1		0.05.00	1	0.05.00	0.50.00
		Spu Connection		0.02.00	1	0.02.00	0.52.00
		Science Activation Type 1		0.04.00	1	0.04.00	0.56.00
		RCA Activation		0.02.00	1	0.02.00	0.58.00
		Set DAE Default configuration		0.02.00	1	0.02.00	1.00.00

An additional step was added at the end of this TS “Reset Science TM Counter” (see PL-LFI-PST-PR-019, par. 5.6, tab. 7) in order to check its correct behaviour on the Nominal REBA unit.

At the end of the Procedure LFI will stay in listening mode with HFI and SCS had performed WFT and Health check.

4.5.2 Results and Conclusions

The procedure was run on February the 13th without any problem and the test was finished successfully.

Pass and Fail Criteria

No errors from the REBA HW Self check	
No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
EEPROM Check Sum passed	
REBA synchronization achieved	
DAE Power Consumption within the ranges of expected values	
DAE Synchronization achieved	
The FEM I Drain Currents obtained from Telemetry are within the ranges expected (5%)	
The DC voltages Outputs (Science Telemetry) are within the ranges expected. (10%)	
No unexpected features in FFT spectrum (Spike, Pop corn noise, currents drops…)	

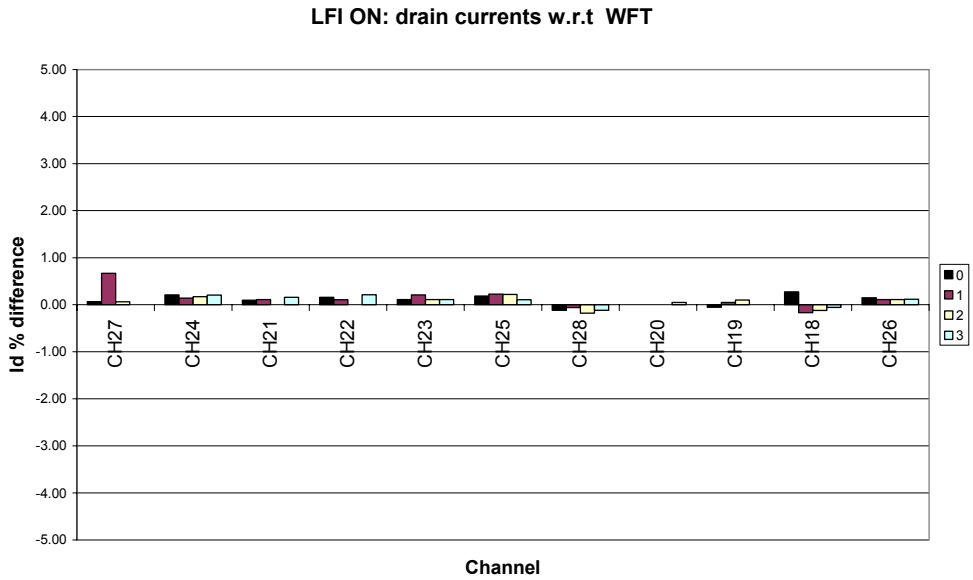

Figure 2 Drain currents with LFI –on

No NCRs have been raised.

4.6 PLM SIT - Nominal Science with nominal unit

During this step HFI and SCS are performing their WFT. LFI stays in nominal acquisition acquiring data for analysis.

4.6.1 Procedure/ Test sequence

No test sequence for LFI is requested to be applied here.

4.6.2 Results and Conclusions

While HFI was switching ON, the swapping feature on RCA25 appeared again. Later on, when the SCS was switching OFF, the feature disappeared.
Unfortunately, due to the sequence going on, it was impossible to apply any procedure to investigate the problem.

Pass and Fail Criteria

No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
DAE Power Consumption within the ranges of expected values	
No unexpected features during HFI activity in Scientific signal	
No unexpected features during SCS activity in Scientific signal	

No NCRs have been raised.

