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BC-SIM-TR-003
STC NECP Report

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1. Introduction

1.1. Scope

The present document has been issued with the aim of describing the NECP (Near Earth Commissioning Phase) Tests of STC the Stereo Camera part of SIMBIO-SYS instrument, payload of the BepiColombo mission.

1.2. Reference Documents

[RD 1] BC-SIM-GAF-MA-002 rev.8_SIMBIO-SYS FM User Manual, 2017

[RD 2] STC FPA Delivery Review Board (DRB) Data Package FM (BC-SIM-RVS-DP-021)

[RD 3] BC-SIM-TN-001-SIMBIOSYS_FOPs_Description_Issue1_v6_01Jan2020 ([20.500.12386/23810](https://doi.org/10.5000/12386/23810))

[RD 4] BC-SIM-TR-001 - SIMBIO-SYS NECP Data Produced Analysis ([20.500.12386/24814](https://doi.org/10.5000/12386/24814))

[RD 5] SIMBIOSYS-STC ready for launch: a technical recap" ICSO, 2018

1.3. Acronyms

ADC	Analogic Digital Converter
FOP	Flight Operation Procedure
DSNU	Dark Signal Non-Uniformity
EGSE	Electronic Ground Segment Equipment
FPA	Focal Plane Assembly
OB	Optical Bench
PE	Proximity Electronics
PSS	SIMBIO-SYS Parameters
SIMBIO-SYS	Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem
ME	Main Electronics
TC	Telecommand
TEC	Thermoelectric Cooler
ZSS	SIMBIO-SYS Telecommands

2. Definitions and assumptions

In this section the main physical and technical terms are defined.

2.1. STC Sensors

Param.	ID	Param. Name	Packet ID	Packet name	Unit	Calibration
NSS21040	STC	Temperature FPA1	YSS40002	SIMB STC Housekeeping	K	CSSP0020TM
NSS21041	STC	Temperature FPA2	YSS40002	SIMB STC Housekeeping	K	CSSP0021TM
NSS21042	STC	Temperature PE	YSS40002	SIMB STC Housekeeping	K	CSSP0022TM
NSS21043	STC	Temp channel fw	YSS40002	SIMB STC Housekeeping	K	CSSP0023TM
NSS21044	STC	Temp channel bw	YSS40002	SIMB STC Housekeeping	K	CSSP0024TM
NSS21050	STC	PE 3.3V Measured	YSS40002	SIMB STC Housekeeping	V	CSSP0025TM
NSS21051	STC	TEC Current	YSS40002	SIMB STC Housekeeping	A	CSSP0026TM

Table 1 Main temperature sensors of STC, distributed on: the FPA, PE, the backside of the detector and the STC Optical Bench as reported in [RD 1].

STC takes advantage of 5 different temperature sensors: four on the instrument and one on the PE (Proximity Electronics). The position of the temperature sensors on the instrument are shown in Figure 1 and Figure 2 extracted by [RD 1] and [RD 5].

The Temp_Channel_fw (defined as FPA_Package in EGSE [RD 4]) sensor is located on the hot side of the FPA, thus it is expected to have values corresponding to instrument temperature; the Temp_Channel_bw (defined as STC_OpticalBench in EGSE [RD 4]) is located on the back of the folding mirror as in Figure 1b is a measurement of the environment of the STC channel. The folding mirror is identified as “Ch-Low” in Figure 2.

The STC Temperature sensors FPA1 and FPA2, often abbreviated TFPA1 and TFPA2 respectively, are located next to the detector surface (see Figure 2a). Their temperature readings increase when the detector is switched on, then their values became lower when the TEC is switched on to cool the detector; their temperature values are also used as a feedback for the TEC.

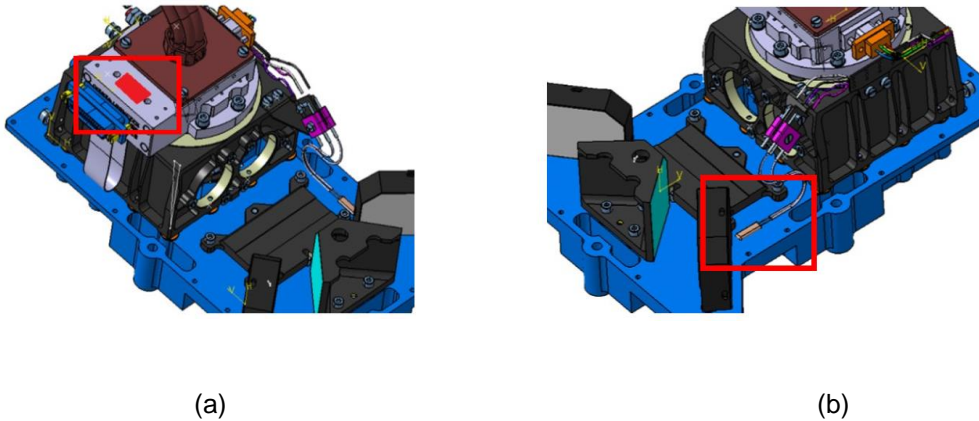


Figure 1 In (a) the location of the “STC Temperature Channel fw” (NSS21043) temperature sensor (red rectangle). As highlighted in the 3D CAD model (no pictures are available, it is not present in the original CAD model), this sensor is placed onto the FPA package, in the same position where the corresponding sensor is placed on the HRIC FPA. In (b) the location of the “STC Temperature Channel bw” (NSS21044) temperature sensor, as shown in the 3D CAD model (no picture available).

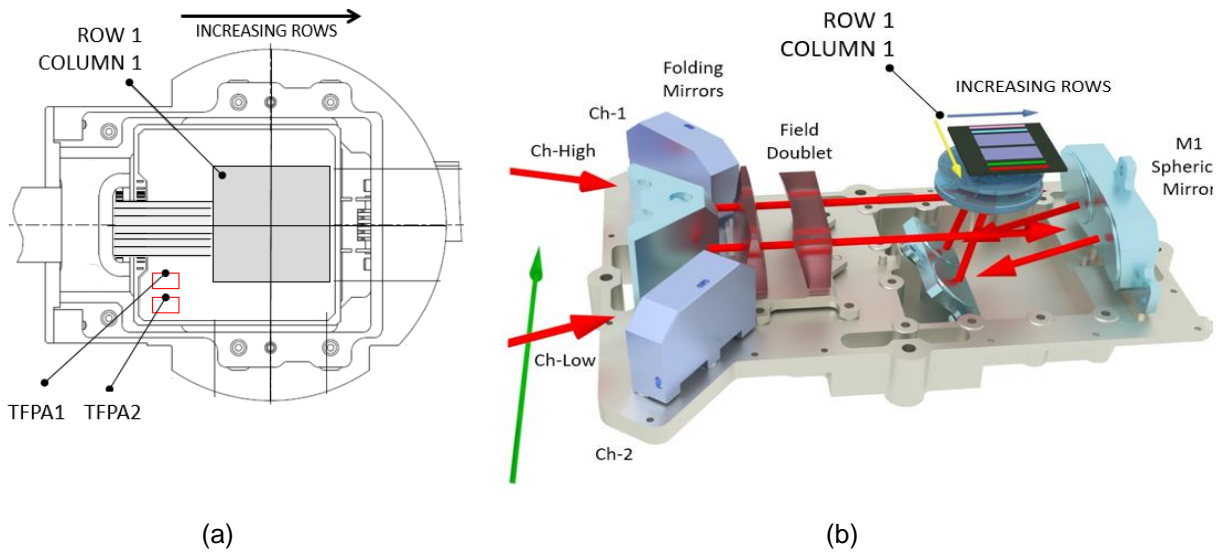


Figure 2 In (a) Location of the “STC-FPA Temperature sensors”. They are next to the FPA (see the red rectangle); they are called TFPA1 (upper one) and TFPA2 (button one) and associated respectively to the NSS21040 and NSS21041 [RD 2]. In (b) STC schematic optical layout ([RD 5]) where origin of the detector reference system is indicated. In green the along-track direction. In red the optical path.

3. NECP Days plan

As reported in [RD 4], the NECP SIMBIO-SYS Phase had the scope to verify the health status of the instrument at channel and system level after launch. Functional and performance tests are planned in the three days of the NECP to monitor the evolution of some key instrument parameters.

Table 2 reports the different test performed by the single channel of STC during the NECP.

Following sections will describe each test.

Day Number	Test name	Out Pass	UTC first Image
DAY1	STC Functional Test on MAIN ME channel		2018-12-10T13:26:46.720632
DAY2	STC TEC Test		No Science data
	STC Functional Test on REDUNDANT ME channel		2018-12-11T14:28:57.716299
	STC Performance Test	X	2018-12-11T18:24:58.466466
DAY3	Inter-channel Test: Max Stress Test,		2018-12-12T11:15:22.592275
	Inter-channel Test: Max DR Test ,		No Science data
	Inter-channel Test: Orbit Test		2018-12-12T12:02:41.819845
	STC "Outpass2" Recovery		2018-12-12T14:37:07.592290

Table 2 Table of the Tests as reported in **RDPlanning**.

For each test reported this Technical Report will include: the test description, the commanding including the timeline planned and the summary of the data acquired, the housekeeping interpretation and a preliminary science data analysis.

4. DAY1: STC Functional Test on MAIN ME channel

4.1. Test description

STC functional tests test the detector/TEC cycles and the acquisition of a limited set of images. Tests are performed through a FOP TST-020 (see [RD 3] for more details).

In particular the FOP commands:

- Switch on of the PE
- Switch on of the detector
- Switch on of the TEC
- Test of the reading and writing of a specific memory address
- Science test:
 - continuous mode, RT=400ms, CM, IBR=63 stopped by TC stop science
 - 50 acq, RT=400 ms, CM, IBR=63
 - 50 acq RT=200 ms, CM, IBR=63
 - 10 acq, RT=2s, CM, IBR=63
- Switch off of the TEC
- Switch off of the Detector
- Switch off of the PE

NOTE: Differently by the programmed FOP the timeline was changed in ESOC during NECP. The TEC switch on was repeated 2 times (TAG3 and 3' in Figure 3) to test the change of the set point of the TEC reaching the wanted temperature of the FPA by two different steps to reduce the gap between the temperature to be reached and the one measured. ZSS and PSS are reported in Table 3.

TC Name	Execution Time	Notes	RAW [DU]	ENG[K]
ZSS17203	2018-12-10T12:13:20.239	STC HRIC Temp set point	2710	276.9967
ZSS17203	2018-12-10T12:27:06.259	STC HRIC Temp set point	2799	269.1073

Table 3 Set points commanded during the TEC switch on.

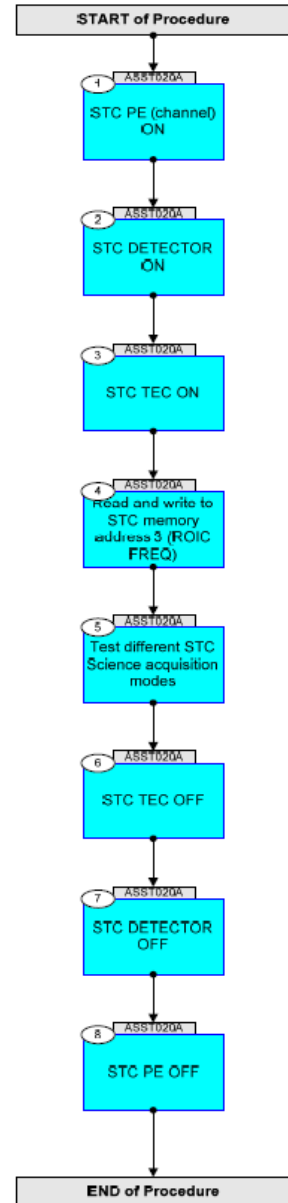


Figure 3 Procedure Flowchart Overview SS-TST-020

4.2. Commanding

Next table reports the ZSS commanded during STC Functional tests. FOP associated are reported (see [RD 3] for more details). Table 5 shows the list of the acquired images associated to each FCP commanded.

