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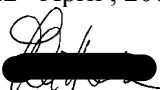


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Spike Tests during EMC tests**

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|                    |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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**Quick look Data Analysis Of LFI Spike  
Tests during EMC tests**

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**CHANGE RECORD**

| Issue | Date                   | Sheet | Description of Change   | Release |
|-------|------------------------|-------|-------------------------|---------|
| 0.1   | February               | All   | First Draft of Document | Draft   |
| 1.0   | 22 <sup>th</sup> April | All   | First Issue of Document | 1.0     |
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## **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 Spike test requested by LFI IOT at system level. Being the tests foreseen to be performed in two slots during the night shift in the middle of EMC/Autocompatibility tests the document is divided in two sets.

Each set is dedicated to a single shift and it is divided in two different 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 2.0.787

LFI Gateway Version V0R9P1

TQL 3.1.2

LIFE Machine version OM 3.00

LFI Personnel involved during the test is:

|                       |     |                                                                                                                                                                                                                                                                                         |
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| Industry support      |     | Paola Battaglia TAS-I                                                                                                                                                                                                                                                                   |



### **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] LFI Warm Functional Test Procedure (WFT)  
PL-LFI-PST-PR-017\_2\_1
- [RD4] Combined LFI EMC Tests at System Level  
PL-LFI-PST-PR-020
- [RD5] Proposal for LFI test dedicated to characterize New Spikes in the FFT spectrum of  
Scientific Data  
PL-LFI-PST-TN-080



## 4 Spike Test Execution

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

### 4.1 First Slot FEU on

The test has been done using the nominal unit but the results could be used also for the redundant unit. The slot starts from the EMC configuration tests and it stops in the same configuration in order to guarantee the continuity of the EMC tests.

#### 4.1.1 Procedure/ Test sequence

| Spike Test Part 2                 |                                             |                             |         |         | 7.52.00 |         |
|-----------------------------------|---------------------------------------------|-----------------------------|---------|---------|---------|---------|
| Preparation to Test configuration |                                             |                             | 1       | 0.17.00 |         |         |
|                                   | Check DAE Configuration                     | IOT Confirm                 | 0.05.00 | 1       | 0.05.00 | 0.05.00 |
|                                   | Stop Monitor Function                       |                             | 0.02.00 | 1       | 0.02.00 | 0.07.00 |
|                                   | Stop Calibration Channel                    |                             | 0.02.00 | 1       | 0.02.00 | 0.09.00 |
|                                   | Science De-Activation                       |                             | 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               |                             | 0.02.00 | 1       | 0.02.00 | 0.15.00 |
|                                   | Science Activation Type 1                   |                             | 0.02.00 | 1       | 0.02.00 | 0.17.00 |
| Test Execution (part 2)           |                                             |                             | 1       | 7.16.00 |         |         |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 1.17.00 |
|                                   | Change PS status on A/C                     | Set P/S to zero status      | 0.02.00 | 1       | 0.02.00 | 1.19.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 2.19.00 |
|                                   | Disable 4KHz switching on B/D               |                             | 0.02.00 | 1       | 0.02.00 | 2.21.00 |
|                                   | Enable 4KHz switching on A/C                |                             | 0.02.00 | 1       | 0.02.00 | 2.23.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 3.23.00 |
|                                   | Change PS Status on B/D                     |                             | 0.02.00 | 1       | 0.02.00 | 3.25.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 4.25.00 |
|                                   | Disable 4KHz switching                      |                             | 0.02.00 | 1       | 0.02.00 | 4.27.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 5.27.00 |
|                                   | Disable HK DAE Sequencer                    | LC064320 with no parameters | 0.02.00 | 1       | 0.02.00 | 5.29.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 6.29.00 |
|                                   | Enable 4KHz switching on B/D                |                             | 0.02.00 | 1       | 0.02.00 | 6.31.00 |
|                                   | Change Ps Status on A/C                     | Set Status to 1             | 0.02.00 | 1       | 0.02.00 | 6.33.00 |
|                                   |                                             | Acquire data                | 1.00.00 | 1       | 1.00.00 | 7.33.00 |
| Recovering EMC configuration      |                                             |                             | 1       | 0.19.00 |         |         |
|                                   | Enable HK DAE Sequencer                     | LC063320 with no parameters | 0.02.00 | 1       | 0.02.00 | 7.35.00 |
|                                   | Science De-Activation                       |                             | 0.02.00 | 1       | 0.02.00 | 7.37.00 |
|                                   | Definition of science Processing Parameters | Naverage set to Nominal     | 0.02.00 | 1       | 0.02.00 | 7.39.00 |
|                                   | Changing Processing Type to 5               |                             | 0.02.00 | 1       | 0.02.00 | 7.41.00 |
|                                   | Science Activation Type 5                   |                             | 0.02.00 | 1       | 0.02.00 | 7.43.00 |
|                                   | Start Channel Switching                     |                             | 0.02.00 | 1       | 0.02.00 | 7.45.00 |
|                                   | Start Monitor function                      |                             | 0.02.00 | 1       | 0.02.00 | 7.47.00 |
|                                   | Check DAE Configuration                     | IOT Confirm                 | 0.05.00 | 1       | 0.05.00 | 7.52.00 |

During the execution of the procedure LFI IOT checks the functionality of the LFI instrument.



#### 4.1.2 Results and Conclusions

The procedure has run on the 5th of February without any problem and the test has finished successfully.

The data collected are divided in different slots:

- AMB\_0121 (4KHz enabled in B/D and A/C status set to 1)
- AMB\_0122 (4KHz enabled in B/D and A/C status set to 0)
- AMB\_0124 (4KHz enabled in A/C and B/D status set to 0)
- AMB\_0125 (4KHz enabled in A/C and B/D status set to 1)
- AMB\_0126 (4KHz disabled)
- AMB\_0127 (4KHz disabled and HK sequence disabled)
- AMB\_0128 (4KHz enabled in B/D and A/C status set to 1 and HK sequencer disabled)
- AMB\_0130 (Back to EMC configuration)