4.6.2.1 Currents monitoring during HFI WFT

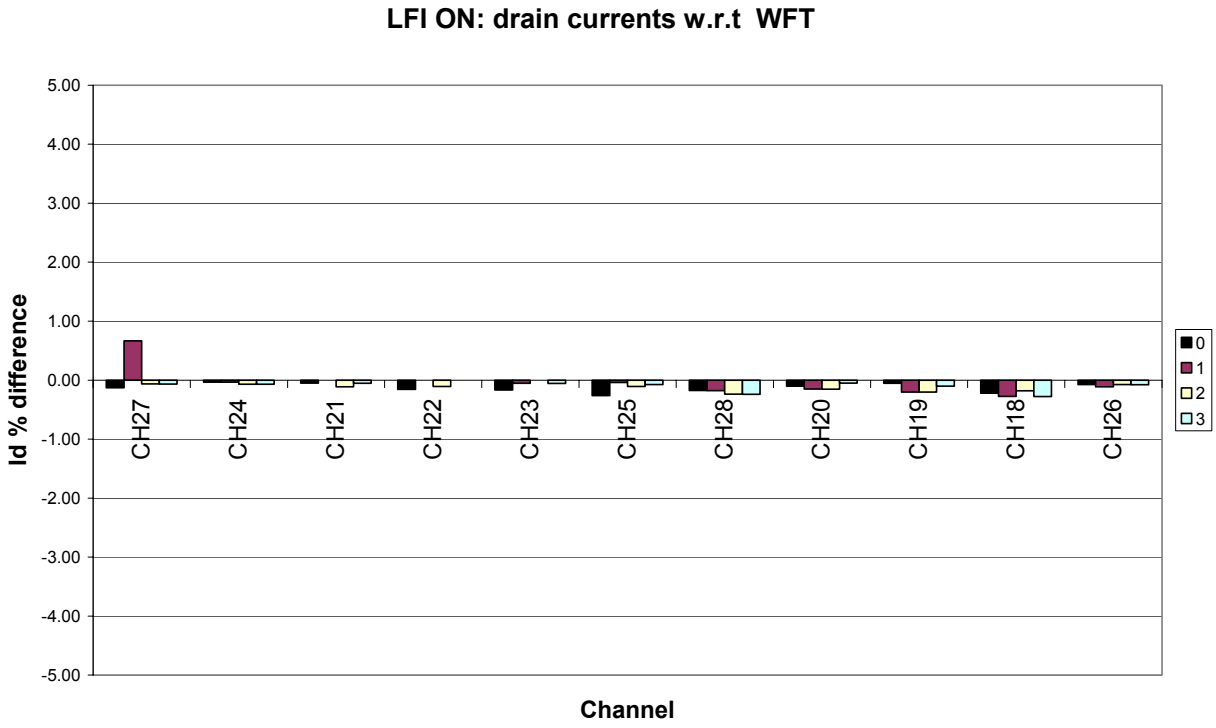

Figure 3

4.6.2.2 Currents monitoring during SCS-N HC

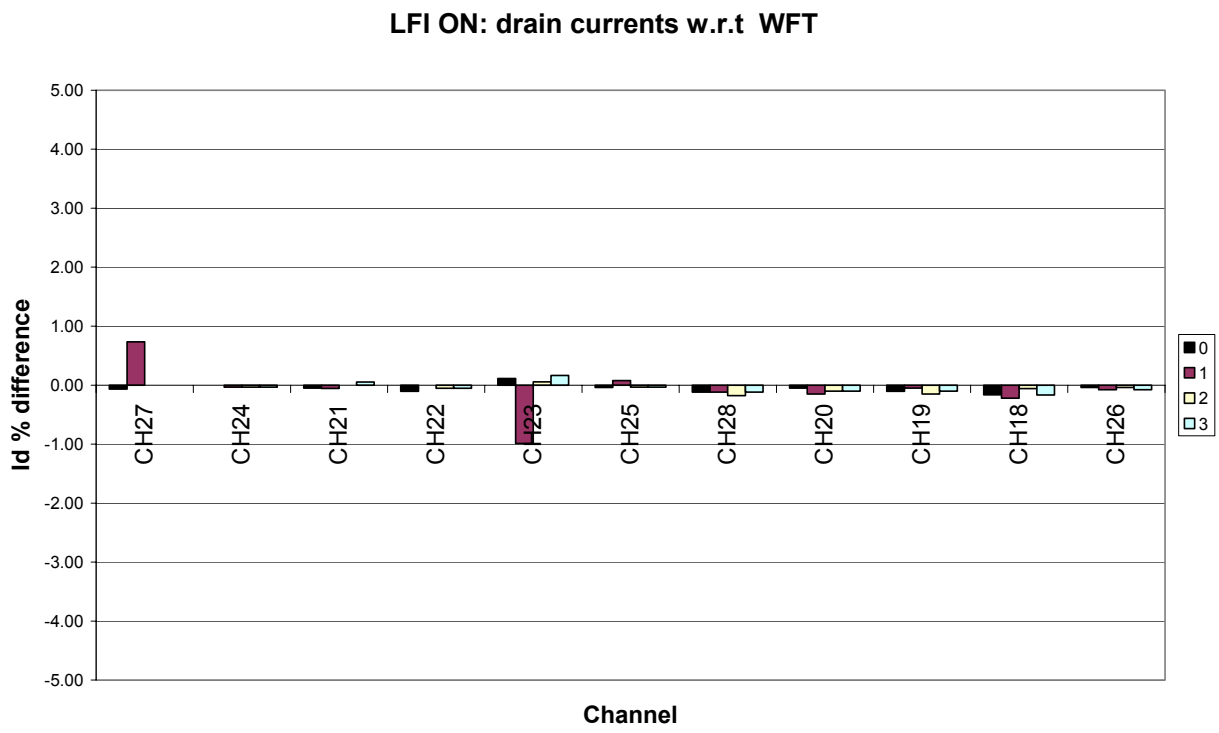

Figure 4

4.7 PLM SIT - Switch off of the Nominal Unit

4.7.1 Procedure/ Test sequence

LFI SIT: Switch off (Nominal Unit)					0.20.00	
	Switch OFF LFI			1	0.20.00	
		Science De-Activation		0.05.00	1	0.05.00	0.05.00
		RCA De-Activation		0.05.00	1	0.05.00	0.10.00
		LFI to Standby	DAE Set Up to Standby	0.05.00	1	0.05.00	0.15.00
		Switch OFF	Standby to OFF	0.05.00	1	0.05.00	0.20.00

4.7.2 Results and Conclusions

The test was successfully completed.

Pass and Fail Criteria

No un-expected event Packets	
No more telemetry coming from LFI	

No NCRs have been raised.

4.8 PLM SIT - LFI Switch on using Redundant Unit

4.8.1 Procedure/ Test sequence

LFI SIT: Switch on (Redundant Unit)						**1.20.00**	
	Switch ON LFI				**1**	**0.39.00**	
		Go to Stand By Mode	OFF to standby	0.32.00	1	0.32.00	0.32.00
		Go to DAE Set Up Mode	Standby to DAE set up	0.07.00	1	0.07.00	0.39.00
	LFI in Normal Science (Warm test Config..)				**1**	**0.19.00**	
		Setting Telemetry Rate	Nominal Values	0.02.00	1	0.02.00	0.41.00
		Event Packet Enabling		0.02.00	1	0.02.00	0.43.00
		Definition of science Processing Parameters	Naverage set to 256	0.02.00	1	0.02.00	0.45.00
		Changing Processing Type to 1		0.05.00	1	0.05.00	0.50.00
		Spu Connection		0.02.00	1	0.02.00	0.52.00
		Science Activation Type 1		0.04.00	1	0.04.00	0.56.00
		RCA Activation		0.02.00	1	0.02.00	0.58.00
		Set DAE Default configuration		0.02.00	1	0.02.00	1.00.00

4.8.2 Results and Conclusions

The procedure was run on February the 14th without any problem and the test was finished successfully.

Pass and Fail Criteria

No errors from the REBA HW Self check	
No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
EEPROM Check Sum passed	
REBA synchronization achieved	
DAE Power Consumption within the ranges of expected values	
DAE Synchronization achieved	

No NCRs were raised.

4.9 PLM SIT - Nominal Science with Redundant unit

During this step SCS redundant is performing its health check. LFI stays in nominal acquisition acquiring data for analysis.

4.9.1 Procedure/ Test sequence

No test sequence for LFI is requested to be applied here.

4.9.2 Results and Conclusions

Pass and Fail Criteria

No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
DAE Power Consumption within the ranges of expected values	
No unexpected features during SCS activity in Scientific signal	

No NCRs were raised.