CommandName	Description	SequenceName	ExecutionTime
ZSS17201 [1]	SIMB STC Power On/Off	ASST020A	2018-12-10T10:40:45.311852Z
ZSS17210 [2]	SIMB STC Detector On/Off	ASST020A	2018-12-10T10:45:14.060312Z
ZSS17205	SIMB STC Upload parameters		2018-12-10T11:27:29.432032Z
ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-10T11:27:34.531567Z
ZSS17205	SIMB STC Upload parameters		2018-12-10T11:30:04.024197Z
ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-10T11:30:09.114349Z
ZSS17205	SIMB STC Upload parameters		2018-12-10T11:30:16.383611Z
ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-10T11:30:21.306458Z
ZSS17205	SIMB STC Upload parameters		2018-12-10T11:30:29.039048Z
ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-10T11:30:34.094379Z
ZSS17205	SIMB STC Upload parameters		2018-12-10T11:30:43.436839Z
ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-10T11:30:48.361670Z
ZSS17203 [3]	SIMB STC Thermal Control On/Off		2018-12-10T12:13:20.239038Z
ZSS17203 [3']	SIMB STC Thermal Control On/Off		2018-12-10T12:27:06.259367Z
ZSS17206	SIMB STC Read Addr	ASST020A	2018-12-10T13:19:12.607905Z
ZSS17207	SIMB STC Write Addr	ASST020A	2018-12-10T13:19:32.527729Z
ZSS17204	SIMB STC Confirm Command	ASST020A	2018-12-10T13:19:37.711173Z
ZSS17207	SIMB STC Write Addr	ASST020A	2018-12-10T13:23:28.520017Z
ZSS17204	SIMB STC Confirm Command	ASST020A	2018-12-10T13:23:33.556661Z
ZSS17202	SIMB STC SCIENCE	ASST020A	2018-12-10T13:26:48.514730Z
	...		
ZSS17209	SIMB STC Stop Science	ASST020A	2018-12-10T13:28:48.401026Z
ZSS17202	SIMB STC SCIENCE	ASST020A	2018-12-10T13:32:37.061809Z
	...		
ZSS172B2	SIMB STC SCIENCE 1ms	ASST020A	2018-12-10T13:33:26.975428Z
	...		
ZSS17203 [6]	SIMB STC Thermal Control On/Off	ASST020A	2018-12-10T13:36:47.045652Z
ZSS17210	SIMB STC Detector On/Off	ASST020A	2018-12-10T13:39:17.363380Z
ZSS17201	SIMB STC Power On/Off	ASST020A	2018-12-10T13:42:18.284473Z

Table 4 ZSSs Commanded during the first day of NECP. Red rows telecommands are key points, also reported in **Figure 5**.

The resulting database derived by EGSE telemetry to raw pipeline is reported in **Table 5**.

EGSE_NTC	First_Acq	Duration	NACQ	DimX	IT	RT
----------	-----------	----------	------	------	----	----

[#]	[UTC]	[s]	[#]	[px]	[ms]	[s]
1	2018-12-10T13:26:46.720632	120	300	896	0.0384	0.4
2	2018-12-10T13:32:35.219503	19.6	50	896	0.0384	0.4
3	2018-12-10T13:33:00.219503	9.8	50	896	0.0384	0.2
4	2018-12-10T13:33:25.219533	18	10	896	999.36	2

Table 5 Resulting database of the NECP Functional Test. All TCs were commanded with the CBD = 64x64 and, nominally, the IBR was set to 63. All the acquisitions were in CM.

4.3. HKs interpretation

In Figure 5 (next page) the evolution, during the functional test of STC, of the calibrated values of the NSS sensors (see Table 1) are shown. Since the TAG1 (PE power on), the PE temperature starts to grow up reaching a maximum value of 287.3 K at the end of the test. At TAG2 (detector switch on) both the FPA temperature sensors increase their reading reaching a maximum value of 279.4 K before the TAG3 (TEC switch on temperature set at 277 K). The difference between the readings of the TFPA2 and TFPA1 sensors is always of 0.3-0.4 K for all the test duration (see Figure 4). The TFPA2 measure is always higher than the TFPA1 one; ADC granularity is limited to 0.1K.

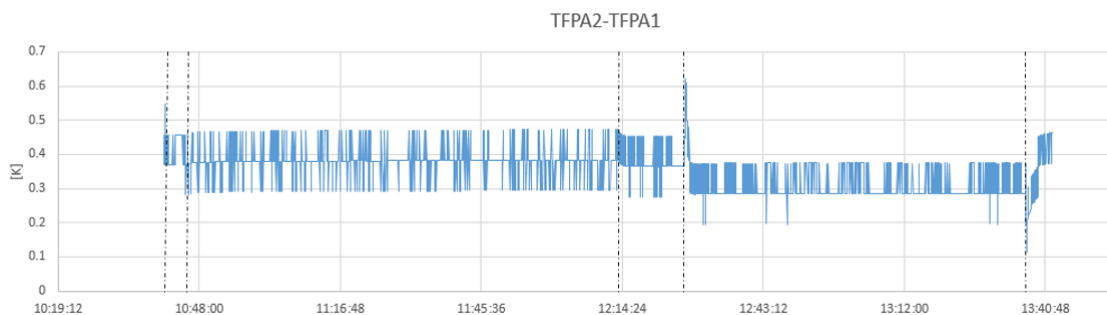


Figure 4 Difference between the reading of the temperature of sensor TFPA2 and the one of TFPA1.

At the switch on of the TEC (TAG3) the temperature set-point commanded is 277.0 K, after, at TAG3', the set-point is changed to 269.0 K.

In both the cases, the gap to be covered by the TEC (2.4K for the first TC and 8K for the second) was not enough to activate the gentle switch on of the TEC and avoid a current peak on the TEC. At the second TC, the peak reached a level of 0.4 A, which is inside the limit range tolerable by the instrument. As shown in Section 9 the gentle switch on was activated only in the last test of the NECP by changing the set point of the STC TEC.

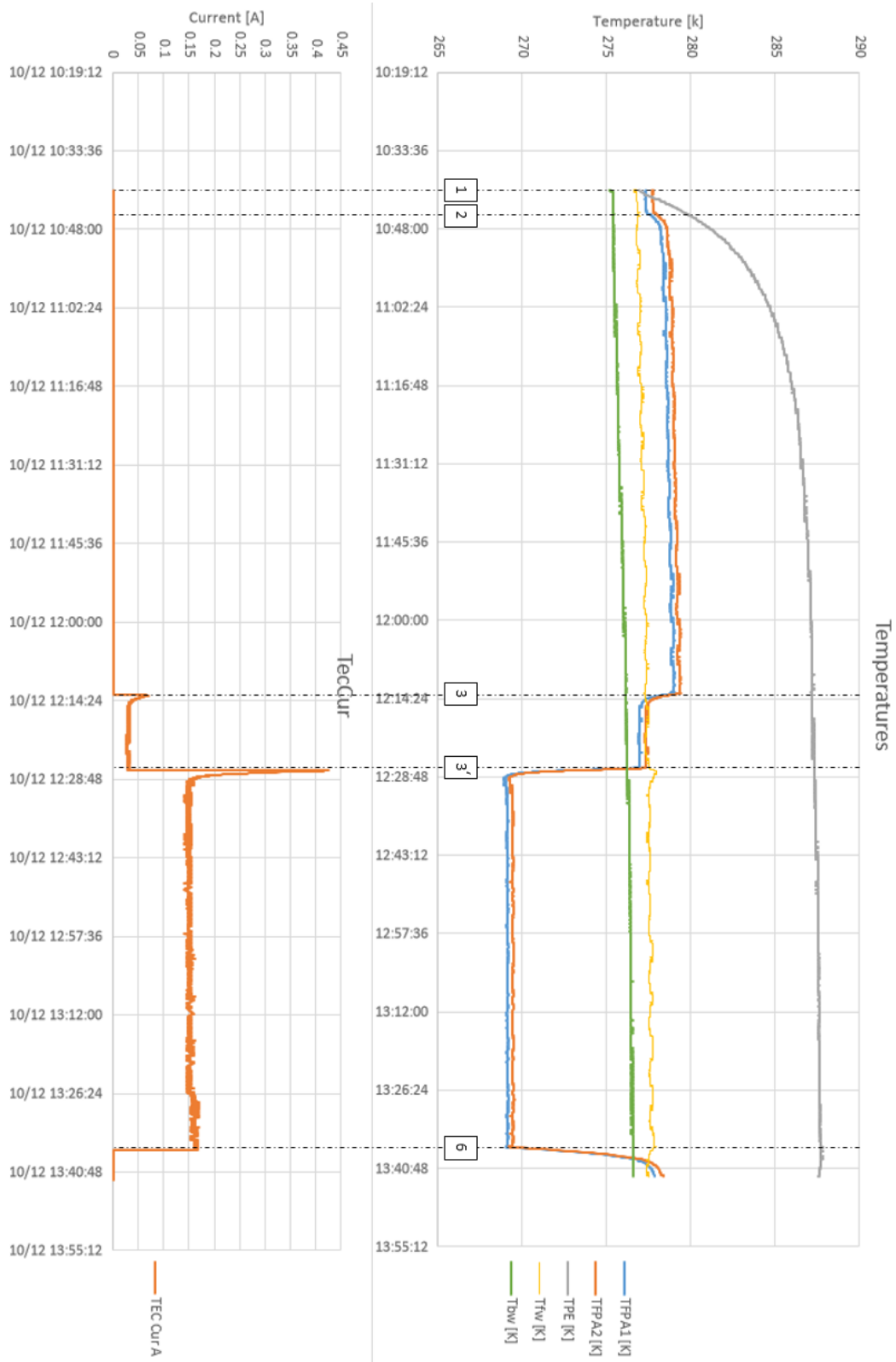


Figure 5 Temperatures and TEC current values evolution over the first day of the NECP. Dotted lines represent the key points associated to the TCs highlighted in red in Table 3 and indexed as reported in Figure 3.

4.4. Images analysis

As reported in [RD 4], no packets were lost.

An example of the first acquisition for the first TC is shown in Figure 6.

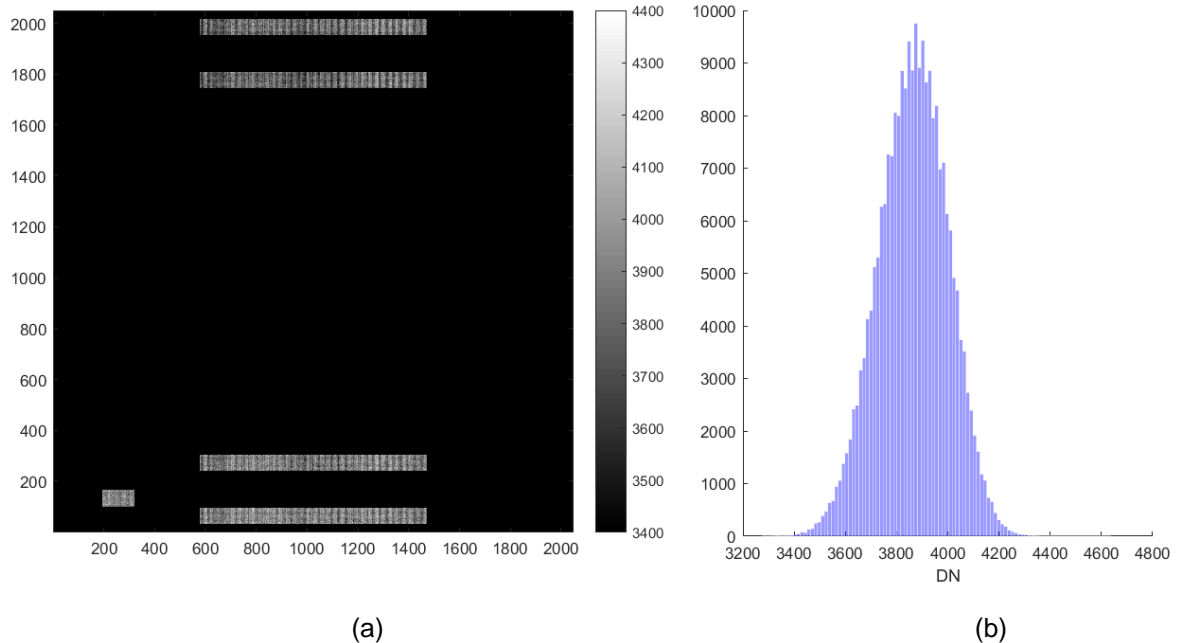


Figure 6 In (a) first image acquired during the functional tests. The windows acquired are the 4 broadband filters and the smaller mitigation window. Repetition time (RT)=400 ms, integration time (IT)=4 raw=38.4 microsec. On the right (b) the histogram of the acquired windows values.

For each image and each window, the dark (mean value), DSNU and RON were calculated (see Table 4). No anomaly was evident with respect to the nominal behavior expected at the commanded temperature.

NTC	1			2			3			4		
	continuous, RT=400ms			50 acq, RT=400 ms,			50 acq RT=200 ms			10 acq, RT=2s		
Nacq	300			50			50			10		
	Mean Value	DSNU	RON	Mean Value	DSNU	RON	Mean Value	DSNU	RON	Mean Value	DSNU	RON
Wx	3925	105.7	13.15	3921	105.6	14.25	3924	105.7	12.23	4677	116.1	14.96
F750	3913	120.9	13.88	3910	121	15.84	3911	121	12.98	4647	133.3	11.83
F420	3885	123.3	14.3	3882	123.2	12.39	3882	123.2	15.1	4592	132.6	15.88
F550	3808	135.4	17.92	3805	135.4	17.27	3807	135.3	20.39	4503	144.4	23.9
F920	3833	136.1	16.92	3829	136.1	16.89	3831	136	18.43	4540	145.5	17.51
mean	3872.8	124.3	15.2	3869.4	124.3	15.3	3871.0	124.2	15.8	4591.8	134.4	16.8

Table 6 The table reports for all the images and for each filter the calculated mean value, the DSNU and the RON. All TCs commanded image acquisition in Continuous Mode (CM) with IBR=63 for all the filters. The mean values and std (here indicated as DSNU) are evaluated on all the windows, while RON is measured on the central pixel. For NTC=4 only the last acquisitions of the sequence are considered for this statistical analysis.