#### Pass and Fail Criteria

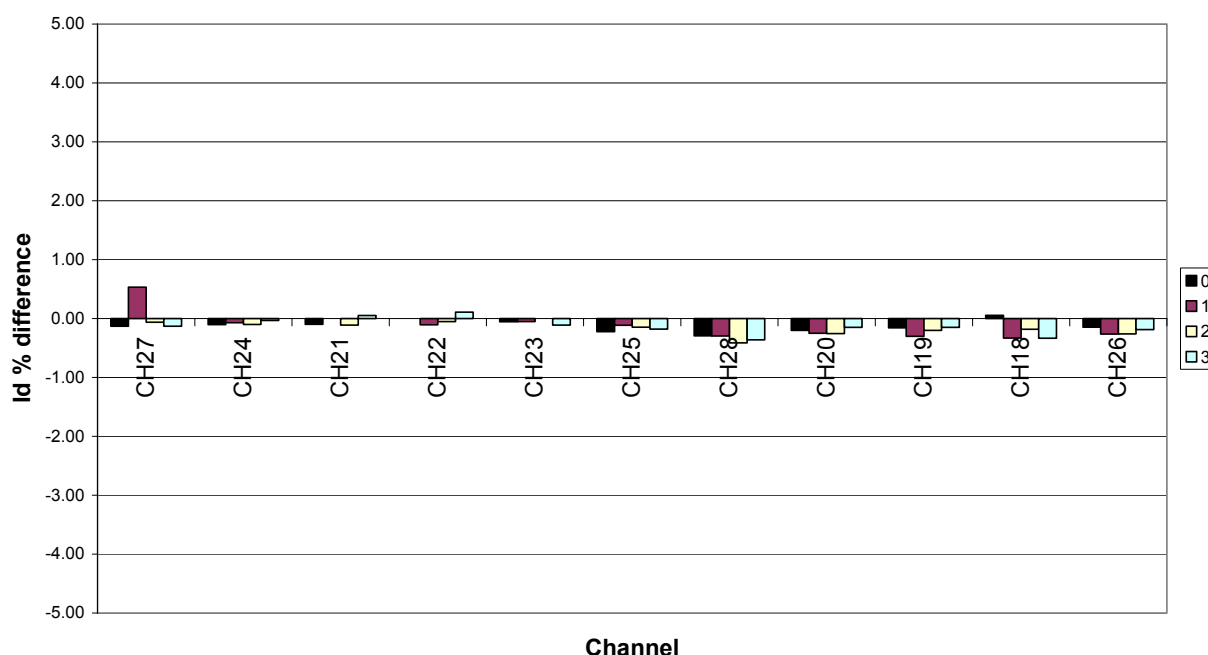
|                                                                                      |          |
|--------------------------------------------------------------------------------------|----------|
| No errors from the REBA HW Self check                                                | Passed   |
| No un-expected event Packets                                                         | Passed   |
| REBA Power Consumption within the ranges of expected values                          | Passed   |
| EEPROM Check Sum passed                                                              | Passed   |
| REBA synchronization achieved                                                        | Passed   |
| DAE Power Consumption within the ranges of expected values                           | Passed   |
| DAE Synchronization achieved                                                         | Passed   |
| The FEM I Drain Currents obtained from Telemetry are within the ranges expected (5%) | Passed   |
| The DC voltages Outputs (Science Telemetry) are within the ranges expected. (10%)    | On going |
| Data Collection completed                                                            | Passed   |

During the execution of the test the TC007320 failed because for a procedural mistake it was sent two times. The TC failed because the Science was already on and the ASW couldn't switch on science again so it delivered a TM(1,8). So the ASW behaved as expected.



| CH   | Id w.r.t WFT |       |       |       |
|------|--------------|-------|-------|-------|
|      | <00>         | <01>  | <10>  | <11>  |
| CH27 | -0.13        | 0.53  | -0.06 | -0.13 |
| CH24 | -0.10        | -0.07 | -0.10 | -0.03 |
| CH21 | -0.10        | 0.00  | -0.11 | 0.05  |
| CH22 | 0.00         | -0.11 | -0.05 | 0.11  |
| CH23 | -0.06        | -0.05 | 0.00  | -0.11 |
| CH25 | -0.22        | -0.11 | -0.15 | -0.18 |
| CH28 | -0.29        | -0.30 | -0.41 | -0.36 |
| CH20 | -0.20        | -0.25 | -0.25 | -0.15 |
| CH19 | -0.16        | -0.30 | -0.20 | -0.15 |
| CH18 | 0.05         | -0.33 | -0.18 | -0.33 |
| CH26 | -0.15        | -0.26 | -0.26 | -0.19 |

**LFI ON: drain currents w.r.t WFT**



2. Figure Drain currents with LFI – N on

## 4.2 Second Slot FEMs OFF

The test has been done using the nominal unit but the results could be used also for the redundant unit. The slot starts from the EMC configuration tests and it stops in the same configuration in order to guarantee the continuity of the EMC tests.