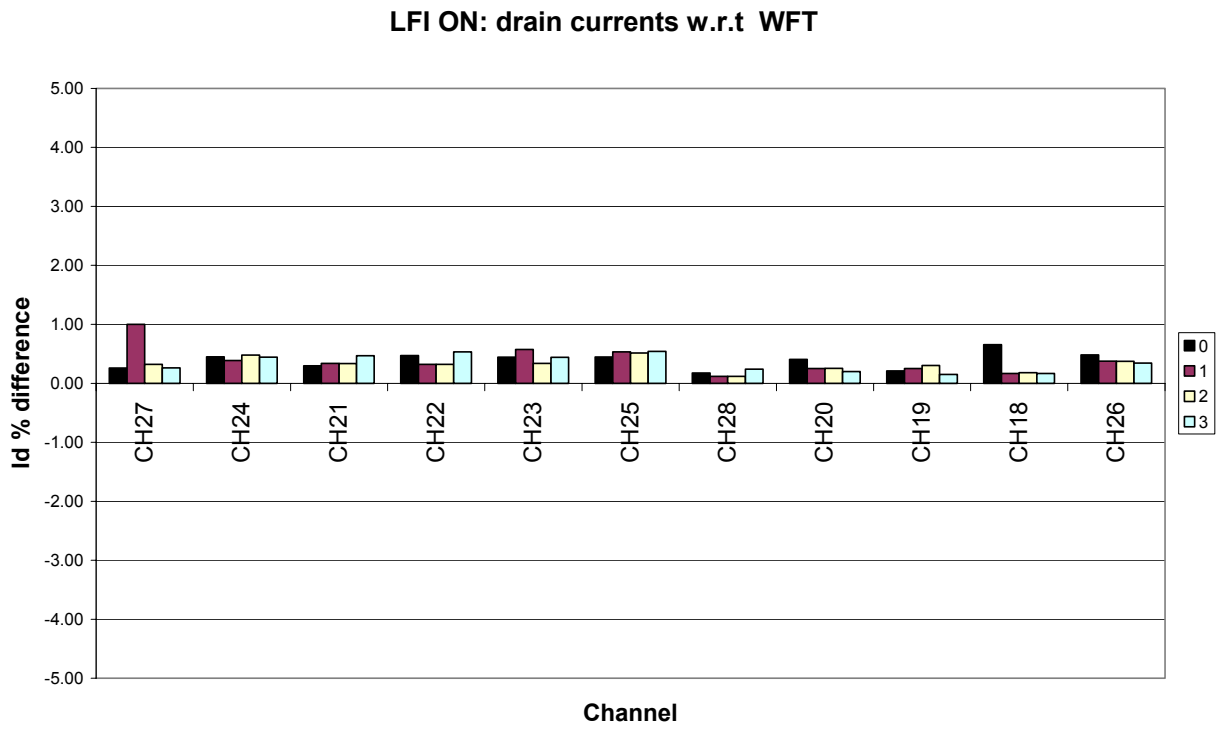

Figure 5 LFI Redundant + SCS Redundant ON

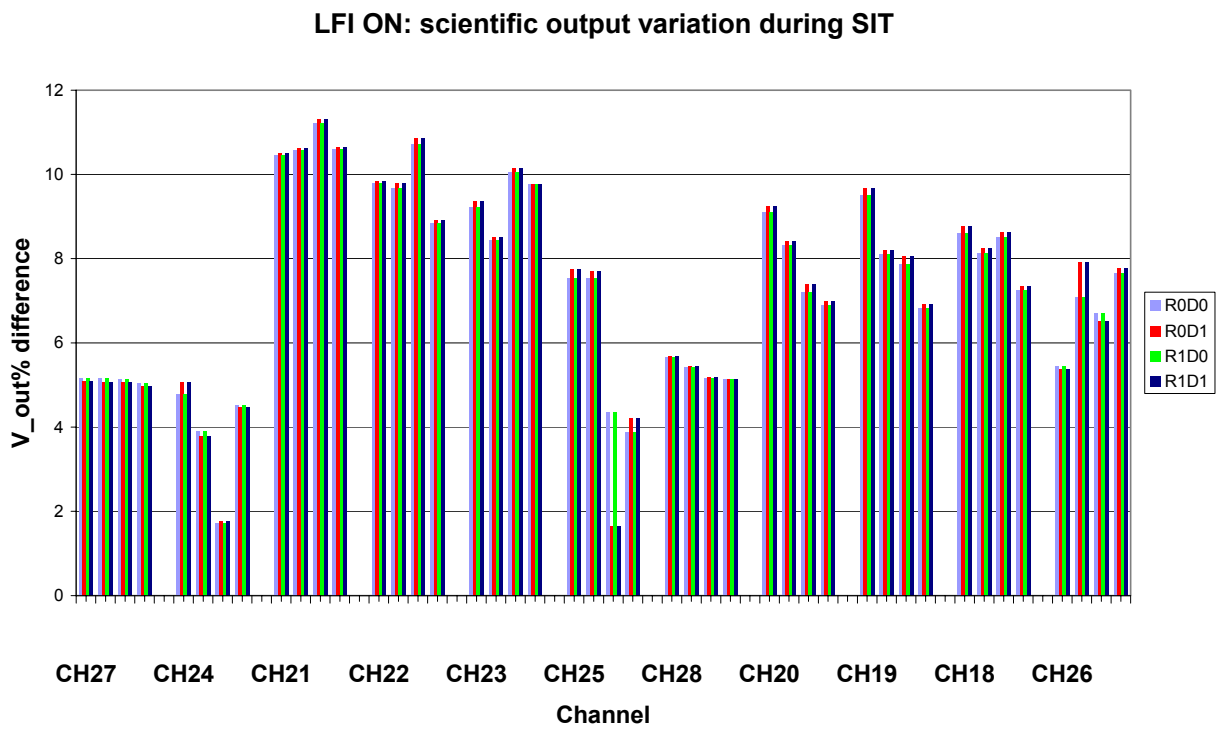

Figure 6 V_out: MAXIMUM variation (%) during the whole SIT (w.r.t. LFI –Nominal Unit ON)

4.10 PLM SIT - LFI Preparation to AMB02 go to Stand By Mode

4.10.1 Procedure/ Test sequence

LFI SIT: AMB 02 Preparation Go back to Standby Mode					0.17.00	
	Switch OFF LFI			1	0.17.00	
	Disable 4KHz Switching		0.02.00	1	0.02.00	0.02.00
	Change PS status to zero		0.02.00	1	0.02.00	0.04.00
	Update Channel config. (Switch off all ACAs in FEM)		0.02.00	1	0.02.00	0.06.00
	Science De-Activation		0.02.00	1	0.02.00	0.08.00
	RCA De-Activation		0.02.00	2	0.04.00	0.12.00
	Switch off RAA from Satellite		0.05.00	1	0.05.00	0.17.00

Once LFI is in Stand By mode the following procedure has been executed.

LFI SIT: AMB02 Preparation Cont. Go to nominal science					0.24.00	
	Switch ON LFI			1	0.07.00	
	Go to DAE Set Up Mode	Standby to DAE set up	0.07.00	1	0.07.00	0.07.00
	LFI in Normal Science (Warm test Config..)			1	0.17.00	
	Setting Telemetry Rate	Nominal Values	0.02.00	1	0.02.00	0.09.00
	Event Packet Enabling		0.02.00	1	0.02.00	0.11.00
	Definition of science Processing Parameters	Naverage set to 256	0.02.00	1	0.02.00	0.13.00
	Changing Processing Type to 1		0.05.00	1	0.05.00	0.18.00
	Spu Connection		0.02.00	1	0.02.00	0.20.00
	Science Activation Type 1		0.04.00	1	0.04.00	0.24.00

4.10.2 Results and Conclusions

The test was successfully completed.