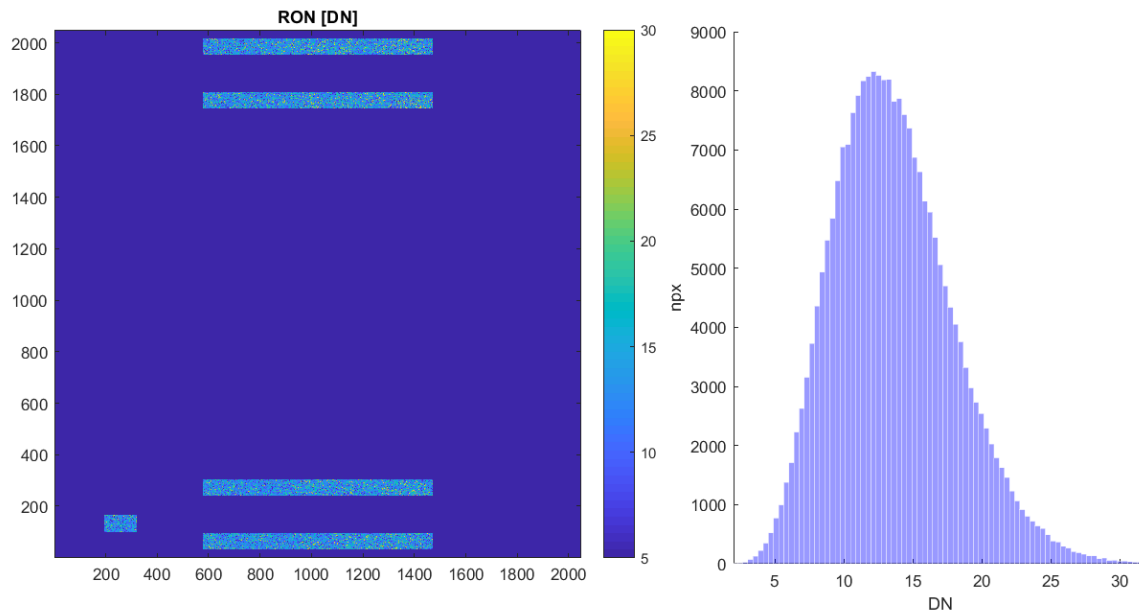


Figure 7 First image acquired during the functional tests: the windows acquired are the 4 broadband filters and the smaller mitigation window. Repetition time (RT)=400 ms, integration time (IT)=4 \times 38.4 μ s acquired. Left image shows the distribution (uniform) of the RON on the detector. On the right the distribution of the RON.

A statistical analysis of the distribution of the RON on the filters acquired in the first TC is shown in Figure 7. Distribution of the RON shows a median value of 13 DN and a mean value of 15.2 DN on all the detector.

All the TCs generated expected behaviour. Figure 8 shows the trend of the mean of each window during the acquisition. Image (d) has the expected behaviour for the instrument for long integration times. In particular this acquisition has been commanded with RT=2s and IT=33809 \times 999.360 ms which means a waiting time after the previous acquisition equal to 15 s (25 s - 50acq*200ms).

Higher level of the DSNU of the filter 550 and 920 can be explained by the greater density of hot pixels.

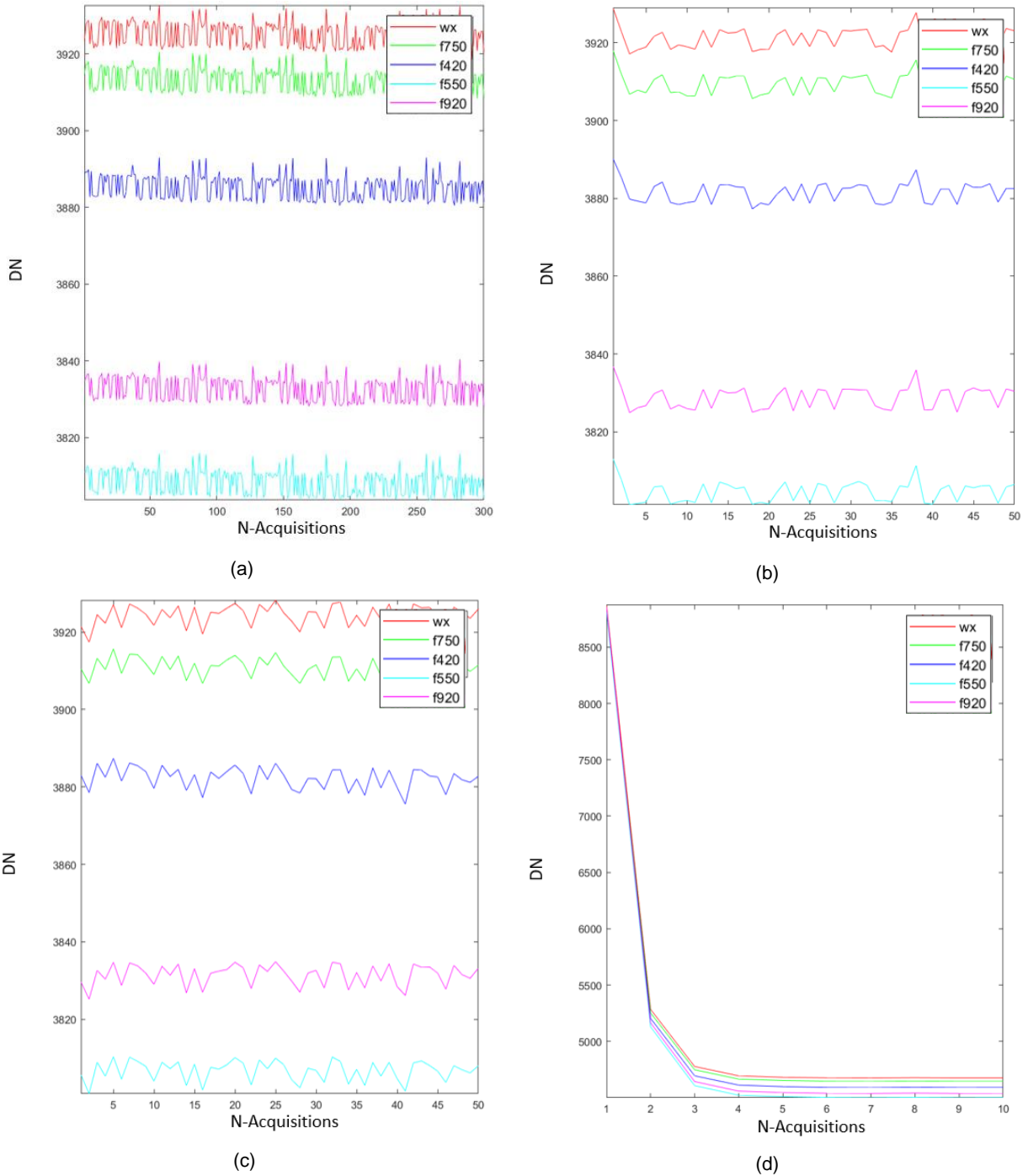


Figure 8 Behaviour of the mean value of each window for the 4 TCs of the functional test. Last TCs represent an expected behaviour for the long ITs.

5. DAY2 Tec Test

5.1. Test description

The scope of this test is to verify that TEC parameters setting remains the same after the PE switch-off.

5.2. Commanding

ZSSs Commanded during the Tec Test (2 Day). Red rows telecommands are key points, also reported in Figure 9.

PHASE1	TC Name	Description	SequenceName	ExecutionTime
PHASE 1	ZSS00329	SIMB Define HK Report Collect Interval	ASST021A	2018-12-11T11:08:39.967745Z
	ZSS17201	SIMB STC Power On/Off	ASST021A	2018-12-11T11:08:58.664904Z
	ZSS17205	SIMB STC Upload parameters		2018-12-11T11:12:03.260527Z
	ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-11T11:12:08.389171Z
	ZSS17205	SIMB STC Upload parameters		2018-12-11T11:12:13.408708Z
	ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-11T11:12:18.399716Z
	ZSS17205	SIMB STC Upload parameters		2018-12-11T11:12:23.465848Z
	ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-11T11:12:28.433460Z
	ZSS17205	SIMB STC Upload parameters		2018-12-11T11:12:33.554391Z
	ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-11T11:12:38.523879Z
	ZSS17205	SIMB STC Upload parameters		2018-12-11T11:12:43.533763Z
	ZSS17204	SIMB STC Confirm Command	ASSF014B	2018-12-11T11:12:48.540725Z
	ZSS17210 [1]	SIMB STC Detector On/Off	ASST021A	2018-12-11T11:13:26.939334Z
	ZSS17203 [2]	SIMB STC Thermal Control On/Off		2018-12-11T11:17:00.196537Z
	ZSS17203 [3]	SIMB STC Thermal Control On/Off	ASST021A	2018-12-11T11:24:49.887220Z
	ZSS17210 [4]	SIMB STC Detector On/Off	ASST021A	2018-12-11T11:27:26.016117Z
	ZSS17201	SIMB STC Power On/Off	ASST021A	2018-12-11T11:30:57.623144Z
PHASE2	ZSS17201	SIMB STC Power On/Off	ASST021A	2018-12-11T11:30:57.623144Z
	ZSSK4003 [5]	Start OBCP: SIMBIO STC Switch On	ASSF008A	2018-12-11T11:34:49.041959Z
	ZSSK4006 [6]	Start OBCP: SIMBIO STC Graceful Shutdown	ASSF007A	2018-12-11T11:43:46.903433Z

Table 7 ZSSs Commanded during the set point tests of the second day of NECP. Red rows correspond to the key point depicted in **Figure 9**.

5.3. HKs interpretation

As shown in Figure 9 the test demonstrates the nominal behaviour [2] of the TEC thanks to the uploaded parameters before switch on of the detector [1]. After the test, all the instrument units were shut down apart from the ME. The test was repeated (right part of the graph) by using the switch on of the STC PE and the detector by OBCP and the test ended with a gracefully shut down.

No anomalies were reported.

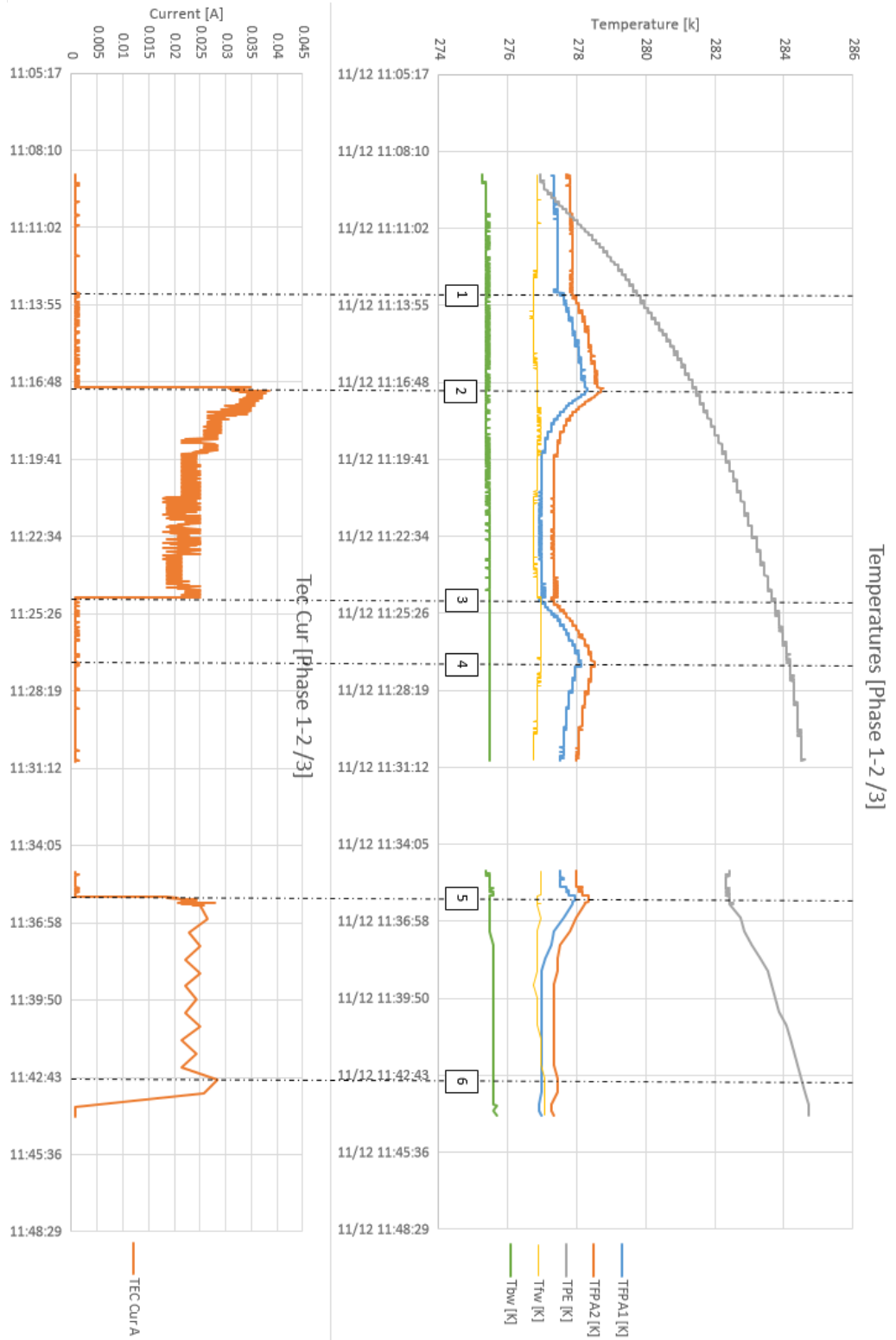


Figure 9 Temperatures and TEC current sensors read values for the set point test (second day of the NECP). Dotted lines represent the key points associated to the red TCs of Table 7 and there indexed.