#### 4.2.1 Procedure/ Test sequence

| Spike Test Part 1                        |                                             |                             |         |   | 5.54.00 |         |
|------------------------------------------|---------------------------------------------|-----------------------------|---------|---|---------|---------|
| <b>Preparation to Test configuration</b> |                                             |                             |         | 1 | 0.17.00 |         |
|                                          | Check DAE Configuration                     | IOT Confirm                 | 0.05.00 | 1 | 0.05.00 | 0.05.00 |
|                                          | Stop Monitor Function                       |                             | 0.02.00 | 1 | 0.02.00 | 0.07.00 |
|                                          | Stop Calibration Channel                    |                             | 0.02.00 | 1 | 0.02.00 | 0.09.00 |
|                                          | Science De-Activation                       |                             | 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               |                             | 0.02.00 | 1 | 0.02.00 | 0.15.00 |
|                                          | Science Activation Type 1                   |                             | 0.02.00 | 1 | 0.02.00 | 0.17.00 |
| <b>Test execution (part 1)</b>           |                                             |                             |         | 1 | 5.16.00 |         |
|                                          | Perform DAE Initialization                  |                             | 0.10.00 | 1 | 0.10.00 | 0.27.00 |
|                                          |                                             | Wait for thermalization     | 0.30.00 | 1 | 0.30.00 | 0.57.00 |
|                                          |                                             | Acquire data                | 1.00.00 | 1 | 1.00.00 | 1.57.00 |
|                                          | Disable HK DAE Sequencer                    | LC064320 with no parameters | 0.02.00 | 1 | 0.02.00 | 1.59.00 |
|                                          |                                             | Acquire data                | 1.00.00 | 1 | 1.00.00 | 2.59.00 |
|                                          | RCA Deactivation                            |                             | 0.02.00 | 1 | 0.02.00 | 3.01.00 |
|                                          |                                             | Wait for thermalization     | 0.30.00 | 1 | 0.30.00 | 3.31.00 |
|                                          |                                             | Acquire data                | 1.00.00 | 1 | 1.00.00 | 4.31.00 |
|                                          | Enable HK DAE Sequencer                     | LC063320 with no parameters | 0.02.00 | 1 | 0.02.00 | 4.33.00 |
|                                          |                                             | Acquire data                | 1.00.00 | 1 | 1.00.00 | 5.33.00 |
| <b>Recovering EMC configuration</b>      |                                             |                             |         | 1 | 0.21.00 |         |
|                                          | RCA Activation                              |                             | 0.02.00 | 1 | 0.02.00 | 5.35.00 |
|                                          | Set DAE Default configuration               |                             | 0.02.00 | 1 | 0.02.00 | 5.37.00 |
|                                          | Science De-Activation                       |                             | 0.02.00 | 1 | 0.02.00 | 5.39.00 |
|                                          | Definition of science Processing Parameters | Naverage set to Nominal     | 0.02.00 | 1 | 0.02.00 | 5.41.00 |
|                                          | Changing Processing Type to 5               |                             | 0.02.00 | 1 | 0.02.00 | 5.43.00 |
|                                          | Science Activation Type 5                   |                             | 0.02.00 | 1 | 0.02.00 | 5.45.00 |
|                                          | Start Channel Switching                     |                             | 0.02.00 | 1 | 0.02.00 | 5.47.00 |
|                                          | Start Monitor function                      |                             | 0.02.00 | 1 | 0.02.00 | 5.49.00 |
|                                          | Check DAE Configuration                     | IOT Confirm                 | 0.05.00 | 1 | 0.05.00 | 5.54.00 |

#### 4.2.2 Results and Conclusions

The results are collected in the following tests:

- AMB\_0137 (Thermalization)
- AMB\_0138 (First and second slots FEMs Off: HK sequencer switched OFF)
- AMB\_0139 (Power Groups switched off)
- AMB\_0140 (HK Sequencer Switched ON and EMC configuration recovered)

Pass and Fail Criteria

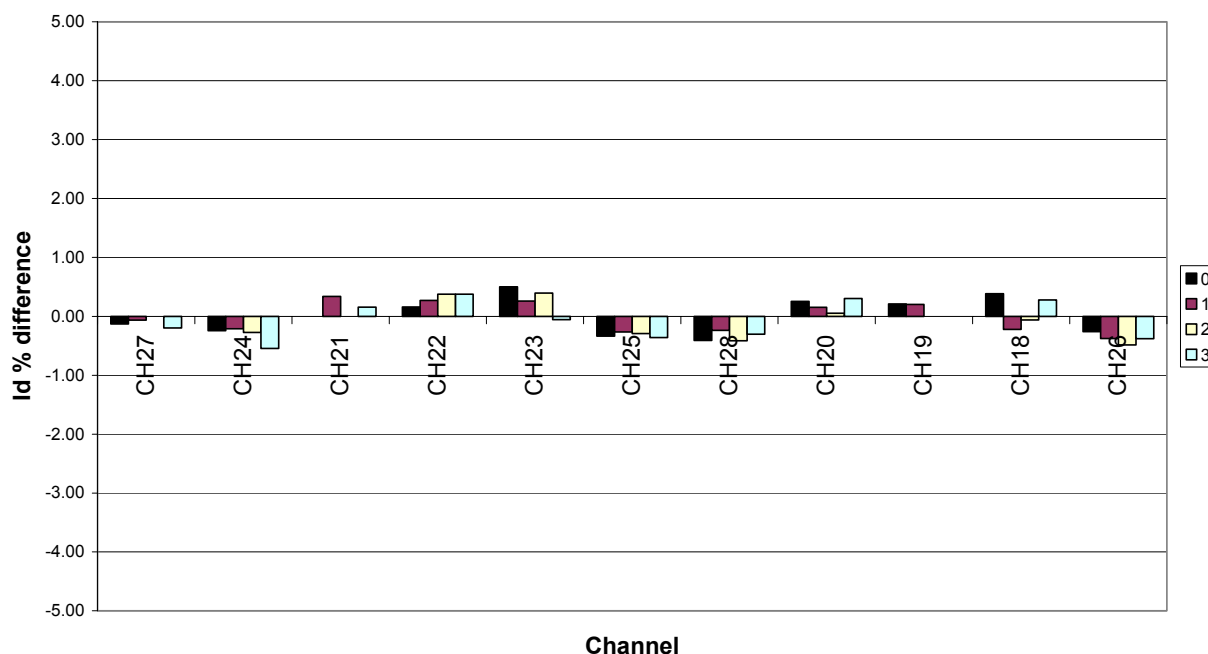
|                                                                                      |          |
|--------------------------------------------------------------------------------------|----------|
| No un-expected event Packets                                                         | Passed   |
|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



At the beginning of the test a current check has been made.

| Id w.r.t WFT |       |       |       |       |
|--------------|-------|-------|-------|-------|
| CH           | <00>  | <01>  | <10>  | <11>  |
| CH27         | -0.19 | 0.60  | -0.06 | -0.26 |
| CH24         | -0.10 | -0.14 | -0.17 | -0.48 |
| CH21         | -0.05 | 0.00  | -0.11 | 0.00  |
| CH22         | -0.16 | -0.11 | -0.05 | 0.05  |
| CH23         | 0.00  | -0.10 | 0.00  | -0.17 |
| CH25         | -0.22 | -0.15 | -0.22 | -0.25 |
| CH28         | -0.35 | -0.36 | -0.47 | -0.42 |
| CH20         | -0.15 | -0.30 | -0.25 | -0.20 |
| CH19         | -0.16 | -0.30 | -0.15 | -0.15 |
| CH18         | -0.05 | -0.44 | -0.37 | -0.28 |
| CH26         | -0.22 | -0.30 | -0.30 | -0.27 |

LFI ON: drain currents w.r.t. RAA



3. Figure Drain currents with LFI – N on

NCR Open:



| NCR      | Description                                                                                                                                                                                                                                                            |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NC-15816 | LFI suffered this failure during the spike tests. The autonomous functions were activated by default so without any TM rate reset the Calibration channel was switched off automatically. Any attempt to switch it off as requested in procedure created a TC failure. |
| NC-14371 | This NC was opened during WFT. During the spike test a analogous failure happened.                                                                                                                                                                                     |