Pass and Fail Criteria

No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
DAE Power Consumption within the ranges of expected values	
DAE Synchronization achieved	
Science production as expected	

No NCRs have been raised

4.11 PLM SIT - LFI Execution of AMB02

4.11.1 Procedure/ Test sequence

LFI SIT: AMB02 execution					3.24.00	
	Switch ON LFI			1	0.05.00	
		RCA Activation	0.05.00	1	0.05.00	0.05.00
		Perform DAE Initialization	0.10.00	1	0.10.00	0.15.00
		Wait for thermalization of power groups	0.30.00	1	0.30.00	0.35.00
		Configure DAE (Scwitch ACA on)	0.02.00	1	0.02.00	0.37.00
		Wait for thermalization of FPU	0.25.00	1	0.25.00	1.02.00
		Enable 4KH switching A/C	0.02.00	1	0.02.00	1.04.00
		Acquire data	0.30.00	1	0.30.00	1.34.00
		Change PS stauts to one on B/D	0.02.00	1	0.02.00	1.36.00
		Acquire data	0.30.00	1	0.30.00	2.06.00
		Disable 4KH switching A/C	0.02.00	1	0.02.00	2.08.00
		Enable 4KHz switching B/D	0.02.00	1	0.02.00	2.10.00
		Change PS status to zero on A/C	0.02.00	1	0.02.00	2.12.00
		Acquire data	0.30.00	1	0.30.00	2.42.00
		Change PS status to one on A/C	0.02.00	1	0.02.00	2.44.00
		Acuire Data	0.30.00	1	0.30.00	3.14.00

4.11.2 Results and Conclusions

The procedure was run on February the 14th without any problem and the test was finished successfully. One minor comment on test sequence about two checks in the TS originally not foreseen in the TS: “wait for thermalization” and “Take note of FEM drain currents”.

Pass and Fail Criteria

No errors from the REBA HW Self check	
No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
EEPROM Check Sum passed	
REBA synchronization achieved	
DAE Power Consumption within the ranges of expected values	
DAE Synchronization achieved	
The FEM I Drain Currents obtained from Telemetry are within the ranges expected (5%)	
The DC voltages Outputs (Science Telemetry) are within the ranges expected. (10%)	
No unexpected features in FFT spectrum (Spike,	

Pop corn noise, currents drops…)	

No NCRs were raised.

Id w.r.t WFT				
CH	<00>	<01>	<10>	<11>
CH27	0.00	0.67	0.06	0.00
CH24	0.07	0.04	-0.03	-0.03
CH21	-0.05	0.00	0.00	0.10
CH22	0.00	-0.05	-0.11	0.05
CH23	-0.11	-0.05	0.00	0.66
CH25	0.00	0.08	0.04	-0.04
CH28	-0.12	-0.12	-0.29	-0.18
CH20	-0.10	-0.10	-0.05	-0.05
CH19	-0.10	-0.10	-0.25	-0.05
CH18	-0.16	-0.22	-0.18	-0.17
CH26	0.04	0.00	0.00	-0.04