6. DAY2 Functions tests (Redundant ME)

6.1. Test description

STC functional tests (on redundant) test the Detector/TEC cycles and the acquisition of a limited set of images. Tests are performed through a FOP SS-TST-021 (see [RD 3] for more details).

In particular the FOP command:

- Switch on of the PE
- Switch on of the detector
- Switch on of the TEC
- Science test:
 - continuous mode, RT=400ms, IBR=63 stopped by TC
- stop science
- Switch off of the TEC
- Switch off of the detector
- Switch off of the PE

NOTE: In the TEC switch on (TAG3 in **Figure 12**), the STC-HRIC Temperature set point was set to 269.1 K (corresponding to 2799 RAW value).

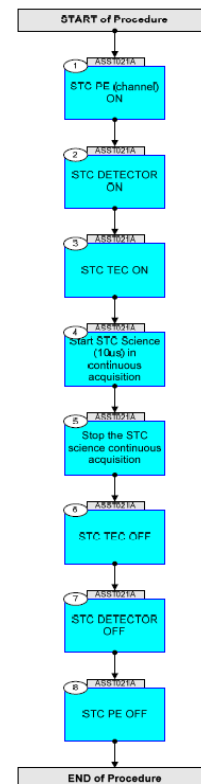


Figure 10 Procedure Flowchart Overview SS-TST-021

6.2. Commanding

Command Name	Description	Sequence Name	Execution Time
ZSS17201	SIMB STC Power On/Off	ASST021A	2018-12-11T14:09:10.035359Z
ZSS17210	SIMB STC Detector On/Off	ASST021A	2018-12-11T14:13:54.509370Z
ZSS17203 [1]	SIMB STC Thermal Control On/Off	ASST021A	2018-12-11T14:13:59.535368Z
ZSS17202	SIMB STC SCIENCE	ASST021A	2018-12-11T14:28:59.504977Z
ZSS17209	SIMB STC Stop Science	ASST021A	2018-12-11T14:30:59.591743Z
ZSS17203 [2]	SIMB STC Thermal Control On/Off	ASST021A	2018-12-11T14:31:04.662603Z
ZSS17210	SIMB STC Detector On/Off	ASST021A	2018-12-11T14:31:09.662405Z
ZSS17201	SIMB STC Power On/Off	ASST021A	2018-12-11T14:31:14.704893Z

Table 8 ZSSs Commanded during the redundant functional test (DAY2) of NECP. Red rows correspond to the key point depicted in **Figure 12**.

EGSE_NTC	First_Acq	Duration	NACQ	DimX	IT	RT
----------	-----------	----------	------	------	----	----

[#]	[UTC]	[s]	[#]	[px]	[ms]	[s]
1	2018-12-11T14:28:57.716299	120	300	128	0.038	0.4

Table 9 Resulting database of the NECP Functional Redundant Test. The TC was commanded with the CBD = 64x64 and, nominally, the IBR was set to 63. All the acquisitions were in CM.

6.3. HKs interpretation

In Figure 12 the evolution of the calibrated values of the NSS during the functional test of STC NECP day2 is shown. Since the TAG1 (TEC power on), the temperature of TFPA1, TFPA2 starts to decrease from 278K to the commanded value of 269K.

All statistical calculated values for the dark (i.e. mean, DSNU, RON) for all the windows considered are reported in Table 10. The values are consistent with the expected behaviour.

NTC	1		
Nacq	continuous, RT=400ms		
	300		
	Mean Value	DSNU	RON
Wx	3923	105.7	14.4
F750	3911	121	15.33
F420	3883	123.3	14.65
F550	3806	135.5	20.83
F920	3830	136.2	18.76
Mean	3870.6	124.3	16.8

Table 10 Statistical values for the dark (i.e. mean, DSNU and RON) calculated for all the TC commands CM with IBR=63 for all the filters for the NECP day2. Mean dark values and std (here indicated as DSNU) are evaluated on all the windows while RON is measured on the central pixel.

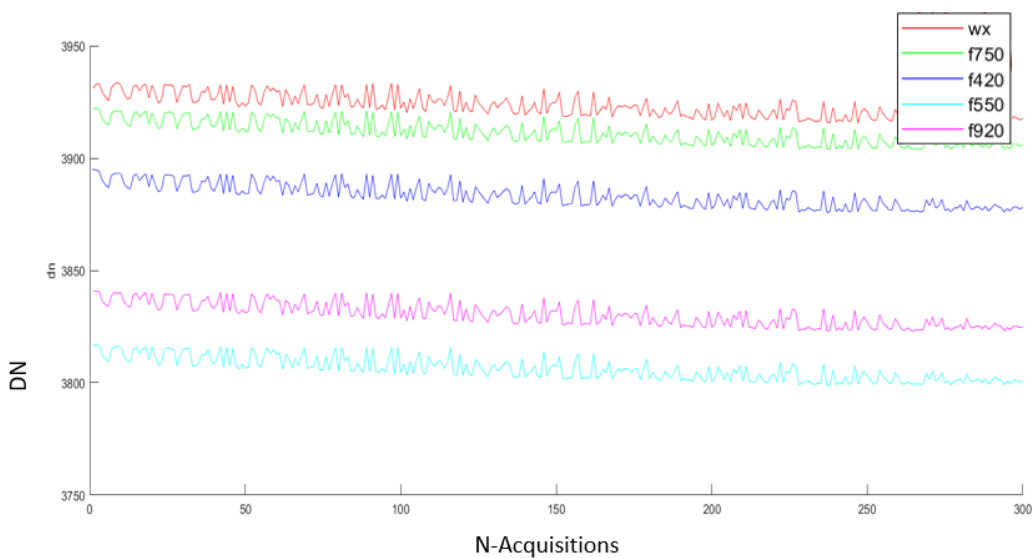


Figure 11 Mean values of the different windows during the acquisitions for TC1.

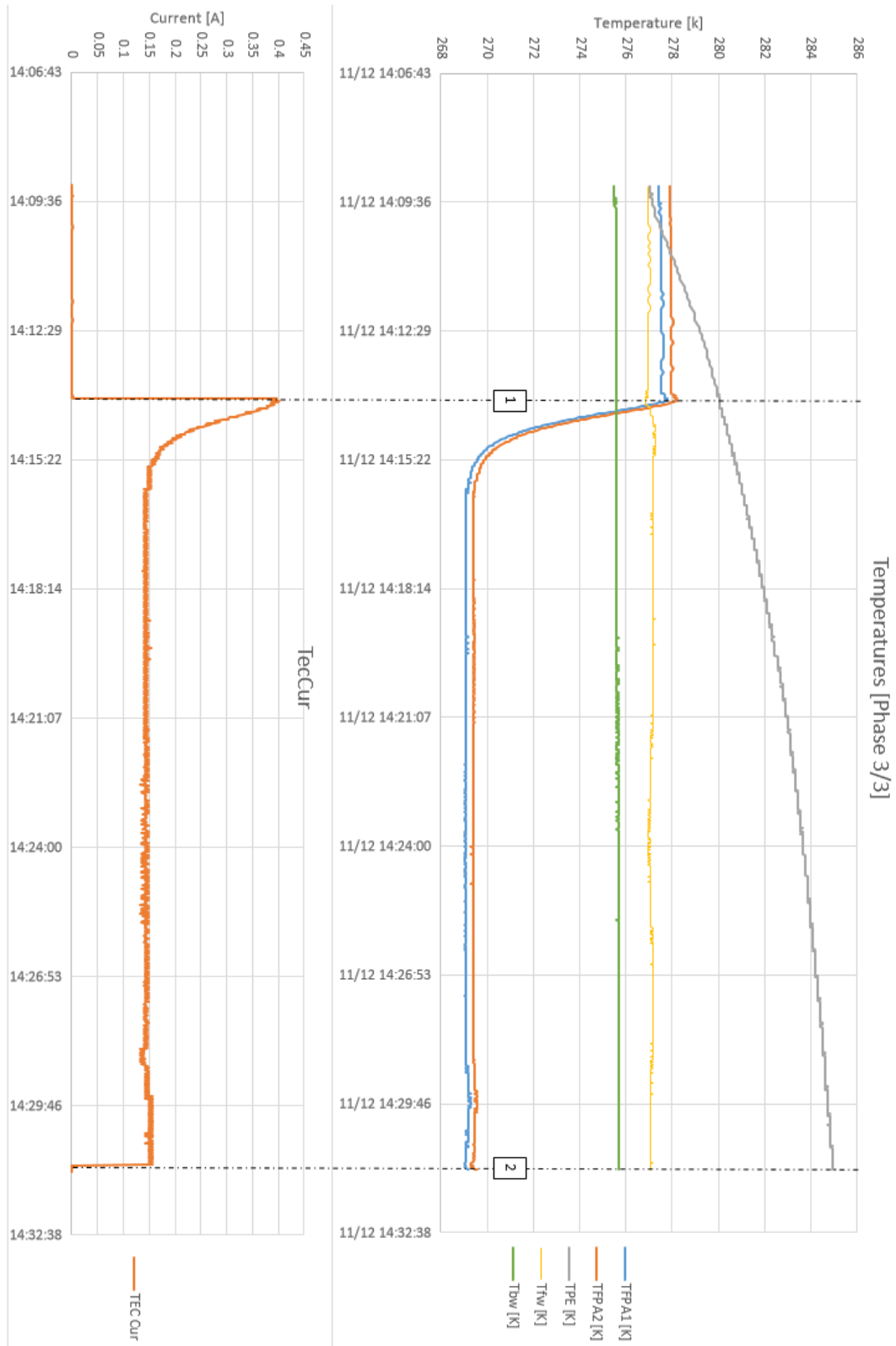


Figure 12 Temperatures and TEC current sensors readings for the functional tests (redundant ME) (second day of the NECP). Dotted lines represent the key points associated to the red TCs of **Table 8** and there indexed.

7. DAY2 (out of pass) Performance Tests

7.1. Test description

For test description, see **RD3**.

7.2. Commanding

The STC performance test is described in **RD3**.

CommandName	Description	SequenceName	ExecutionTime
ZSS17201	SIMB STC Power On/Off		2018-12-11T18:05:00.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:00.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:00.000000Z
ZSS17204	SIMB STC Confirm Command		2018-12-11T18:10:05.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:10.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:10.000000Z
ZSS17204	SIMB STC Confirm Command		2018-12-11T18:10:15.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:20.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:20.000000Z
ZSS17204	SIMB STC Confirm Command		2018-12-11T18:10:25.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:30.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:30.000000Z
ZSS17204	SIMB STC Confirm Command		2018-12-11T18:10:35.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:40.000000Z
ZSS17205	SIMB STC Upload parameters		2018-12-11T18:10:40.000000Z
ZSS17204	SIMB STC Confirm Command		2018-12-11T18:10:45.000000Z
ZSS17201 [1]	SIMB STC Power On/Off		2018-12-11T18:10:50.000000Z
ZSS17202	SIMB STC SCIENCE	ASSF307A	2018-12-11T18:25:00.000000Z
	...		

Table 11 ZSSs Commanded during the performance tests (second day of the NECP out of pass). Red rows correspond to the key point depicted in **Figure 13**.