### **4.3 DATA Analysis and NEW FEATURES**

#### **4.3.1 Current drops in RCA 23**

NA

#### **4.3.2 Scientific output crossing in RCA 25**

NA

#### **4.3.3 Noise / spikes in signal**

##### **4.3.3.1 General remarks**

The objectives of this test were to characterise the presence of frequency spikes in the LFI data and verify their correlation with the status of the DAE HK sequencer. More in particular these are the objectives stated in the test proposal [RD5]:

To verify that the 1 Hz spikes in the DAE output are strictly correlated with the switch on/off of the HK sequencer

To characterise 1 Hz spikes (i.e. measure frequency, amplitude and phase) present in the DAE output when the BEMs are off

To characterise 1 Hz spikes (see above) present in the DAE output when the BEMs are on

To verify that the 1 Hz spikes in the radiometric output are at the same frequencies of the spikes in the DAE output

To verify that the 1 Hz spikes in the radiometric output are strictly correlated with the switch on/off of the HK sequencer

To characterize at the same time the low frequency spikes.



In the following table we summarise the results in relation with the above mentioned objectives

| Objective # | Passed | Remarks                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1           | YES    | The majority of the frequency spikes disappear when the HK sequencer is turned off. Nonetheless it was apparent that some channels showed also some features not correlated with the HK sequencer status. In particular LFI22 R0D0 and R0D1 show a strong disturbance in frequency spectrum, while minor features are seen in LFI23 R1D1, LFI24 R0D0 R0D1 and R1D0, LFI25 R1D0 and R0D1, LFI26, LFI27 and LFI28 (all channels) |
| 2           | YES    | Phase characterisation is ongoing                                                                                                                                                                                                                                                                                                                                                                                              |
| 3           | YES    | Same remarks as in point 1                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4           | YES    | From visual inspection of spectra. Quantitative analysis ongoing. Many spikes that are visible on the DAE output are not seen in the radiometric output because of the higher noise level                                                                                                                                                                                                                                      |
| 5           | YES    | Same remarks as in point 1                                                                                                                                                                                                                                                                                                                                                                                                     |
| 6           | YES    |                                                                                                                                                                                                                                                                                                                                                                                                                                |

#### **4.3.3.2 Detailed results**

All the data have been acquired with the LFI instrument in Type 1 mode with Naver = 256 on all channels. This implied a sampling frequency of 16 Hz in switched mode and of 32 Hz in unswitched mode, i.e. a maximum frequency of 8 Hz and 16 Hz in switched and unswitched modes, respectively.

The choice of this mode instead of the Type 5 mode (that would have provided information on a larger frequency range) has been dictated by the optimisation of the REBA compression parameters, that in these conditions (room temperature) was not optimal on all channels. Furthermore running the instrument in Type 1 mode with a binning lower than 256 would have been incompatible with the telemetry requirements.

Detailed plots and results are reported in the annex documents listed in the following table



| Step number           | Power groups | FEM biased? | 4 KHz sw. | A/C | B/D | HK seq. | Document           |
|-----------------------|--------------|-------------|-----------|-----|-----|---------|--------------------|
| First part (FEMs OFF) |              |             |           |     |     |         |                    |
| 1                     | OFF          | NO          | NO        | N/A | N/A | ON      | spike_amb_0140.pdf |
| 2                     | OFF          | NO          | NO        | N/A | N/A | OFF     | spike_amb_0139.pdf |
| 3                     | ON           | NO          | NO        | N/A | N/A | OFF     | TBW                |
| 4                     | ON           | NO          | NO        | N/A | N/A | ON      | TBW                |
| Second part (FEMs ON) |              |             |           |     |     |         |                    |
| 5                     | ON           | YES         | YES       | sw  | 0   | ON      | spike_amb_0121.pdf |
| 6                     | ON           | YES         | YES       | 0   | sw  | ON      | spike_amb_0122.pdf |
| 7                     | ON           | YES         | YES       | 1   | sw  | ON      | TBW                |
| 8                     | ON           | YES         | YES       | sw  | 1   | ON      | spike_amb_0125.pdf |
| 9                     | ON           | YES         | NO        | 0   | 1   | ON      | spike_amb_0126.pdf |
| 10                    | ON           | YES         | NO        | 0   | 1   | OFF     | spike_amb_0127.pdf |
| 11                    | ON           | YES         | YES       | sw  | 1   | OFF     | spike_amb_0128.pdf |

#### 4.4 Conclusions and recommendations

The test has proven a successful and provided valuable information to characterise spurious effects in the scientific output disentangling different sources. More in particular we could:

- separate effects arising in the back-end electronics from those caused by the front end modules (by acquiring data with FEMs on and off);
- isolate spurious spikes caused by the DAE HK sequencer (by acquiring data with FEMs on and off).