Figure 7 currents during AMB02

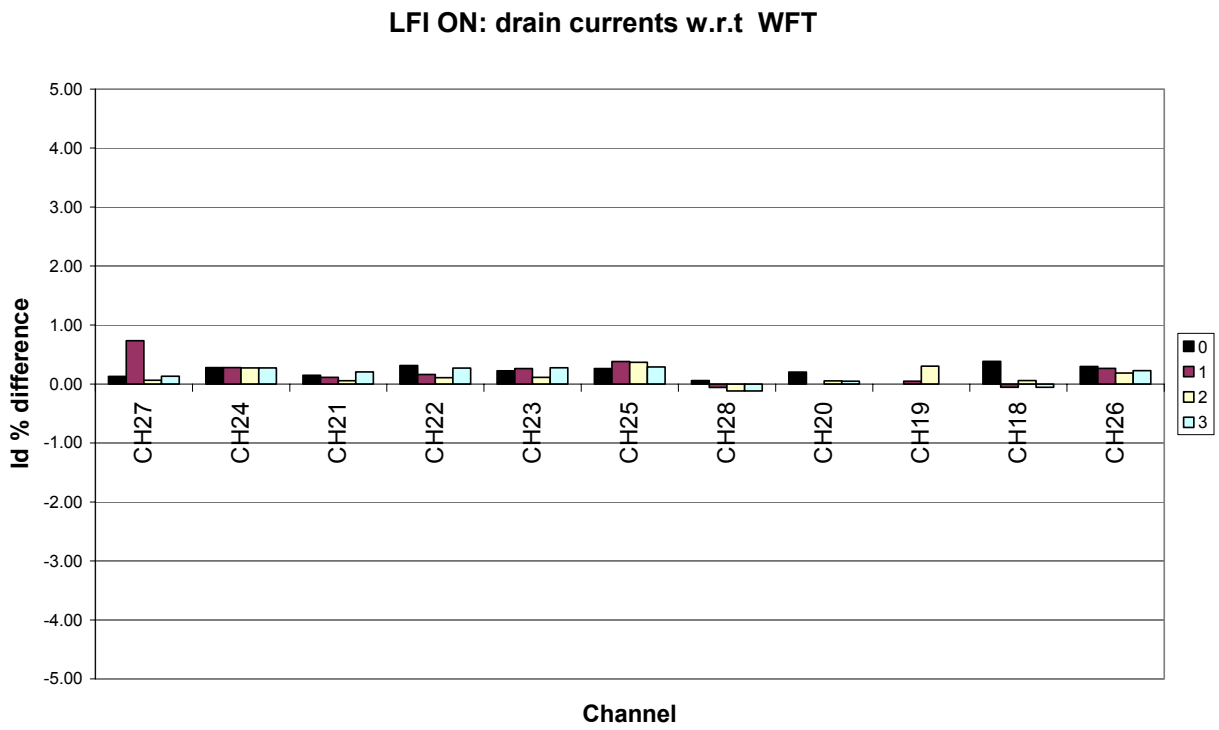

Figure 8 FEM drain currents comparison w.r.t. WFT reference test

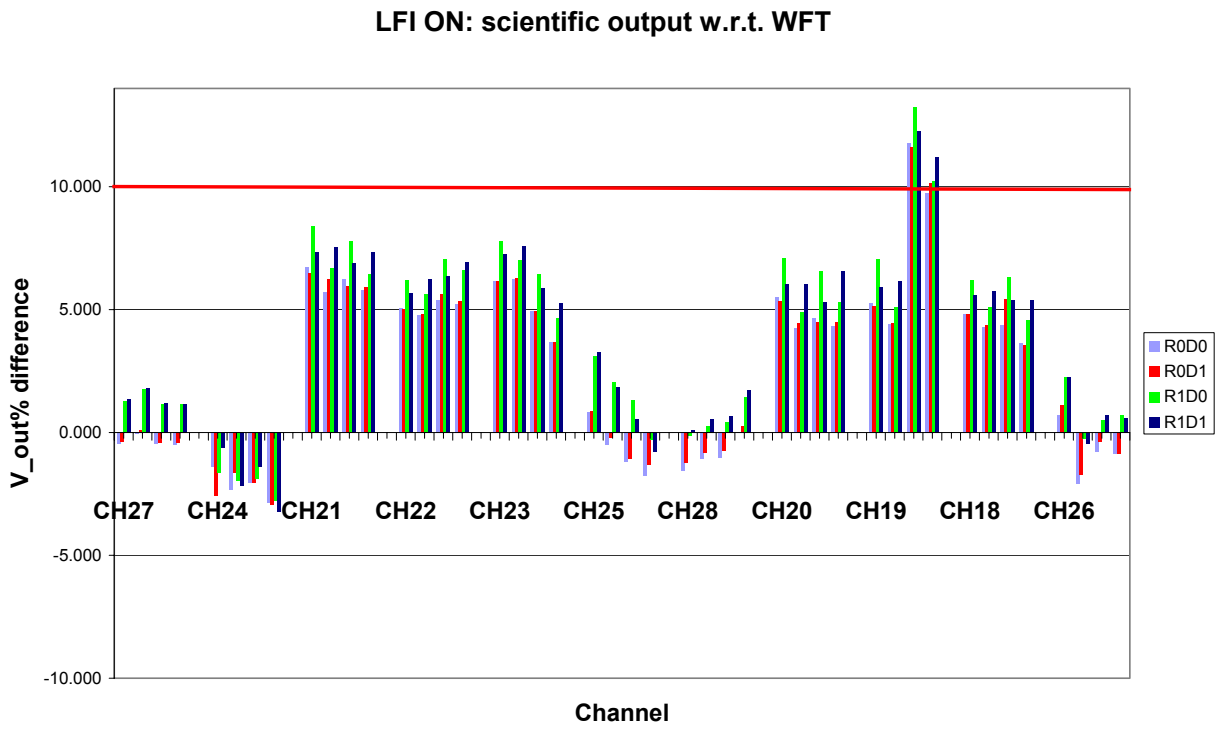

Figure 9 Vout during AMB_02: comparison with WFT test.

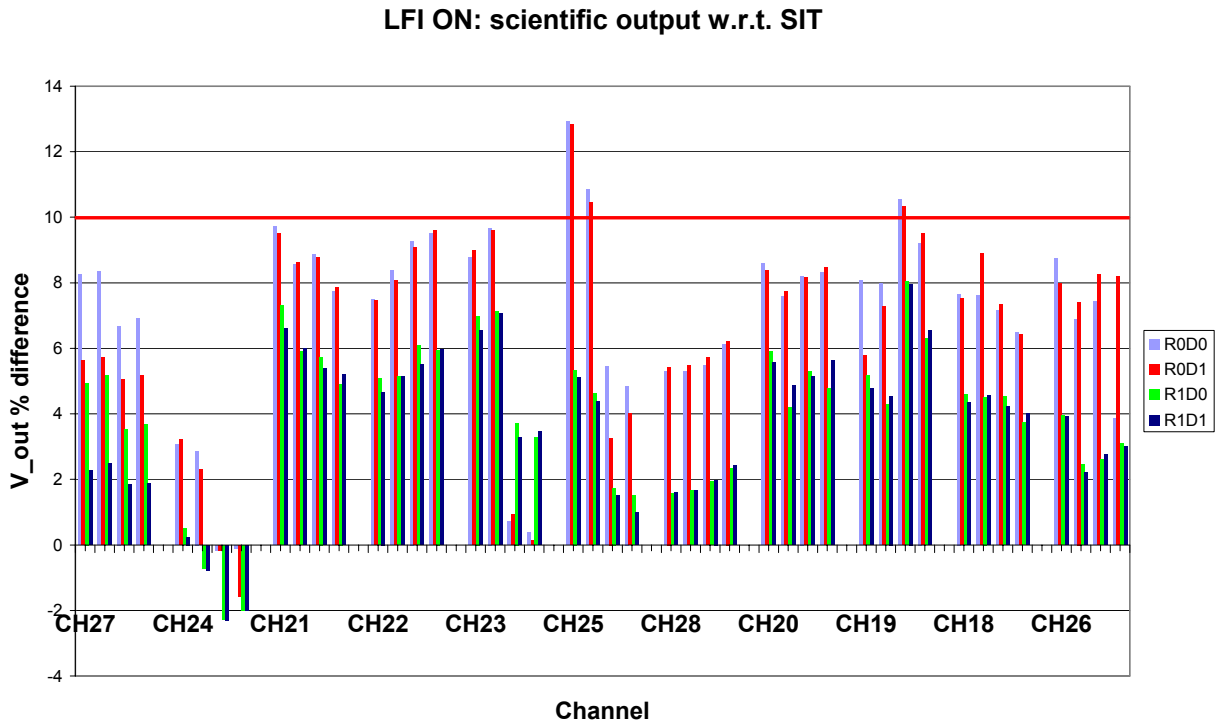

Figure 10 Vout during AMB_02: comparison with SIT test.

LFI ON VOUT (w.r.t WFT)						
	B/D SW		A/C SW		average B/D	average A/C
	REF	Remarks	Remarks	Remarks		
CH27	-0.48	-0.38	4.94	2.28	-0.33	3.22
	-0.05	0.09	5.16	2.49		
	-0.46	-0.41	3.52	1.85		
	-0.51	-0.44	3.67	1.87		
CH24	-1.41	-2.59	-1.66	-0.61	-2.24	-1.97
	-2.34	-1.64	-1.97	-2.18		
	-2.06	-2.06	-1.91	-1.40		
	-2.89	-2.94	-2.79	-3.22		
CH21	6.74	6.48	8.40	7.34	6.14	7.31
	5.70	6.23	6.70	7.55		
	6.25	5.96	7.79	6.89		
	5.82	5.94	6.47	7.33		
CH22	5.06	5.96	5.73	5.39	4.67	3.87
	4.79	5.94	4.91	5.19		
	5.39	0.00	0.00	0.00		
	5.22	5.01	5.08	4.67		
CH23	6.17	6.17	7.80	7.25	5.26	6.50
	6.27	6.28	7.03	7.61		
	4.92	4.93	6.46	5.87		
	3.68	3.67	4.64	5.29		
CH25	0.82	0.86	3.13	3.28	-0.55	1.38
	-0.50	-0.22	2.06	1.83		
	-1.20	-1.08	1.30	0.55		
	-1.78	-1.32	-0.29	-0.81		
CH28	-1.56	-1.24	-0.13	0.12	-0.78	0.63
	-1.07	-0.82	0.28	0.55		
	-1.02	-0.74	0.41	0.66		
	-0.04	0.27	1.43	1.74		
CH20	5.51	5.34	7.11	6.04	4.69	5.98
	4.26	4.47	4.89	6.02		
	4.65	4.51	6.58	5.32		
	4.32	4.49	5.33	6.58		
CH19	5.27	5.14	7.08	5.94	7.83	8.91
	4.43	4.47	5.11	6.17		
	11.79	11.61	13.24	12.25		
	9.75	10.15	10.24	11.22		
CH18	4.83	4.83	6.21	5.59	4.42	5.55
	4.30	4.39	5.12	5.76		
	4.39	5.44	6.34	5.41		
	3.63	3.54	4.58	5.40		
CH26	0.70	1.11	2.24	2.24	-0.62	0.78
	-2.09	-1.71	-0.26	-0.46		
	-0.80	-0.37	0.50	0.70		
	-0.89	-0.87	0.71	0.60		