PDOR	EGSE_NTC	First_Acq	Duration	NACQ	DimX	IT	RT	Windows
	[#]	[UTC]	[s]	[#]	[px]	[ms]	[s]	
Nominal PDOR	1	2018-12-11T18:24:58.466466	4.05	10	896	0	0.5	GM
	2	2018-12-11T18:25:05.466558	4.05	10	896	0.0096	0.4	GM
	3	2018-12-11T18:25:12.466390	4.05	10	896	0.0576	0.5	GM
	4	2018-12-11T18:25:19.466375	4.05	10	896	0.1056	0.5	GM
	5	2018-12-11T18:25:26.466375	4.05	10	896	0.192	0.5	GM
	6	2018-12-11T18:25:33.466283	4.05	10	896	0.288	0.5	GM
	7	2018-12-11T18:25:40.466344	4.05	10	896	0.336	0.5	GM
	8	2018-12-11T18:25:47.466375	4.05	10	896	0.48	0.4	GM
	9	2018-12-11T18:25:54.466268	4.05	10	896	0.576	0.4	GM
	10	2018-12-11T18:26:01.466299	4.05	10	896	0.96	0.4	GM
	11	2018-12-11T18:26:08.466177	4.05	10	896	2.4	0.4	GM
	12	2018-12-11T18:26:15.466146	4.05	10	896	3.36	0.4	GM
	13	2018-12-11T18:26:22.466039	4.05	10	896	4.8	0.5	GM
	14	2018-12-11T18:26:29.466024	4.05	10	896	9.6	0.5	GM
	15	2018-12-11T18:26:36.465993	4.05	10	896	30	0.5	GM
	16	2018-12-11T18:26:43.465932	4.05	10	896	150	0.5	GM
	17	2018-12-11T18:26:50.465932	4.05	10	896	270	0.4	GM
	18	2018-12-11T18:26:57.465978	7.02	10	896	480	0.8	GM
	19	2018-12-11T18:27:07.470861	11.3	10	896	960	1.3	GM
	20	2018-12-11T18:27:22.465795	45.9	10	896	4800	5.1	GM
	21	2018-12-11T18:28:15.470495	89.1	10	896	9600	9.9	GM
	22	2018-12-11T18:29:56.469945	63	10	896	0	7.0	GM
	23	2018-12-11T18:31:08.469625	63	10	896	0.0096	7.0	GM
	24	2018-12-11T18:32:20.469167	63	10	896	0.0576	7.0	GM
	25	2018-12-11T18:33:32.468816	63	10	896	0.1056	7.0	GM
	26	2018-12-11T18:34:44.468374	63	10	896	0.192	7.0	GM
	27	2018-12-11T18:35:56.468130	63	10	896	0.288	7.0	GM
	28	2018-12-11T18:37:08.467748	63	10	896	0.336	7.0	GM
	29	2018-12-11T18:38:20.467367	63	10	896	0.48	7.0	GM
	30	2018-12-11T18:39:32.466939	63	10	896	0.576	7.0	GM
	31	2018-12-11T18:40:44.466711	63	10	896	0.96	7.0	GM
	32	2018-12-11T18:41:56.466283	63	10	896	2.4	7.0	GM
	33	2018-12-11T18:43:08.466009	63	10	896	3.36	7.0	GM
	34	2018-12-11T18:44:20.465780	63	10	896	4.8	7.0	GM
	35	2018-12-11T18:45:32.470418	63	10	896	9.6	7.0	GM
	36	2018-12-11T18:46:44.470052	63	10	896	30	7.0	GM
	37	2018-12-11T18:47:56.469656	63	10	896	150	7.0	GM
	38	2018-12-11T18:49:08.469335	63	10	896	270	7.0	GM
	39	2018-12-11T18:50:20.469060	63	10	896	480	7.0	GM

40	2018-12-11T18:51:32.468771	63	10	896	960	7.0	GM
41	2018-12-11T18:52:44.468435	63	10	896	4800	7.0	GM
42	2018-12-11T18:53:56.468053	89.1	10	896	9600	9.9	GM
43	2018-12-11T18:55:37.467596	2.25	10	896	0	0.3	CM
44	2018-12-11T18:55:42.467702	2.25	10	896	0.0096	0.3	CM
45	2018-12-11T18:55:47.467565	2.25	10	896	0.384	0.3	CM
46	2018-12-11T18:55:52.467596	2.25	10	896	0.768	0.3	CM
47	2018-12-11T18:55:57.467687	2.25	10	896	1.92	0.3	CM
48	2018-12-11T18:56:02.467504	2.25	10	896	2.88	0.3	CM
49	2018-12-11T18:56:07.467565	2.25	10	896	3.36	0.2	CM
50	2018-12-11T18:56:12.467443	2.25	10	896	3.84	0.3	CM
51	2018-12-11T18:56:17.467535	2.25	10	896	4.8	0.2	CM
52	2018-12-11T18:56:22.467504	2.25	10	896	5.28	0.3	CM
53	2018-12-11T18:56:27.467489	2.25	10	896	7.2	0.2	CM
54	2018-12-11T18:56:32.467458	2.25	10	896	9.6	0.3	CM
55	2018-12-11T18:56:37.467382	2.25	10	896	12.48	0.3	CM
56	2018-12-11T18:56:42.467275	2.25	10	896	20.16	0.3	CM
57	2018-12-11T18:56:47.467336	2.25	10	896	45.2256	0.3	CM
58	2018-12-11T18:56:52.467275	2.25	10	896	150	0.3	CM
59	2018-12-11T18:56:57.467306	5.13	10	896	270	0.6	CM
60	2018-12-11T18:57:05.467336	7.02	10	896	480	0.8	CM
61	2018-12-11T18:57:15.467275	11.3	10	896	960	1.3	CM
62	2018-12-11T18:57:30.467229	45.9	10	896	4800	5.1	CM
63	2018-12-11T18:58:23.466863	89.1	10	896	9600	9.9	CM
64	2018-12-11T19:00:04.491506	45	10	896	0	5.0	CM
65	2018-12-11T19:00:56.466329	45	10	896	0.0096	5.0	CM
66	2018-12-11T19:01:48.466054	45	10	896	0.384	5.0	CM
67	2018-12-11T19:02:40.465871	45	10	896	0.768	5.0	CM
68	2018-12-11T19:03:32.465765	45	10	896	1.92	5.0	CM
69	2018-12-11T19:04:24.470342	45	10	896	2.88	5.0	CM
70	2018-12-11T19:05:16.470190	45	10	896	3.36	5.0	CM
71	2018-12-11T19:06:08.470006	45	10	896	3.84	5.0	CM
72	2018-12-11T19:07:00.469793	45	10	896	4.8	5.0	CM
73	2018-12-11T19:07:52.469549	45	10	896	5.28	5.0	CM
74	2018-12-11T19:08:44.469259	45	10	896	7.2	5.0	CM
75	2018-12-11T19:09:36.469076	45	10	896	9.6	5.0	CM
76	2018-12-11T19:10:28.468816	45	10	896	12.48	5.0	CM
77	2018-12-11T19:11:20.468648	45	10	896	20.16	5.0	CM
78	2018-12-11T19:12:12.468389	45	10	896	45.2256	5.0	CM
79	2018-12-11T19:13:04.468236	45	10	896	150	5.0	CM
80	2018-12-11T19:13:56.468053	45	10	896	270	5.0	CM
81	2018-12-11T19:14:48.467840	45	10	896	480	5.0	CM
82	2018-12-11T19:15:40.467565	45	10	896	960	5.0	CM

	83	2018-12-11T19:16:32.467382	45	10	896	4800	5.0	CM	
	84	2018-12-11T19:17:24.467199	89.1	10	896	9600	9.9	CM	
Out of filter	85	2018-12-11T19:36:14.467580	10.8	10	2048	0	1.2	cust0 (*)	
	86	2018-12-11T19:36:28.467504	10.8	10	2048	4.8	1.2	cust0 (*)	
	87	2018-12-11T19:36:42.467489	45	10	2048	0	5.0	cust0 (*)	
	88	2018-12-11T19:37:34.467336	45	10	2048	4.8	5.0	cust0 (*)	
	89	2018-12-11T19:38:26.467107	10.8	10	2048	0	1.2	cust0 (*)	
	90	2018-12-11T19:38:40.467046	10.8	10	2048	4.8	1.2	cust0 (*)	
	91	2018-12-11T19:38:54.467031	45	10	2048	0	5.0	cust0 (*)	
	92	2018-12-11T19:39:46.466817	45	10	2048	4.8	5.0	cust0 (*)	
	93	2018-12-11T19:41:18.466436	1.4	3	640	4.8	0.7	cust0	
	94	2018-12-11T19:41:23.466436	1.4	3	640	4.8	0.7	cust0	
	95	2018-12-11T19:41:28.466421	1.4	3	640	4.8	0.7	cust0	
	96	2018-12-11T19:41:33.466375	1.4	3	640	4.8	0.7	cust0	
	97	2018-12-11T19:41:38.466375	1.4	3	640	4.8	0.7	cust0	
	98	2018-12-11T19:41:43.466329	1.4	3	640	4.8	0.7	cust0	
	99	2018-12-11T19:41:48.466283	1.4	3	640	4.8	0.7	cust0	
		100	2018-12-11T19:41:53.466314	1.4	3	640	4.8	0.7	cust0
	Reset	101	2018-12-11T19:59:58.467031	3.8	20	128	0	0.2	filterx
102		2018-12-11T20:00:04.467062	3.8	20	128	0.0096	0.2	filterx	
103		2018-12-11T20:00:10.466894	3.8	20	128	0.48	0.2	filterx	
104		2018-12-11T20:00:16.466955	3.8	20	128	1.44	0.2	filterx	
105		2018-12-11T20:00:22.466863	3.8	20	128	3.36	0.2	filterx	
106		2018-12-11T20:00:28.466878	3.8	20	128	7.2	0.2	filterx	
107		2018-12-11T20:00:34.467016	3.8	20	128	9.6	0.2	filterx	
108		2018-12-11T20:00:40.466924	3.8	20	128	20.16	0.2	filterx	
109		2018-12-11T20:00:46.466833	10.5	20	128	0	0.6	filterx	
110		2018-12-11T20:00:59.466848	10.4	20	128	0.0096	0.5	filterx	
111		2018-12-11T20:01:12.466787	10.4	20	128	0.48	0.6	filterx	
112		2018-12-11T20:01:25.466695	10.4	20	128	1.44	0.5	filterx	
113		2018-12-11T20:01:38.466634	10.5	20	128	3.36	0.6	filterx	
114		2018-12-11T20:01:51.466634	10.4	20	128	7.2	0.6	filterx	
115		2018-12-11T20:02:04.466604	10.4	20	128	9.6	0.5	filterx	
116		2018-12-11T20:02:17.466390	10.5	20	128	20.16	0.6	filterx	
117		2018-12-11T20:02:30.491430	17.1	20	128	0	0.9	filterx	
118		2018-12-11T20:02:50.466390	17.1	20	128	0.0096	0.9	filterx	
119		2018-12-11T20:03:10.466344	17.1	20	128	0.48	0.9	filterx	
120		2018-12-11T20:03:30.491201	17.1	20	128	1.44	0.9	filterx	
121		2018-12-11T20:03:50.466161	17.1	20	128	3.36	0.9	filterx	
122		2018-12-11T20:04:10.466039	17.1	20	128	7.2	0.9	filterx	
123		2018-12-11T20:04:30.470983	17.1	20	128	9.6	0.9	filterx	
124		2018-12-11T20:04:50.465963	17.1	20	128	20.16	0.9	filterx	
125		2018-12-11T20:05:10.465856	23.7	20	128	0	1.3	filterx	

126	2018-12-11T20:05:37.470708	23.7	20	128	0.0096	1.3	filterx
127	2018-12-11T20:06:04.490514	23.8	20	128	0.48	1.3	filterx
128	2018-12-11T20:06:31.465566	23.7	20	128	1.44	1.3	filterx
129	2018-12-11T20:06:58.465520	23.7	20	128	3.36	1.3	filterx
130	2018-12-11T20:07:25.470357	23.7	20	128	7.2	1.3	filterx
131	2018-12-11T20:07:52.470144	23.7	20	128	9.6	1.3	filterx
132	2018-12-11T20:08:19.470022	23.7	20	128	20.16	1.3	filterx
133	2018-12-11T20:08:46.470068	30.4	20	128	0	1.6	filterx
134	2018-12-11T20:09:20.469854	30.4	20	128	0.0096	1.6	filterx
135	2018-12-11T20:09:54.469701	30.4	20	128	0.48	1.6	filterx
136	2018-12-11T20:10:28.469625	30.4	20	128	1.44	1.6	filterx
137	2018-12-11T20:11:02.469427	30.4	20	128	3.36	1.6	filterx
138	2018-12-11T20:11:36.469366	30.4	20	128	7.2	1.6	filterx
139	2018-12-11T20:12:10.469228	30.4	20	128	9.6	1.6	filterx
140	2018-12-11T20:12:44.469106	30.4	20	128	20.16	1.6	filterx
141	2018-12-11T20:13:18.468969	37	20	128	0	2.0	filterx
142	2018-12-11T20:13:59.468816	37	20	128	0.0096	2.0	filterx
143	2018-12-11T20:14:40.468542	37	20	128	0.48	2.0	filterx
144	2018-12-11T20:15:21.468511	37	20	128	1.44	2.0	filterx
145	2018-12-11T20:16:02.468328	37	20	128	3.36	2.0	filterx
146	2018-12-11T20:16:43.468114	37	20	128	7.2	2.0	filterx
147	2018-12-11T20:17:24.467992	37	20	128	9.6	2.0	filterx
148	2018-12-11T20:18:05.467809	37	20	128	20.16	2.0	filterx
149	2018-12-11T20:18:46.467702	43.7	20	128	0	2.3	filterx
150	2018-12-11T20:19:34.492422	43.7	20	128	0.0096	2.3	filterx
151	2018-12-11T20:20:22.467306	43.7	20	128	0.48	2.3	filterx
152	2018-12-11T20:21:10.467046	43.7	20	128	1.44	2.3	filterx
153	2018-12-11T20:21:58.466878	43.7	20	128	3.36	2.3	filterx
154	2018-12-11T20:22:46.466665	43.7	20	128	7.2	2.3	filterx
155	2018-12-11T20:23:34.466512	43.7	20	128	9.6	2.3	filterx
156	2018-12-11T20:24:22.466466	43.7	20	128	20.16	2.3	filterx
157	2018-12-11T20:25:10.466238	50.3	20	128	0	2.7	filterx
158	2018-12-11T20:26:05.465902	50.3	20	128	0.0096	2.7	filterx
159	2018-12-11T20:27:00.465765	50.3	20	128	0.48	2.7	filterx
160	2018-12-11T20:27:55.470556	50.3	20	128	1.44	2.7	filterx
161	2018-12-11T20:28:50.465292	50.3	20	128	3.36	2.7	filterx
162	2018-12-11T20:29:45.470144	50.3	20	128	7.2	2.7	filterx
163	2018-12-11T20:30:40.469945	50.3	20	128	9.6	2.7	filterx
164	2018-12-11T20:31:35.469656	50.3	20	128	20.16	2.7	filterx
165	2018-12-11T20:32:30.469457	57	20	128	0	3.0	filterx
166	2018-12-11T20:33:32.469289	57	20	128	0.0096	3.0	filterx
167	2018-12-11T20:34:34.493932	57	20	128	0.48	3.0	filterx
168	2018-12-11T20:35:36.468709	57	20	128	1.44	3.0	filterx