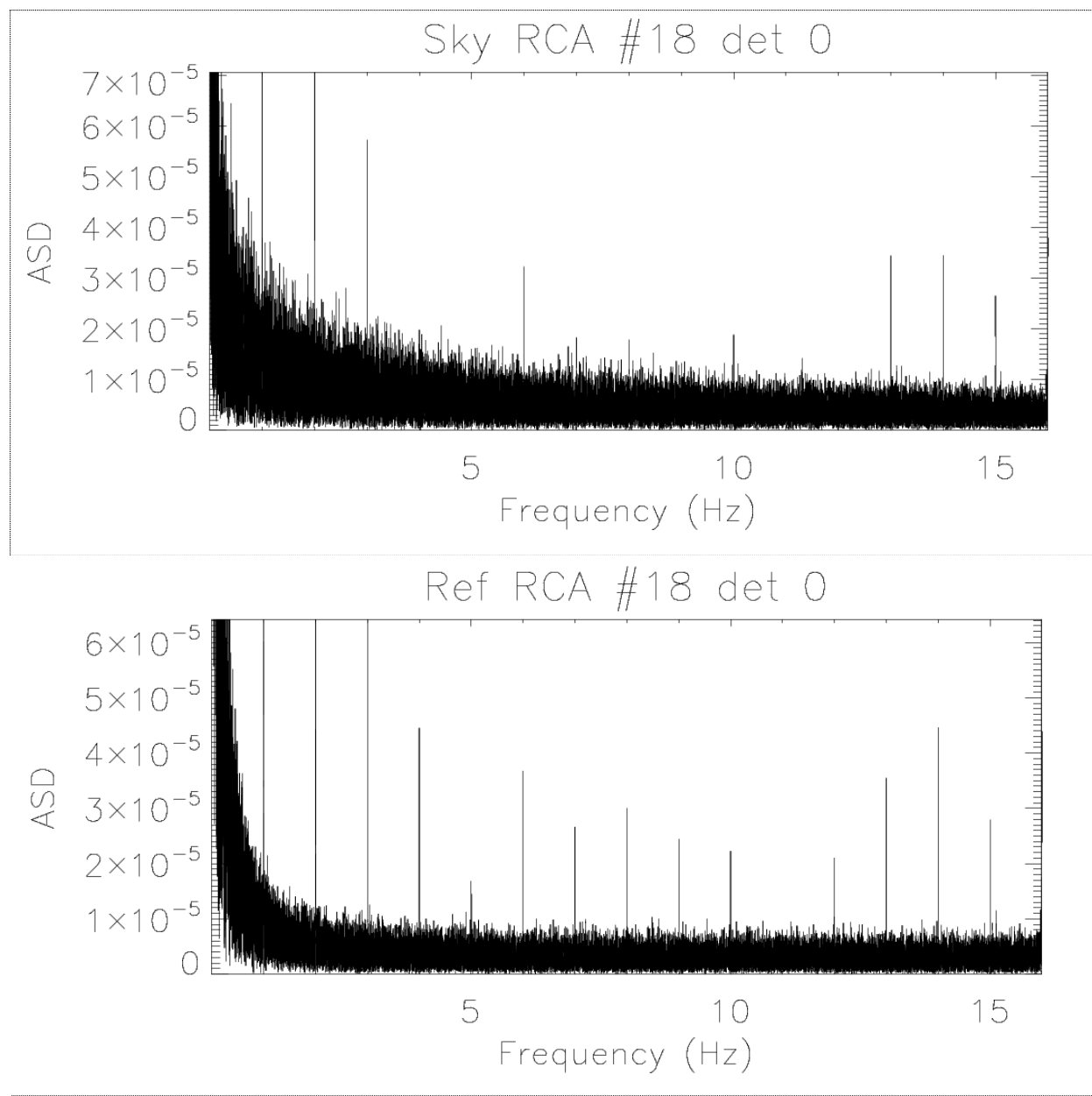
The results obtained from this test can be summarised as follows:

- we have found no particular effects related to the FEMs and very little dependence of the frequency spikes from the phase switch state and switching condition (see, e.g. Fig. 1);
- almost all the frequency spikes disappear when the DAE HK sequencer is deactivated, as was expected (see, e.g., Fig. 2);
- some frequency spikes remain in a limited number of channels even after HK sequencer deactivation (see Fig. 3). In one case (the output of LFI22 R1D0 and R1D1) the effect is quite strong and can be found at a fundamental frequency of  $\sim 3$  Hz. Looking at data acquired at the nominal sampling frequency of 76.8 Hz this effect can be found at  $\sim 30$  Hz; this indicates that the fundamental of 3 Hz is probably the result of a beating between the frequency of the spurious effect and the sampling frequency (see Fig. 4)

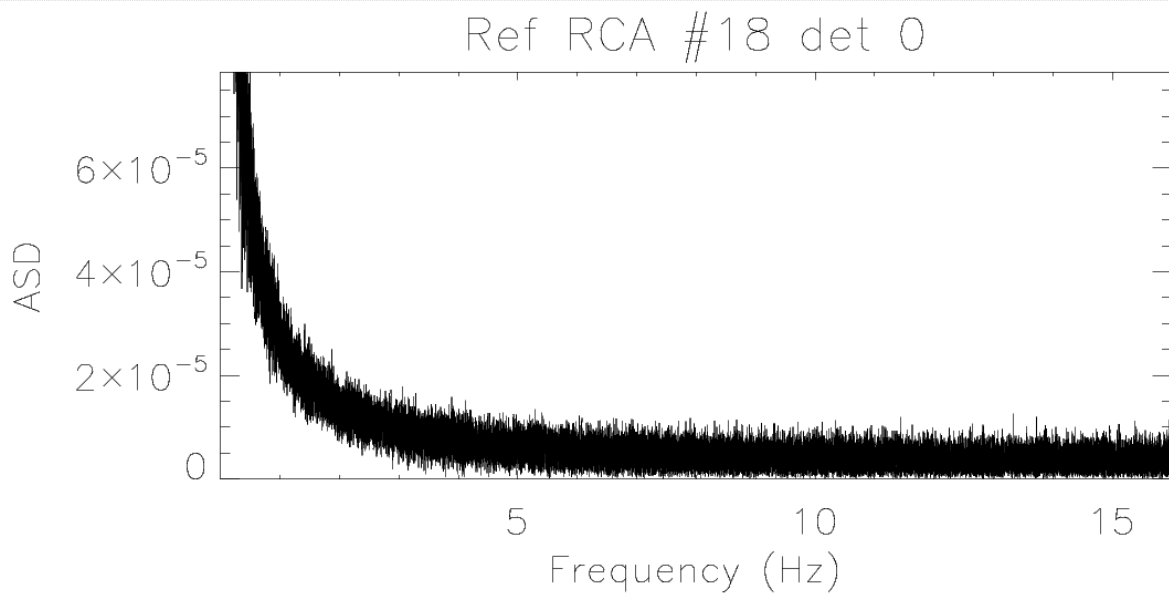
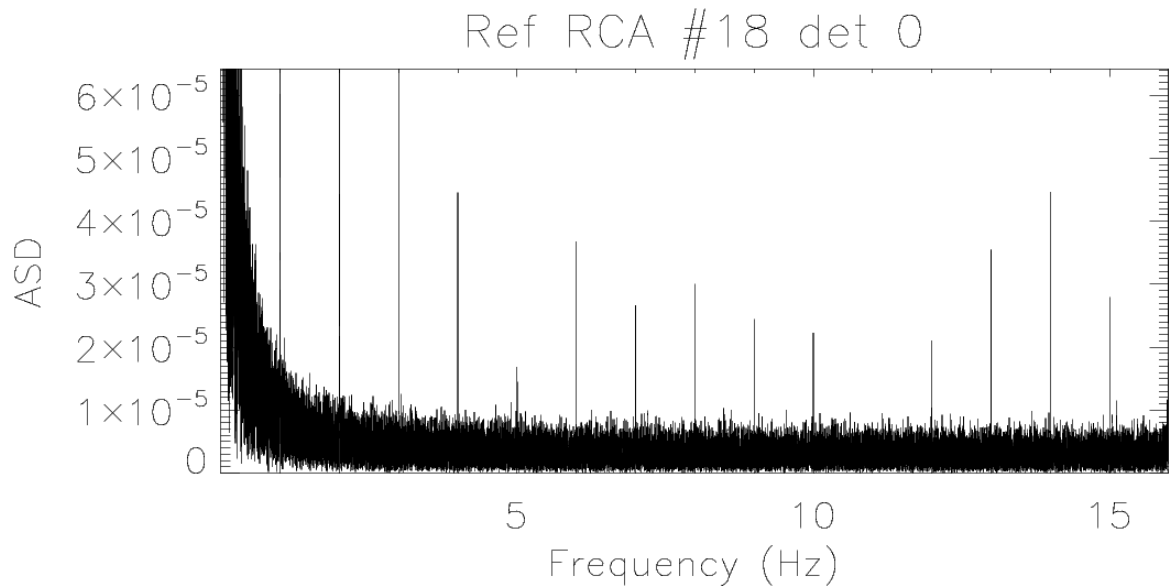
These results call for further investigations to understand the nature of the unexpected spikes uncorrelated with the DAE HK sequencer. Furthermore, the