Figure 11 Vout : comparison with results from WFT reference test

RCA #	Detector ID		SCOS Parameter	VG1		VG2		Vd		I1		I2		B/D SW		A/C SW	
				DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	DEC	HEX	B/D SW	REF	SKY	REF
CH27	00	00	LP001320	250	FA	130	82	200	C8	205	CD	205	CD	1.131966	1.122667	1.143868	1.133266
	01	01	LP002320	250	FA	130	82	200	C8	205	CD	205	CD	1.202101	1.191537	1.214544	1.204253
	02	10	LP003320	250	FA	130	82	200	C8	205	CD	205	CD	1.064712	1.063174	1.075527	1.07862
	03	11	LP004320	250	FA	130	82	200	C8	205	CD	205	CD	0.885107	0.879228	0.899822	0.888335
CH24	04	00	LP005320	241	E6	241	E5	255	FF	205	CD	205	CD	0.006803	0.006916	0.006884	0.006957
	05	01	LP006320	241	E6	241	E5	255	FF	205	CD	205	CD	0.007715	0.007672	0.007744	0.007728
	06	10	LP007320	241	E6	241	E6	255	FF	205	CD	205	CD	0.005191	0.005191	0.005199	0.005226
	07	11	LP008320	241	E6	241	E6	255	FF	205	CD	205	CD	0.006992	0.006988	0.007096	0.007065
CH21	08	00	LP009320	217	D9	178	B2	255	FF	255	FF	255	FF	0.031489	0.030987	0.031871	0.031343
	09	01	LP010320	218	DA	163	A3	255	FF	255	FF	255	FF	0.028223	0.028894	0.02849	0.029147
	0A	10	LP011320	133	85	178	B2	255	FF	255	FF	255	FF	0.061838	0.061242	0.061008	0.060178
	0B	11	LP012320	151	97	163	A3	255	FF	255	FF	255	FF	0.058939	0.059326	0.057387	0.058066
CH22	0C	00	LP013320	166	A6	172	AC	255	FF	255	FF	255	FF	0.079215	0.078442	0.078705	0.077139
	0D	01	LP014320	142	8E	124	7C	255	FF	255	FF	255	FF	0.089072	0.091202	0.087475	0.090728
	0E	10	LP015320	154	9A	124	7C	255	FF	255	FF	255	FF	0.071247	0.070249	0.071711	0.069315
	0F	11	LP016320	142	8E	121	79	255	FF	255	FF	255	FF	0.085856	0.086904	0.084761	0.087216
CH23	10	00	LP017320	162	A2	130	82	255	FF	255	FF	255	FF	0.137061	0.139505	0.142293	0.142755
	11	01	LP018320	148	94	127	7F	255	FF	255	FF	255	FF	0.167793	0.165475	0.17245	0.172369
	12	10	LP019320	141	8D	133	85	255	FF	255	FF	255	FF	0.185818	0.187712	0.178402	0.180725
	13	11	LP020320	183	B7	177	B1	255	FF	255	FF	255	FF	0.091341	0.090918	0.088612	0.088042
CH25	14	00	LP021320	242	F2	242	F2	255	FF	205	CD	205	CD	0.033875	0.036107	0.034447	0.035631
	15	01	LP022320	242	F2	242	F2	255	FF	205	CD	205	CD	0.03403	0.033028	0.033373	0.033502
	16	10	LP023320	242	F2	242	F2	255	FF	205	CD	205	CD	0.009386	0.009397	0.009421	0.009552
	17	11	LP024320	242	F2	242	F2	255	FF	205	CD	205	CD	0.007759	0.007697	0.007877	0.007737
CH28	18	00	LP025320	247	F7	128	80	200	C8	206	CE	205	CD	0.562205	0.561945	0.568869	0.562948
	19	01	LP026320	247	F7	128	80	200	C8	205	CD	206	CE	0.746593	0.729879	0.74827	0.738123
	1A	10	LP027320	246	F6	128	80	200	C8	205	CD	206	CE	0.701788	0.697802	0.709412	0.705714
	1B	11	LP028320	247	F7	128	80	200	C8	206	CE	205	CD	0.633477	0.622477	0.639689	0.628875
CH20	1C	00	LP029320	151	97	127	7F	255	FF	255	FF	255	FF	0.122601	0.120302	0.122859	0.12036
	1D	01	LP030320	112	70	172	AC	255	FF	255	FF	255	FF	0.111456	0.113982	0.1115	0.114294
	1E	10	LP031320	127	7F	154	9A	255	FF	255	FF	255	FF	0.130601	0.129482	0.131625	0.129334
	1F	11	LP032320	145	91	172	AC	255	FF	255	FF	255	FF	0.138322	0.140127	0.138292	0.141534
CH19	20	00	LP033320	109	6D	114	72	255	FF	255	FF	255	FF	0.089273	0.087898	0.088664	0.085808
	21	01	LP034320	157	9D	148	94	255	FF	255	FF	255	FF	0.095031	0.096112	0.092809	0.095447
	22	10	LP035320	172	AC	174	AE	255	FF	255	FF	255	FF	0.118496	0.116851	0.119921	0.118758
	23	11	LP036320	115	73	168	A8	255	FF	255	FF	255	FF	0.110084	0.111911	0.112664	0.114002
CH18	24	00	LP037320	177	B1	132	84	255	FF	255	FF	255	FF	0.135539	0.133663	0.137009	0.134624
	25	01	LP038320	135	87	180	B4	255	FF	255	FF	255	FF	0.179921	0.181632	0.182906	0.185084
	26	10	LP039320	156	9C	147	93	255	FF	255	FF	255	FF	0.093117	0.094893	0.092512	0.093285
	27	11	LP040320	165	A5	129	81	255	FF	255	FF	255	FF	0.10477	0.103334	0.103426	0.103078
CH26	28	00	LP041320	241	F1	242	F2	255	FF	205	CD	205	CD	0.012286	0.01274	0.012371	0.012575
	29	01	LP042320	242	F2	241	F1	255	FF	205	CD	205	CD	0.015176	0.015038	0.015061	0.015229
	2A	10	LP043320	241	F1	241	F1	255	FF	205	CD	205	CD	0.019443	0.020026	0.019698	0.02004
	2B	11	LP044320	241	F1	241	F1	255	FF	205	CD	205	CD	0.021705	0.021312	0.021652	0.02163

Figure 12 Bias and Voltage synoptic frame during AMB02

4.12 Nominal Science with Redundant unit

During this step HFI and SCS are switching off. LFI stays in nominal acquisition acquiring data for analysis.

4.12.1 Procedure/ Test sequence

Before starting data acquisition, "LFI goes in Nominal Science - type 5" and "Reset Science TM Counter" (see PL-LFI-PST-PR-019, par. 5.6, tab. 7)

4.12.2 Results and Conclusions

The procedure was run on February the 14th without any problem and the test was finished successfully.

The "LFI goes in Nominal Science - type 5" procedure was not included in the TS (type 1 was instead foreseen). It was added just before the test but was run without any problem.