	169	2018-12-11T20:36:38.468557	57	20	128	3.36	3.0	filterx
	170	2018-12-11T20:37:40.468267	57	20	128	7.2	3.0	filterx
	171	2018-12-11T20:38:42.468069	57	20	128	9.6	3.0	filterx
	172	2018-12-11T20:39:44.467779	57	20	128	20.16	3.0	filterx
	173	2018-12-11T20:40:46.467565	190	20	128	0	10.0	filterx
	174	2018-12-11T20:44:08.466772	190	20	128	0.0096	10.0	filterx
	175	2018-12-11T20:47:30.491048	190	20	128	0.48	10.0	filterx
	176	2018-12-11T20:50:52.465246	190	20	128	1.44	10.0	filterx
	177	2018-12-11T20:54:14.469503	190	20	128	3.36	10.0	filterx
	178	2018-12-11T20:57:36.468694	190	20	128	7.2	10.0	filterx
	179	2018-12-11T21:00:58.467824	190	20	128	9.6	10.0	filterx
	180	2018-12-11T21:04:20.467138	190	20	128	20.16	10.0	filterx
	181	2018-12-11T21:07:42.466314	19	20	128	960	1.0	filterx
	182	2018-12-11T21:08:04.466360	188	20	128	9600	9.9	filterx
	183	2018-12-11T21:11:24.465627	190	20	128	960	10.0	filterx
	184	2018-12-11T21:14:46.469656	190	20	128	9600	10.0	filterx
Single Filter	185	2018-12-11T21:44:58.467733	4.05	10	896	0	0.5	panh+x
	186	2018-12-11T21:45:05.467748	4.05	10	896	0.0096	0.5	panh+x
	187	2018-12-11T21:45:12.467794	4.05	10	896	0.1056	0.4	panh+x
	188	2018-12-11T21:45:19.492605	4.05	10	896	0.192	0.5	panh+x
	189	2018-12-11T21:45:26.467763	4.05	10	896	0.288	0.4	panh+x
	190	2018-12-11T21:45:33.467672	4.05	10	896	0.48	0.5	panh+x
	191	2018-12-11T21:45:40.467626	4.05	10	896	0.96	0.5	panh+x
	192	2018-12-11T21:45:47.467611	4.05	10	896	2.4	0.5	panh+x
	193	2018-12-11T21:45:54.467565	4.05	10	896	4.8	0.4	panh+x
	194	2018-12-11T21:46:01.467535	4.05	10	896	9.6	0.5	panh+x
	195	2018-12-11T21:46:08.467519	4.05	10	896	30	0.5	panh+x
	196	2018-12-11T21:46:15.467504	11.3	10	896	960	1.3	panh+x
	197	2018-12-11T21:46:30.492376	45.9	10	896	4800	5.1	panh+x
	198	2018-12-11T21:47:23.467229	89.1	10	896	9600	9.9	panh+x
	199	2018-12-11T21:49:04.466787	63	10	896	0	7.0	panh+x
	200	2018-12-11T21:50:16.466558	63	10	896	0.0096	7.0	panh+x
	201	2018-12-11T21:51:28.466253	63	10	896	0.1056	7.0	panh+x
	202	2018-12-11T21:52:40.465902	63	10	896	0.192	7.0	panh+x
	203	2018-12-11T21:53:52.465749	63	10	896	0.288	7.0	panh+x
	204	2018-12-11T21:55:04.470357	63	10	896	0.48	7.0	panh+x
	205	2018-12-11T21:56:16.470129	63	10	896	0.96	7.0	panh+x
	206	2018-12-11T21:57:28.469900	63	10	896	2.4	7.0	panh+x
	207	2018-12-11T21:58:40.469579	63	10	896	4.8	7.0	panh+x
	208	2018-12-11T21:59:52.469350	63	10	896	9.6	7.0	panh+x
	209	2018-12-11T22:01:04.468984	63	10	896	30	7.0	panh+x
	210	2018-12-11T22:02:16.468801	63	10	896	960	7.0	panh+x
	211	2018-12-11T22:03:28.468587	63	10	896	4800	7.0	panh+x

212	2018-12-11T22:04:40.468267	89.1	10	896	9600	9.9	panh+x
213	2018-12-11T22:06:21.467748	4.05	10	896	0	0.5	panh+x
214	2018-12-11T22:06:28.467855	4.05	10	896	0.0096	0.5	panh+x
215	2018-12-11T22:06:35.467687	4.05	10	896	0.1056	0.5	panh+x
216	2018-12-11T22:06:42.467809	4.05	10	896	0.192	0.4	panh+x
217	2018-12-11T22:06:49.467657	4.05	10	896	0.288	0.5	panh+x
218	2018-12-11T22:06:56.467672	4.05	10	896	0.48	0.5	panh+x
219	2018-12-11T22:07:03.467718	4.05	10	896	0.96	0.4	panh+x
220	2018-12-11T22:07:10.467565	4.05	10	896	2.4	0.5	panh+x
221	2018-12-11T22:07:17.467657	4.05	10	896	4.8	0.4	panh+x
222	2018-12-11T22:07:24.467519	4.05	10	896	9.6	0.5	panh+x
223	2018-12-11T22:07:31.467611	4.05	10	896	30	0.4	panh+x
224	2018-12-11T22:07:38.467535	11.3	10	896	960	1.3	panh+x
225	2018-12-11T22:07:53.467474	45.9	10	896	4800	5.1	panh+x
226	2018-12-11T22:08:46.467351	89.1	10	896	9600	9.9	panh+x
227	2018-12-11T22:10:27.466939	63	10	896	0	7.0	panh+x
228	2018-12-11T22:11:39.466527	63	10	896	0.0096	7.0	panh+x
229	2018-12-11T22:12:51.466375	63	10	896	0.1056	7.0	panh+x
230	2018-12-11T22:14:03.466115	63	10	896	0.192	7.0	panh+x
231	2018-12-11T22:15:15.465902	63	10	896	0.288	7.0	panh+x
232	2018-12-11T22:16:27.470495	63	10	896	0.48	7.0	panh+x
233	2018-12-11T22:17:39.465353	63	10	896	0.96	7.0	panh+x
234	2018-12-11T22:18:51.469945	63	10	896	2.4	7.0	panh+x
235	2018-12-11T22:20:03.469701	63	10	896	4.8	7.0	panh+x
236	2018-12-11T22:21:15.469381	63	10	896	9.6	7.0	panh+x
237	2018-12-11T22:22:27.469167	63	10	896	30	7.0	panh+x
238	2018-12-11T22:23:39.468832	63	10	896	960	7.0	panh+x
239	2018-12-11T22:24:51.468633	63	10	896	4800	7.0	panh+x
240	2018-12-11T22:26:03.468359	89.1	10	896	9600	9.9	panh+x
241	2018-12-11T22:27:44.467885	89.1	10	896	9600	9.9	panh+x
242	2018-12-11T22:29:25.467550	2.25	10	896	0	0.2	f420+x
243	2018-12-11T22:29:30.467504	2.25	10	896	0.0096	0.3	f420+x
244	2018-12-11T22:29:35.467535	2.25	10	896	0.384	0.2	f420+x
245	2018-12-11T22:29:40.467443	2.25	10	896	1.92	0.3	f420+x
246	2018-12-11T22:29:45.467474	2.25	10	896	3.36	0.3	f420+x
247	2018-12-11T22:29:50.467397	2.25	10	896	4.8	0.3	f420+x
248	2018-12-11T22:29:55.467443	2.25	10	896	5.28	0.3	f420+x
249	2018-12-11T22:30:00.467382	2.25	10	896	7.2	0.3	f420+x
250	2018-12-11T22:30:05.467397	2.25	10	896	9.6	0.2	f420+x
251	2018-12-11T22:30:10.467367	2.25	10	896	20.16	0.3	f420+x
252	2018-12-11T22:30:15.467321	2.25	10	896	45.2256	0.3	f420+x
253	2018-12-11T22:30:20.467367	11.3	10	896	960	1.3	f420+x
254	2018-12-11T22:30:35.467321	45.9	10	896	4800	5.1	f420+x

255	2018-12-11T22:31:28.467184	89.1	10	896	9600	9.9	f420+x
256	2018-12-11T22:33:09.466726	45	10	896	0	5.0	f420+x
257	2018-12-11T22:34:01.466512	45	10	896	0.0096	5.0	f420+x
258	2018-12-11T22:34:53.466314	45	10	896	0.384	5.0	f420+x
259	2018-12-11T22:35:45.466100	45	10	896	1.92	5.0	f420+x
260	2018-12-11T22:36:37.470937	45	10	896	3.36	5.0	f420+x
261	2018-12-11T22:37:29.465703	45	10	896	4.8	5.0	f420+x
262	2018-12-11T22:38:21.470556	45	10	896	5.28	5.0	f420+x
263	2018-12-11T22:39:13.470357	45	10	896	7.2	5.0	f420+x
264	2018-12-11T22:40:05.470113	45	10	896	9.6	5.0	f420+x
265	2018-12-11T22:40:57.469854	45	10	896	20.16	5.0	f420+x
266	2018-12-11T22:41:49.469610	45	10	896	45.2256	5.0	f420+x
267	2018-12-11T22:42:41.469457	45	10	896	960	5.0	f420+x
268	2018-12-11T22:43:33.469244	45	10	896	4800	5.0	f420+x
269	2018-12-11T22:44:25.469121	89.1	10	896	9600	9.9	f420+x
270	2018-12-11T22:46:06.468618	2.25	10	896	0	0.3	f550+x
271	2018-12-11T22:46:11.468725	2.25	10	896	0.0096	0.2	f550+x
272	2018-12-11T22:46:16.468557	2.25	10	896	0.384	0.3	f550+x
273	2018-12-11T22:46:21.468633	2.25	10	896	1.92	0.3	f550+x
274	2018-12-11T22:46:26.468603	2.25	10	896	3.36	0.3	f550+x
275	2018-12-11T22:46:31.468526	2.25	10	896	4.8	0.3	f550+x
276	2018-12-11T22:46:36.468633	2.25	10	896	5.28	0.2	f550+x
277	2018-12-11T22:46:41.468664	2.25	10	896	7.2	0.2	f550+x
278	2018-12-11T22:46:46.468572	2.25	10	896	9.6	0.2	f550+x
279	2018-12-11T22:46:51.468648	2.25	10	896	20.16	0.2	f550+x
280	2018-12-11T22:46:56.468557	2.25	10	896	45.2256	0.2	f550+x
281	2018-12-11T22:47:01.468572	11.3	10	896	960	1.3	f550+x
282	2018-12-11T22:47:16.468404	45.9	10	896	4800	5.1	f550+x
283	2018-12-11T22:48:09.468160	89.1	10	896	9600	9.9	f550+x
284	2018-12-11T22:49:50.467870	45	10	896	0	5.0	f550+x
285	2018-12-11T22:50:42.492696	45	10	896	0.0096	5.0	f550+x
286	2018-12-11T22:51:34.467382	45	10	896	0.384	5.0	f550+x
287	2018-12-11T22:52:26.467290	45	10	896	1.92	5.0	f550+x
288	2018-12-11T22:53:18.492086	45	10	896	3.36	5.0	f550+x
289	2018-12-11T22:54:10.491888	45	10	896	4.8	5.0	f550+x
290	2018-12-11T22:55:02.466726	45	10	896	5.28	5.0	f550+x
291	2018-12-11T22:55:54.466436	45	10	896	7.2	5.0	f550+x
292	2018-12-11T22:56:46.466177	45	10	896	9.6	5.0	f550+x
293	2018-12-11T22:57:38.466009	45	10	896	20.16	5.0	f550+x
294	2018-12-11T22:58:30.470861	45	10	896	45.2256	5.0	f550+x
295	2018-12-11T22:59:22.465673	45	10	896	960	5.0	f550+x
296	2018-12-11T23:00:14.470418	45	10	896	4800	5.0	f550+x
297	2018-12-11T23:01:06.470312	89.1	10	896	9600	9.9	f550+x