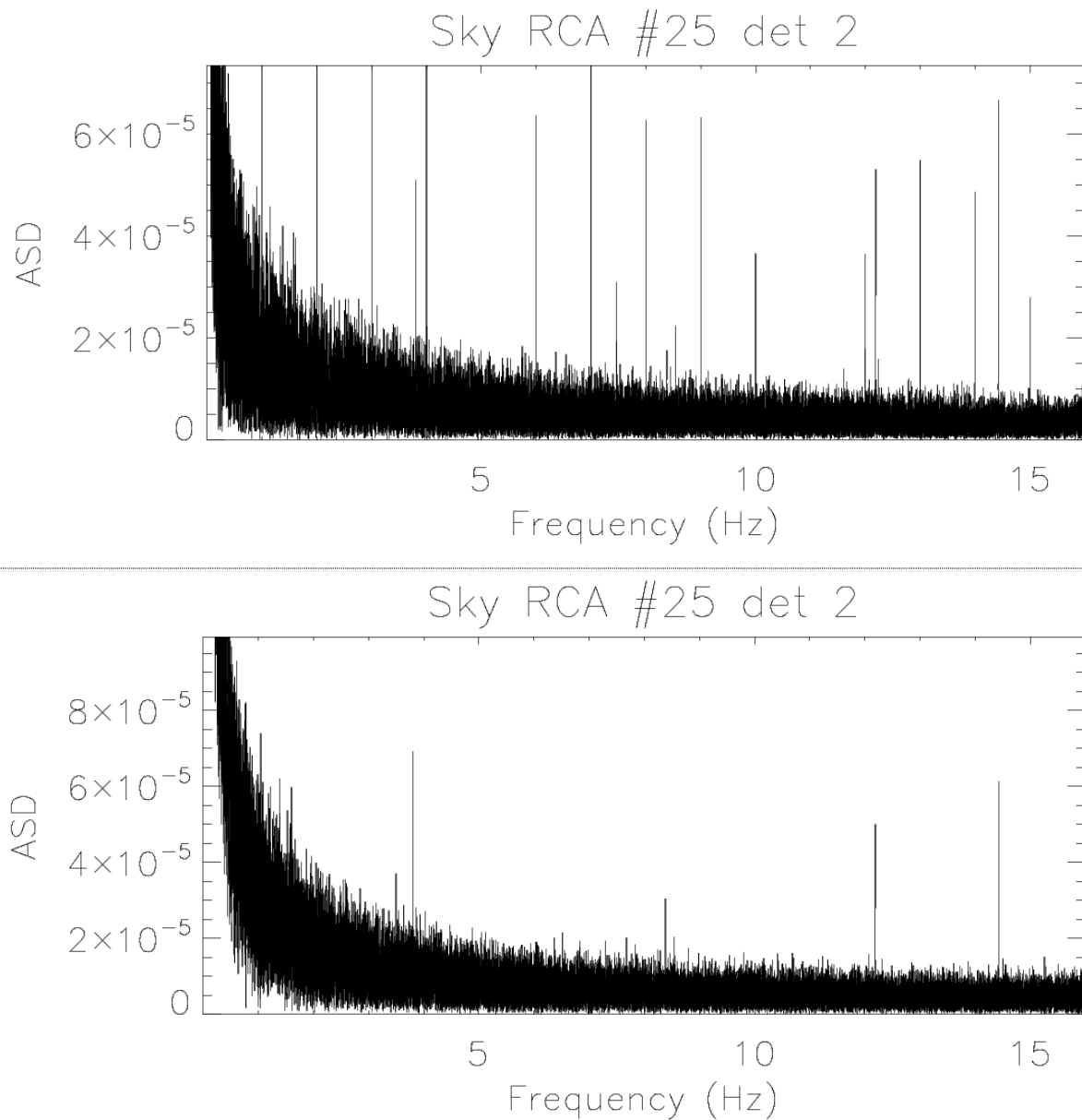
scientific importance of the control of these systematic effects requires that these tests will be run during the following testing phases of Planck, i.e. during the thermo-vacuum tests at CSL and during the CPV phase in flight.