The "Reset Science TM Counter" procedure (see PL-LFI-PST-PR-019, par. 5.6, tab. 7) was added just for this test (and thus it should not be included in the TS) and applied in order to investigate the problem occurred during last Spike test (performed on February 5th and 6th) with failures of the TC LC021320 "Disabling Calibration Channel switching" (because the Channel was already off).
The result is ok and the problem did not appeared again. Additional offline investigation is still necessary before the problem is completely understood and solved.

Pass and Fail Criteria

No un-expected event Packets	
REBA Power Consumption within the ranges of expected values	
DAE Power Consumption within the ranges of expected values	
No unexpected features during SCS activity in Scientific signal	
No unexpected features during HFI activity in Scientific signal	

No NCRs were raised.

4.13 PLM SIT Switch off of the Redundant Unit

4.13.1 Procedure/ Test sequence

LFI SIT: Switch off (Redundant Unit)					0.20.00	
	Switch OFF LFI			1	0.20.00	
		Science De-Activation		0.05.00	1	0.05.00	0.05.00
		RCA De-Activation		0.05.00	1	0.05.00	0.10.00
		LFI to Standby	DAE Set Up to Standby	0.05.00	1	0.05.00	0.15.00
		Switch OFF	Standby to OFF	0.05.00	1	0.05.00	0.20.00

4.13.2 Results and Conclusions

The procedure was run on February the 14th and the test was finished successfully. One minor problem occurred. The switch off procedure foresees a disabling of the calibration switching but due to late inclusion of "LFI goes in Nominal Science - type 5" with respect to "type 1" (that does not require the calibration channel), the disabling was forgotten and not included in the TS. This was anyway disabled since the LFI went to a complete switched OFF. Thus the TS was not stopped but it should be included in the final TS.
In addition, perhaps for this last part of the test, the TC history file was not produced.

Pass and Fail Criteria

No un-expected event Packets	
No more telemetry coming from LFI	

No NCRs were raised.

4.14 OTHER FEATURES

4.14.1 Current drops in RCA 23

This feature was monitored just from TQL: a deeper investigation from offline (LIFE software) analysis is required an will be added in the next Issue of this document.

4.14.2 Scientific output crossing in RCA 25

The feature appeared again on February the 14th during the SIT procedure while HFI was switching ON and disappeared while SCS was switching OFF (see Par. 4.6.2). The TC history file was produced when the two crossings appeared.
Unfortunately, due to the sequence going on, it was impossible to apply any procedure to investigate the problem.
From first level analysis it comes out that the voltage level when the feature exhibits is about the same of previous tests. It confirms that this phenomenon, whatever be its cause, is deterministic.
A snapshot of the feature appearance during the SIT test is shown in the next figure. The crossing condition, probably driven by thermal, showed twice. The average value of the crossing point is 0.0096766 V in the first appearance and 0.0096765 V in the second.

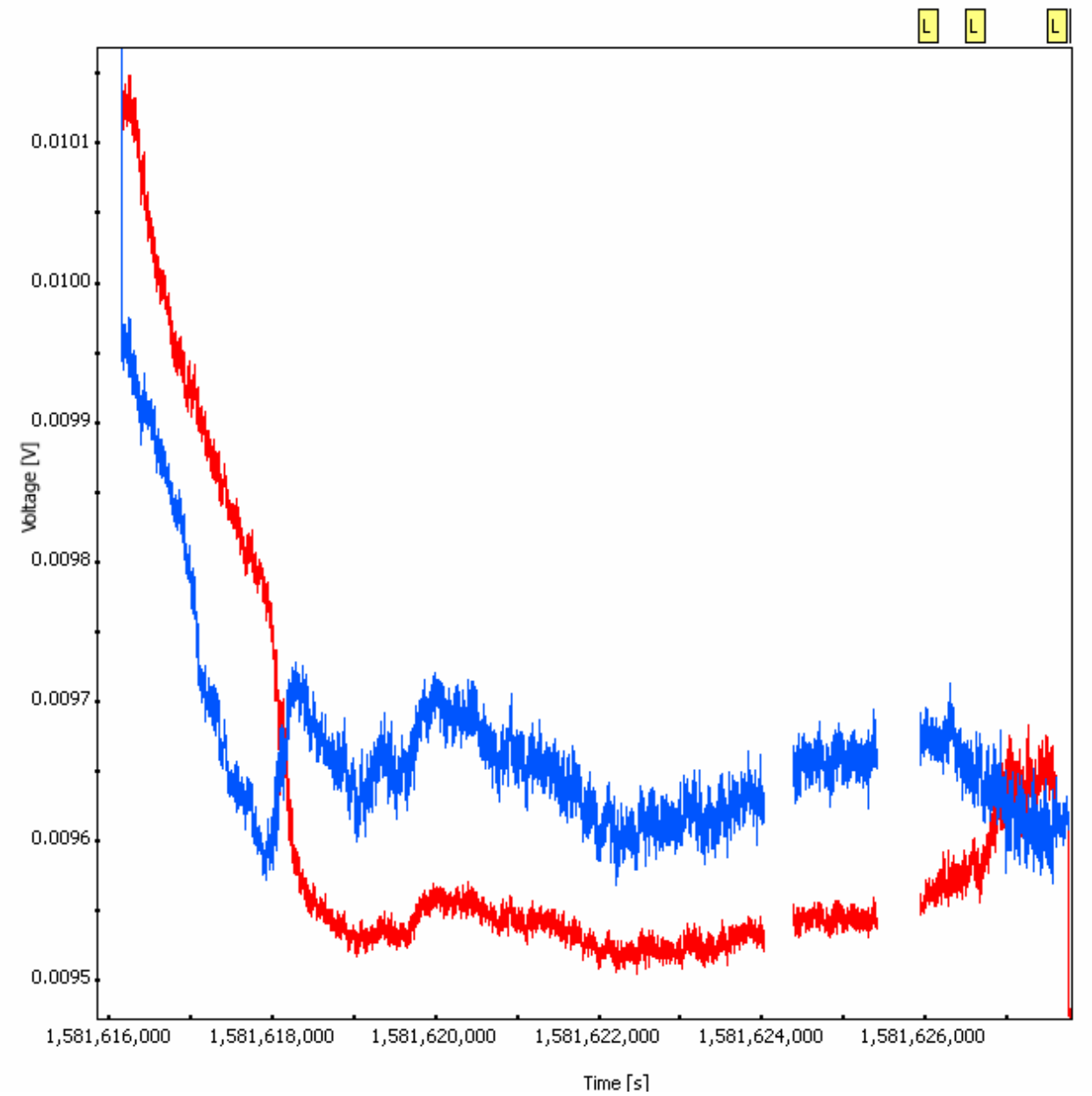

Figure 13 RCA25R1D0: SKY- REF signals crossing monitored during tests AMB160, AMB161, AMB 162. Crossing starts when HFI is switched on and reverts when SCS Health check terminates.

4.14.3 SKY REF separation in RCA 25

It was noted that a particular condition of 4KHz and PS polarization produces in the scientific output a condition where SKY and REF signals are superposed. This is somehow unexpected, moreover since the separation is not recovered neither when the PS polarization in the not switching ACA is changed.