298	2018-12-11T23:02:47.469823	2.25	10	896	0	0.3	f750+x
299	2018-12-11T23:02:52.469793	2.25	10	896	0.0096	0.3	f750+x
300	2018-12-11T23:02:57.469869	2.25	10	896	0.384	0.3	f750+x
301	2018-12-11T23:03:02.469915	2.25	10	896	1.92	0.2	f750+x
302	2018-12-11T23:03:07.469839	2.25	10	896	3.36	0.2	f750+x
303	2018-12-11T23:03:12.469793	2.25	10	896	4.8	0.2	f750+x
304	2018-12-11T23:03:17.469701	2.25	10	896	5.28	0.3	f750+x
305	2018-12-11T23:03:22.469686	2.25	10	896	7.2	0.3	f750+x
306	2018-12-11T23:03:27.469732	2.25	10	896	9.6	0.3	f750+x
307	2018-12-11T23:03:32.469732	2.25	10	896	20.16	0.3	f750+x
308	2018-12-11T23:03:37.469594	2.25	10	896	45.2256	0.3	f750+x
309	2018-12-11T23:03:42.469701	11.3	10	896	960	1.3	f750+x
310	2018-12-11T23:03:57.469640	45.9	10	896	4800	5.1	f750+x
311	2018-12-11T23:04:50.469381	89.1	10	896	9600	9.9	f750+x
312	2018-12-11T23:06:31.469045	45	10	896	0	5.0	f750+x
313	2018-12-11T23:07:23.468847	45	10	896	0.0096	5.0	f750+x
314	2018-12-11T23:08:15.468648	45	10	896	0.384	5.0	f750+x
315	2018-12-11T23:09:07.468435	45	10	896	1.92	5.0	f750+x
316	2018-12-11T23:09:59.468221	45	10	896	3.36	5.0	f750+x
317	2018-12-11T23:10:51.468053	45	10	896	4.8	5.0	f750+x
318	2018-12-11T23:11:43.467794	45	10	896	5.28	5.0	f750+x
319	2018-12-11T23:12:35.467718	45	10	896	7.2	5.0	f750+x
320	2018-12-11T23:13:27.467367	45	10	896	9.6	5.0	f750+x
321	2018-12-11T23:14:19.467138	45	10	896	20.16	5.0	f750+x
322	2018-12-11T23:15:11.466985	45	10	896	45.2256	5.0	f750+x
323	2018-12-11T23:16:03.466741	45	10	896	960	5.0	f750+x
324	2018-12-11T23:16:55.466588	45	10	896	4800	5.0	f750+x
325	2018-12-11T23:17:47.466344	89.1	10	896	9600	9.9	f750+x
326	2018-12-11T23:19:28.466009	2.25	10	896	0	0.3	f920+x
327	2018-12-11T23:19:33.465917	2.25	10	896	0.0096	0.3	f920+x
328	2018-12-11T23:19:38.466009	2.25	10	896	0.384	0.3	f920+x
329	2018-12-11T23:19:43.465978	2.25	10	896	1.92	0.3	f920+x
330	2018-12-11T23:19:48.465871	2.25	10	896	3.36	0.3	f920+x
331	2018-12-11T23:19:53.465978	2.25	10	896	4.8	0.3	f920+x
332	2018-12-11T23:19:58.466009	2.25	10	896	5.28	0.2	f920+x
333	2018-12-11T23:20:03.465871	2.25	10	896	7.2	0.3	f920+x
334	2018-12-11T23:20:08.465978	2.25	10	896	9.6	0.3	f920+x
335	2018-12-11T23:20:13.465826	2.25	10	896	20.16	0.3	f920+x
336	2018-12-11T23:20:18.465932	2.25	10	896	45.2256	0.2	f920+x
337	2018-12-11T23:20:23.465841	11.3	10	896	960	1.3	f920+x
338	2018-12-11T23:20:38.465871	45.9	10	896	4800	5.1	f920+x
339	2018-12-11T23:21:31.470541	89.1	10	896	9600	9.9	f920+x
340	2018-12-11T23:23:12.470159	45	10	896	0	5.0	f920+x

341	2018-12-11T23:24:04.489980	45	10	896	0.0096	5.0	f920+x
342	2018-12-11T23:24:56.469808	45	10	896	0.384	5.0	f920+x
343	2018-12-11T23:25:48.469610	45	10	896	1.92	5.0	f920+x
344	2018-12-11T23:26:40.469305	45	10	896	3.36	5.0	f920+x
345	2018-12-11T23:27:32.469213	45	10	896	4.8	5.0	f920+x
346	2018-12-11T23:28:24.468938	45	10	896	5.28	5.0	f920+x
347	2018-12-11T23:29:16.468786	45	10	896	7.2	5.0	f920+x
348	2018-12-11T23:30:08.468557	45	10	896	9.6	5.0	f920+x
349	2018-12-11T23:31:00.468389	45	10	896	20.16	5.0	f920+x
350	2018-12-11T23:31:52.468160	45	10	896	45.2256	5.0	f920+x
351	2018-12-11T23:32:44.467962	45	10	896	960	5.0	f920+x
352	2018-12-11T23:33:36.467687	45	10	896	4800	5.0	f920+x
353	2018-12-11T23:34:28.467565	89.1	10	896	9600	9.9	f920+x

Table 12 Resulting database of the NECP Performance Test. All TCs were commanded with the CBD = 64x64 a part the custom (*) ones were CBD=64x128. Nominally, the IBR was set to 63. First column identifies the PDOR name.

7.3. HKs interpretation

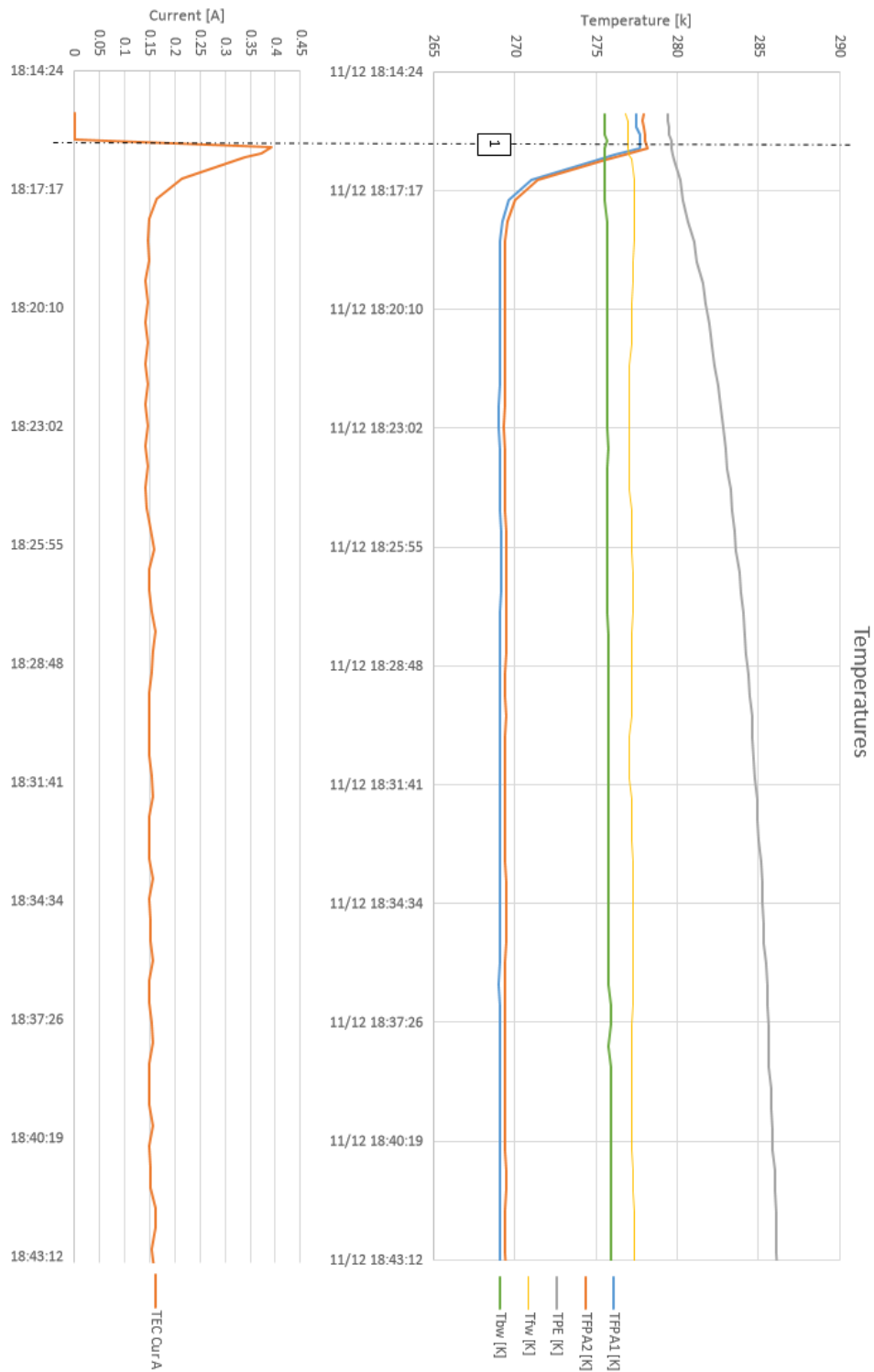


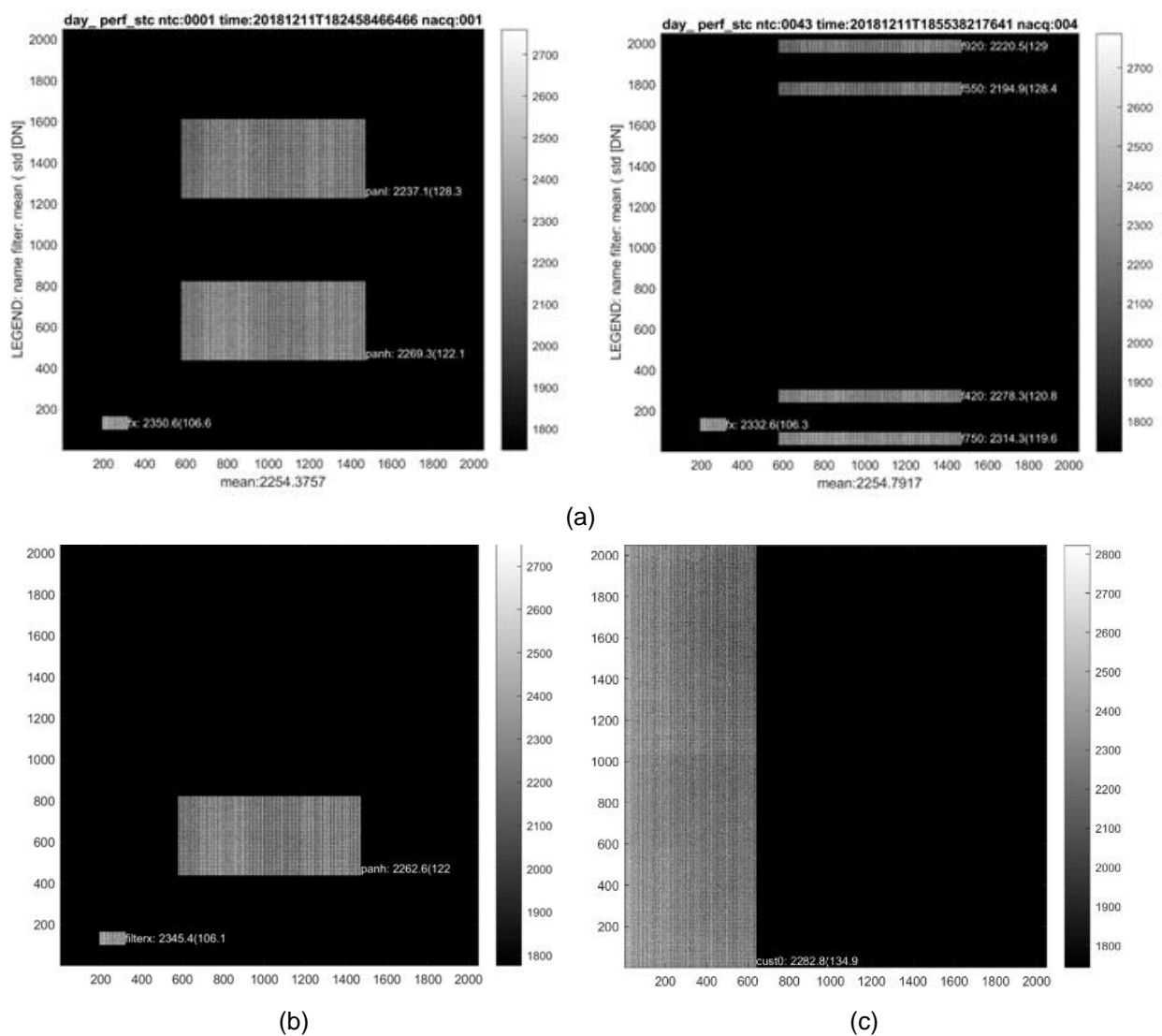
Figure 13 Evolution of the temperatures and TEC current sensors values for the performance tests (second day of the NECP out of pass). The test has finished at 23.35 PM. Dotted lines represent the key points associated to the red TCs of **Table 11** and there indexed.