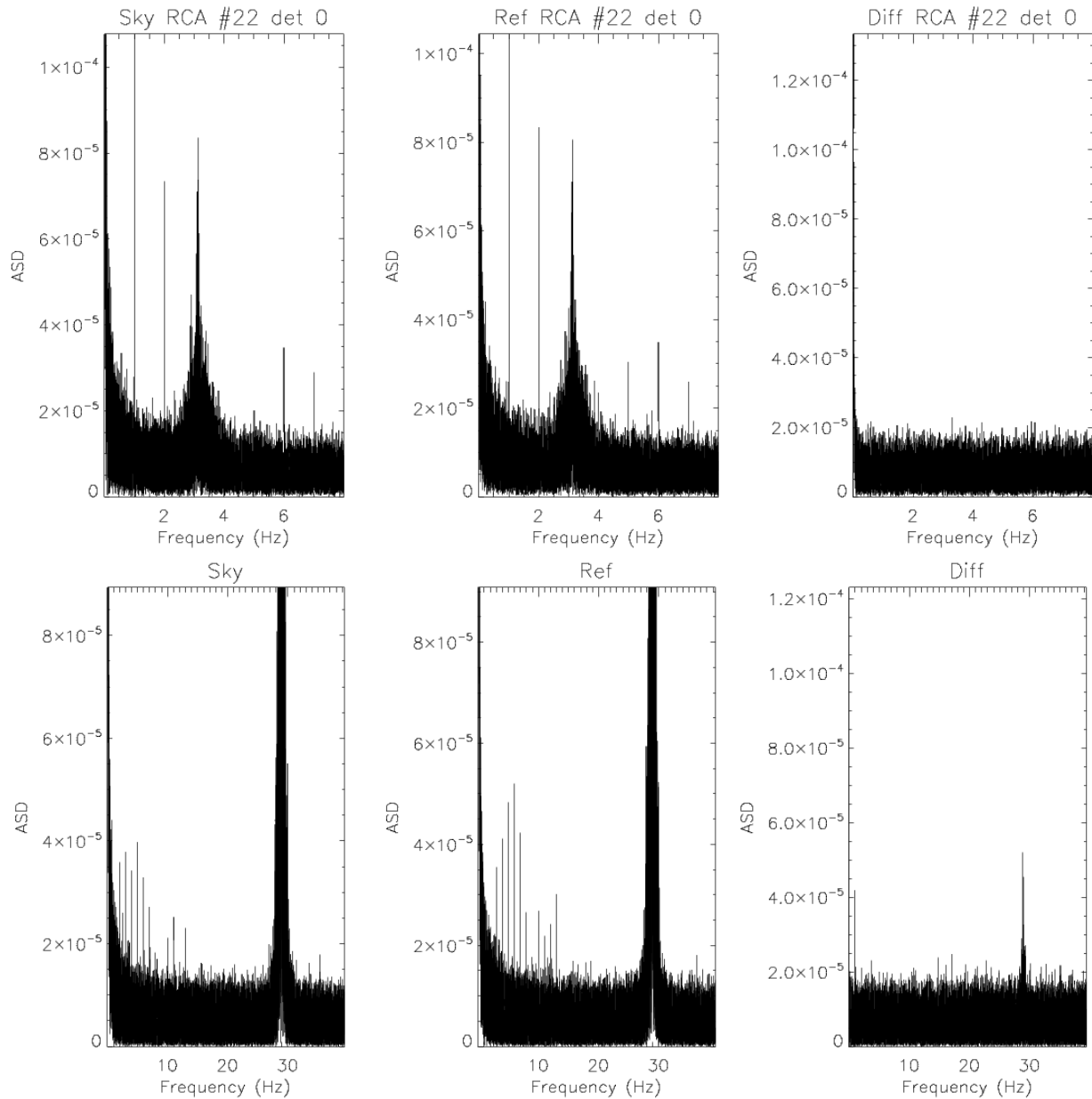
*Fig. 1 – Comparison of frequency spectrum with FEMs on (top panel) and off (bottom panel). HK sequencer was on in both cases. Data are relative to detector*



*Fig. 2 – Top panel: frequency spectrum of DAE noise with HK on. Bottom panel: frequency spectrum of DAE noise with HK off. Data are relative to detector*



*Fig. 3 – For some channels not all the spurious frequency spikes disappear with the switch off of the HK sequencer. This is an example relative to detector LFI25 R1D0 acquired with FEMs off. Top panel: frequency spectrum of DAE noise with HK on. Bottom panel: frequency spectrum of DAE noise with HK off.*



*Fig. 4 – The output of LFI22 R1D0 and R1D1 show a disturbance that is not correlated with the HK sequencer status and does not show the “monochromatic” character of all the other spikes. Here we show the output of R0D0 acquired during this test (top panel) with reduced sampling frequency (16 Hz) and AVR1 mode and during REBA tuning tests with nominal sampling frequency (76.8 Hz) and COM5 mode*



## 5 TC History

| TC Code   | Description  | Execution Time |    |    |    |    |
|-----------|--------------|----------------|----|----|----|----|
| LC 8320   | RM_START     | 2008           | 37 | 7  | 12 | 21 |
| LC 3320   | CL_START     | 2008           | 37 | 7  | 9  | 4  |
| LC 10320  | CALIBRATION  | 2008           | 37 | 6  | 45 | 47 |
| LC 65320  | DCSCSSTA     | 2008           | 37 | 6  | 6  | 59 |
| LC 7320   | SC_START     | 2008           | 37 | 6  | 6  | 58 |
| LC 65320  | DCSCSSTA     | 2008           | 37 | 5  | 42 | 22 |
| LC 7320   | SC_START     | 2008           | 37 | 5  | 42 | 22 |
| LC 76320  | SetSciProc   | 2008           | 37 | 5  | 41 | 7  |
| LC 150320 | Enable TM    | 2008           | 37 | 5  | 38 | 1  |
| LC 150320 | Enable TM    | 2008           | 37 | 5  | 33 | 9  |
| LC 71320  | SetREBASci   | 2008           | 37 | 5  | 33 | 4  |
| LC 71320  | SetREBASci   | 2008           | 37 | 5  | 32 | 58 |
| LC 71320  | SetREBASci   | 2008           | 37 | 5  | 32 | 53 |
| LC 71320  | SetREBASci   | 2008           | 37 | 5  | 32 | 48 |
| LC 150320 | Enable TM    | 2008           | 37 | 5  | 26 | 52 |
| LC 75320  | Naverage     | 2008           | 37 | 5  | 26 | 51 |
| LC 18320  | SC_STOP      | 2008           | 37 | 5  | 23 | 50 |
| LC 66320  | DCSCCSTO     | 2008           | 37 | 5  | 23 | 50 |
| LC 63320  | DCHKSSTA     | 2008           | 37 | 5  | 23 | 47 |
| LC 150320 | Enable TM    | 2008           | 37 | 4  | 14 | 10 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 4  | 14 | 9  |
| LC 150320 | Enable TM    | 2008           | 37 | 4  | 10 | 40 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 4  | 10 | 39 |
| LC 64320  | DCHKSSTO     | 2008           | 37 | 3  | 1  | 25 |
| LC 150320 | Enable TM    | 2008           | 37 | 1  | 54 | 44 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 1  | 54 | 43 |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 47 | 24 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 47 | 24 |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 46 | 48 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 46 | 46 |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 46 | 29 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 46 | 28 |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 45 | 43 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 45 | 43 |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 42 | 1  |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 42 | 1  |
| LC 150320 | Enable TM    | 2008           | 37 | 0  | 39 | 14 |
| LC 128320 | SetConfigRCA | 2008           | 37 | 0  | 39 | 13 |
| LC 150320 | Enable TM    | 2008           | 36 | 23 | 36 | 26 |
| LC 128320 | SetConfigRCA | 2008           | 36 | 23 | 36 | 24 |
| LC 150320 | Enable TM    | 2008           | 36 | 23 | 35 | 57 |
| LC 128320 | SetConfigRCA | 2008           | 36 | 23 | 35 | 56 |
| LC 150320 | Enable TM    | 2008           | 36 | 22 | 24 | 8  |
| LC 128320 | SetConfigRCA | 2008           | 36 | 22 | 24 | 8  |