A first comparison with the previous SIT shows that this is the first time this unexpected behaviour is observed. A possible explanation could be ascribed to the different thermal conditions, producing slightly different voltages for all the ACAs. However, this feature must be investigated deeper, correlating results with the behaviour observed in the ACA sharing the same 4KHz.

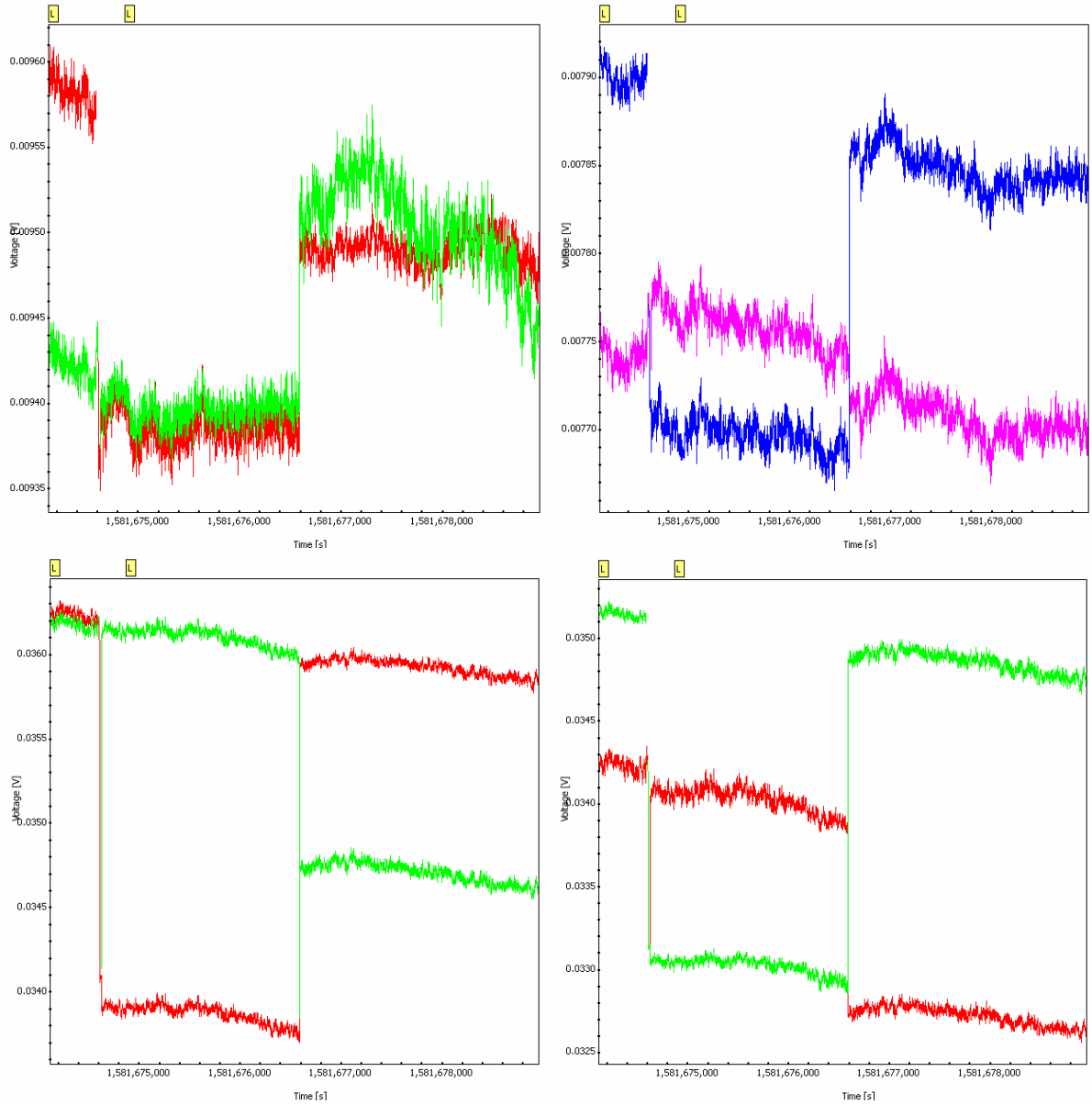

Figure 14 Channel RCA25-10 on the left and RCA25-11 on the right. RCA25-00 below Sky ref signals are not well separated when the B/D 4KHz is switched ON and further when the AC polarization is changed from 0 to 1. The same does not appear on channel 11, sharing the Hybrid, nor in the channel (R0D0) sharing the A/C 4KHz

4.14.4 Noise / spikes in signal corresponding to some SCS activities

A deeper offline analysis is required to map these features. This paragraph will be completed in the next Issue.

4.14.5 Thermal variation in BEM sensors when science is disabled

As observed in the previous tests, a like digital variation exhibits in LBEM and RBEM sensors when science is activated – deactivated.
This feature was hence expected (possible explanation given in WFT test report AD**) and here is just monitored.

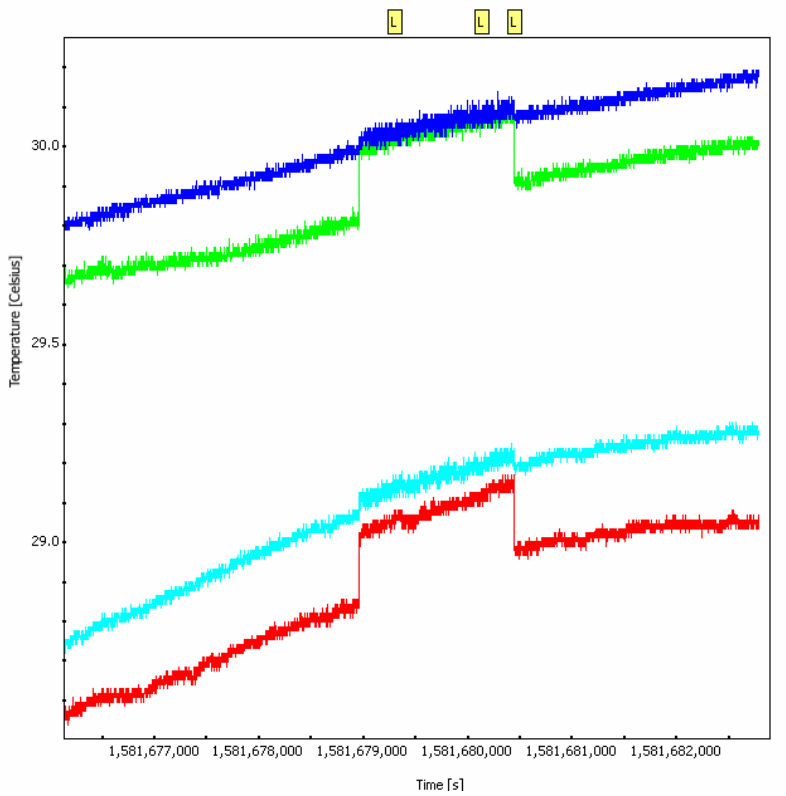

Figure 15