4. Tab. TC History of the first slot of the test (5<sup>th</sup> and 6<sup>th</sup> February 2008). The TC failure is enlighten in red



# Quick look Data Analysis Of LFI Spike Tests during EMC tests

Document No.: PL-LFI-PST-RP-031  
Issue/Rev. No.: 1.0  
Date: 22<sup>th</sup> April 2008  
Page: 17

| TC Code   | Description  | Execution Time |    |    |    |    |          |  |
|-----------|--------------|----------------|----|----|----|----|----------|--|
| LC 8320   | RM_START     | 2008           | 38 | 4  | 50 | 45 | AMB_0140 |  |
| LC 3320   | CL_START     | 2008           | 38 | 4  | 48 | 34 |          |  |
| LC 10320  | CALIBRATION  | 2008           | 38 | 4  | 32 | 44 |          |  |
| LC 65320  | DCSCSSTA     | 2008           | 38 | 3  | 56 | 52 |          |  |
| LC 7320   | SC_START     | 2008           | 38 | 3  | 56 | 52 |          |  |
| LC 76320  | SetSciProc   | 2008           | 38 | 3  | 56 | 29 |          |  |
| LC 150320 | Enable TM    | 2008           | 38 | 3  | 55 | 31 |          |  |
| LC 150320 | Enable TM    | 2008           | 38 | 3  | 54 | 11 |          |  |
| LC 71320  | SetREBASci   | 2008           | 38 | 3  | 54 | 5  |          |  |
| LC 71320  | SetREBASci   | 2008           | 38 | 3  | 54 | 0  |          |  |
| LC 71320  | SetREBASci   | 2008           | 38 | 3  | 53 | 55 |          |  |
| LC 71320  | SetREBASci   | 2008           | 38 | 3  | 53 | 49 |          |  |
| LC 150320 | Enable TM    | 2008           | 38 | 3  | 53 | 31 |          |  |
| LC 75320  | Naverage     | 2008           | 38 | 3  | 53 | 29 |          |  |
| LC 18320  | SC_STOP      | 2008           | 38 | 3  | 51 | 11 |          |  |
| LC 66320  | DCSCCSTO     | 2008           | 38 | 3  | 51 | 11 |          |  |
| LC 150320 | Enable TM    | 2008           | 38 | 3  | 48 | 20 |          |  |
| LC 59320  | DCDEFCON     | 2008           | 38 | 3  | 48 | 19 |          |  |
| LC 132320 | SciDCDCSetup | 2008           | 38 | 3  | 47 | 48 |          |  |
| LC 63320  | DCHKSSTA     | 2008           | 38 | 2  | 45 | 18 |          |  |
| LC 132320 | SciDCDCSetup | 2008           | 38 | 1  | 15 | 56 | AMB_0139 |  |
| LC 64320  | DCHKSSTO     | 2008           | 38 | 0  | 14 | 3  | AMB_0138 |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 57 | 1  | AMB_0137 |  |
| LC 121320 | SetConfCh    | 2008           | 37 | 22 | 56 | 57 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 56 | 48 |          |  |
| LC 121320 | SetConfCh    | 2008           | 37 | 22 | 56 | 45 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 56 | 36 |          |  |
| LC 121320 | SetConfCh    | 2008           | 37 | 22 | 56 | 33 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 56 | 3  |          |  |
| LC 121320 | SetConfCh    | 2008           | 37 | 22 | 56 | 0  |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 55 | 51 |          |  |
| LC 121320 | SetConfCh    | 2008           | 37 | 22 | 55 | 48 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 55 | 33 |          |  |
| LC 128320 | SetConfigRCA | 2008           | 37 | 22 | 55 | 33 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 55 | 16 |          |  |
| LC 128320 | SetConfigRCA | 2008           | 37 | 22 | 55 | 16 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 55 | 6  |          |  |
| LC 128320 | SetConfigRCA | 2008           | 37 | 22 | 55 | 5  |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 54 | 36 |          |  |
| LC 128320 | SetConfigRCA | 2008           | 37 | 22 | 54 | 35 |          |  |
| LC 65320  | DCSCSSTA     | 2008           | 37 | 22 | 51 | 1  | AMB_0135 |  |
| LC 7320   | SC_START     | 2008           | 37 | 22 | 51 | 0  |          |  |
| LC 76320  | SetSciProc   | 2008           | 37 | 22 | 50 | 43 |          |  |
| LC 150320 | Enable TM    | 2008           | 37 | 22 | 50 | 32 |          |  |
| LC 75320  | Naverage     | 2008           | 37 | 22 | 50 | 32 |          |  |
| LC 18320  | SC_STOP      | 2008           | 37 | 22 | 49 | 22 |          |  |
| LC 18320  | SC_STOP      | 2008           | 37 | 22 | 42 | 52 |          |  |
| LC 66320  | DCSCCSTO     | 2008           | 37 | 22 | 42 | 52 |          |  |
| LC 21320  | CAL_STOP     | 2008           | 37 | 22 | 42 | 37 |          |  |
| LC 19320  | RM_STOP      | 2008           | 37 | 22 | 42 | 21 |          |  |
| LC 15320  | CL_STOP      | 2008           | 37 | 22 | 42 | 9  |          |  |

5. Tab. History file of the second slot of the tests. The TC failures are enlighten in red.