7.4. Images analysis

This test has been performed through the execution of 4 pre-defined PDORs named:

- “PDOR_BPSS_C_SS_SIMBIOSYS_stc_nominal_test”,
- “PDOR_BPSS_C_SS_SIMBIOSYS_stc_out_filters_test”,
- “PDOR_BPSS_C_SS_SIMBIOSYS_stc_reset_test”
- “PDOR_BPSS_C_SS_SIMBIOSYS_stc_single_filters_test”,

An example of the outcome of four different PDORs is shown in Figure 14.



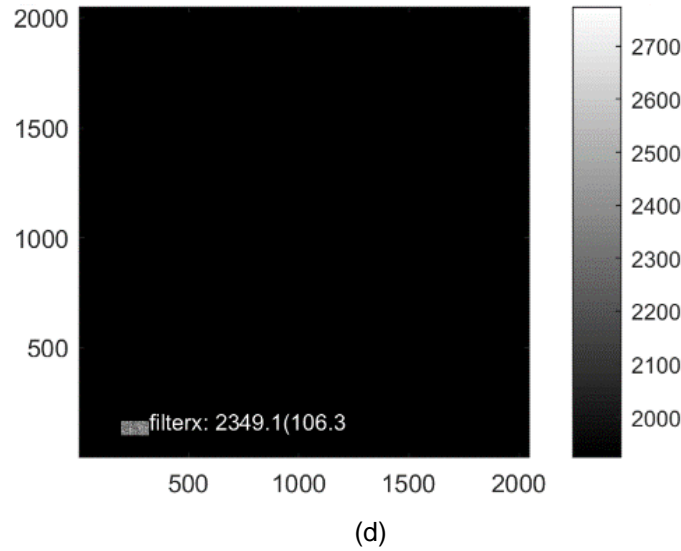


Figure 14 Examples of the acquisitions performed during the Performance Test of STC. For each windows acquired, as means and standard deviation are indicated near the filter name in the format "FILTER : MEAN (STD)".

Figure 14 shows some acquisition examples of the Performance Test of STC. In (a) the "nominal test", acquired for different ITs and RTs, for the nominal configuration of the STC channel: Global Mapping (GM) on the left and Color Mode (CM) on the right.

In (b) the "Single Filters test" in which all the six STC filters are acquired one by one. In (c) the "Out Filters Test", a set of acquisitions of the out of filter region of the detector . In (d) the "Reset Test" to define the behaviour of the window-x dark mitigation window of STC.

During the Performance Tests, 28 TCs were rejected by the on board SW because of a FPGA limit. They were repeated the day after thanks to "STC_outfilters_bup" PDOR (See Section 9).

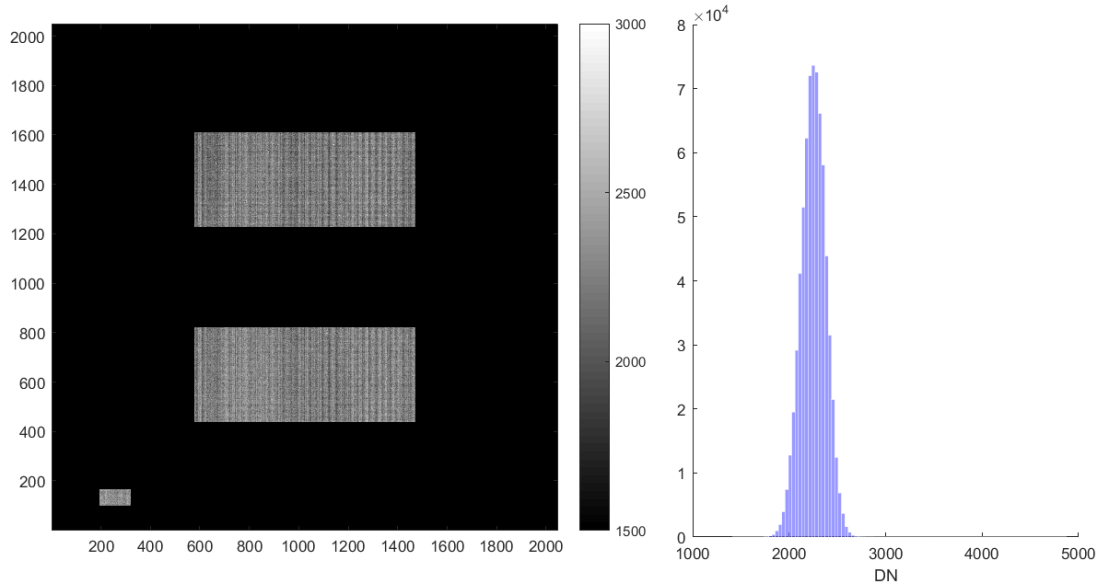
All the DataBench was acquired nominally and it will be used for STC Dark calibration.

As reported for Functional Test a set of statistical parameters of the first acquisition of the Performance Test are reported in the following table.

NTC	1		
Nacq	RT=400ms		
	10		
	Mean Value	DSNU	RON
Wx	2349.2	106.4	6.8
PANH	2266.4	122.0	7.2
PANL	2233.2	128.3	9.3
Mean	2282.9	118.9	7.8

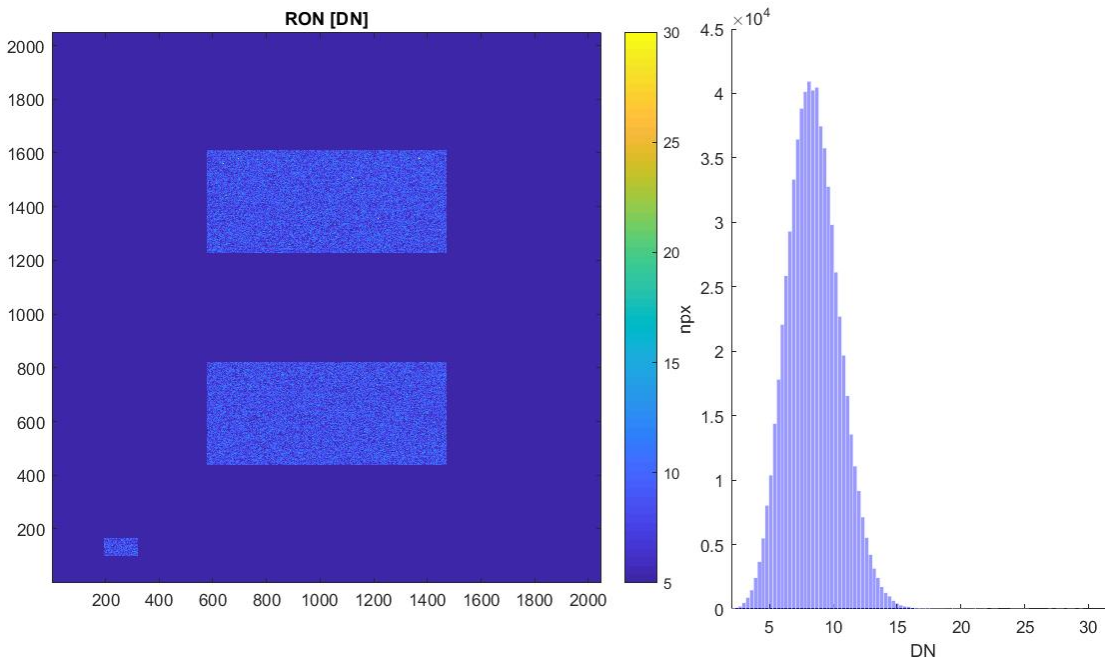
Table 13 Statistical values for the dark (i.e. mean, DSNU and RON) calculated for the first TC commanding GM with IBR=0. Mean dark values and std (here indicated as DSNU) are evaluated on all the windows while RON is measured on the central pixel.

As reported for CM in Figure 8, a preliminary statistical overview of the dark and RON on the detector during Global Mapping acquisition is shown in Figure 15. The analysis confirms a RON mean value of 10 DN.



(a)

(b)



(c)

Figure 15 Example of an image acquired during the GM acquisition mode in (a). In (b) the histogram of the values of the 3 windows. In (c) the distribution of the RON.

8. DAY3 Inter-Channel Tests

8.1. Test description

Test scope is described in **RDPLAN**. As a summary we report the different test executed in Table 14.

Name Sub Test	Expected Science [Gb]	Notes
MAX STRESS Test	2.8063	About half of the STC Science data are completely lost Last available STC frame presents an incomplete subframe (i.e., row=00, col=12) and a missing subframe (i.e., row=00, col=13) in F920
MAX DR Test	0.2806	All STC Science data are lost.
ORBIT Test	0.2208	Data of first 4 STC Science TCs (low priority) are lost. First 19 Acquisitions of 5th STC Science TC (low priority) are incomplete.

Table 14 Test executed as Inter Channel Test

As described in Section 9.4 part of the data were lost as a consequence of the SSMM overwriting.

8.2. Commanding

The STC Inter Channel Tests are described in **RD3**.

Table 16 and Table 17 reports the not over written science data respectively for Max Stress Test and Orbit Test.

CommandName	Description	SequenceName	ExecutionTime
ZSSK4000	Start OBCP: SIMBIO ME Switch On	ASSF001A	2018-12-12T10:10:47.906605Z
ZSS17201	SIMB STC Power On/Off		2018-12-12T10:17:48.607054Z
ZSS17205	SIMB STC Upload parameters		2018-12-12T10:18:48.736186Z
ZSS17204	SIMB STC Confirm Command		2018-12-12T10:18:53.702907Z
ZSS17205	SIMB STC Upload parameters		2018-12-12T10:18:58.695255Z
ZSS17204	SIMB STC Confirm Command		2018-12-12T10:19:03.861232Z
ZSS17205	SIMB STC Upload parameters		2018-12-12T10:19:08.795070Z
ZSS17204	SIMB STC Confirm Command		2018-12-12T10:19:13.753274Z
ZSS17205	SIMB STC Upload parameters		2018-12-12T10:19:18.827320Z
ZSS17204	SIMB STC Confirm Command		2018-12-12T10:19:23.946854Z
ZSS17205	SIMB STC Upload parameters		2018-12-12T10:19:28.938084Z
ZSS17204	SIMB STC Confirm Command		2018-12-12T10:19:33.905237Z
ZSS17201	SIMB STC Power On/Off		2018-12-12T10:19:39.061467Z
ZSSK4003 [1]	Start OBCP: SIMBIO STC Switch On	ASSF008A	2018-12-12T10:55:21.930582Z
ZSS17202	SIMB STC SCIENCE	ASSF308A	2018-12-12T11:15:24.414181Z

ZSS17202	SIMB STC SCIENCE	ASSF308A	2018-12-12T11:15:24.414181Z
ZSS17209	SIMB STC Stop Science	ASSF368A	2018-12-12T11:25:24.351495Z
ZSS17202	SIMB STC SCIENCE	ASSF308A	2018-12-12T11:32:28.698694Z
ZSS17202	SIMB STC SCIENCE	ASSF308A	2018-12-12T11:32:28.698694Z
ZSS17109	SIMB HRIC Stop Science	ASSF110A	2018-12-12T11:33:27.190911Z
ZSS17209	SIMB STC Stop Science	ASSF368A	2018-12-12T11:33:29.106365Z
ZSS17309	SIMB VIHI Stop Science	ASSF514A	2018-12-12T11:33:31.079686Z
ZSS17202	SIMB STC SCIENCE	ASSF307A	2018-12-12T11:38:14.149070Z
ZSS17202	SIMB STC SCIENCE	ASSF307A	2018-12-12T11:38:14.149070Z
ZSS17202	SIMB STC SCIENCE	ASSF307A	2018-12-12T12:24:15.494694Z
ZSS17209	SIMB STC Stop Science	ASSF368A	2018-12-12T12:27:15.294216Z
ZSSK4006 [2]	Start OBCP: SIMBIO STC Graceful Shutdown	ASSF007A	2018-12-12T12:43:15.328171Z

Table 15 ZSSs Commanded during the inter-channel test. Red rows correspond to the key point depicted in **Figure 16**.

EGSE_NTC [#]	First_Acq [UTC]	Duration [s]	NACQ [#]	DimX [px]	IT [ms]	RT [s]	Windows
1	2018-12-12T11:15:22.592275	304	1521	896	4.032	0.2	CM

Table 16 Resulting database of the NECP Inter Channel Max Stress Test. The TC was commanded with the CBD = 64x64 and nominally, the IBR was set to 63.

EGSE_NTC [#]	First_Acq [UTC]	Duration [s]	NACQ [#]	DimX [px]	IT [ms]	RT [s]	Windows
1	2018-12-12T12:13:18.017080	231	30	512	0.1728	7.97	GM
2	2018-12-12T12:17:17.117925	174	21	384	0.2592	8.695	GM
3	2018-12-12T12:20:19.713445	231	25	256	0.3264	9.635	GM
4	2018-12-12T12:24:20.589498	169	16	128	0.432	11.24	GM

Table 17 Resulting database of the NECP Inter Channel Orbit Test. The TC was commanded with the CBD = 64x64 and nominally, the IBR was set to 32.

8.3. HKs interpretation

TEC current presents (see Figure 17 in the next page) still (despite in the nominal range) a spike behaviour. This is due to the difference between expected and measured temperature which does not allow the activation of gentle switch on. This modality was tested the day before during Performance Recovery.

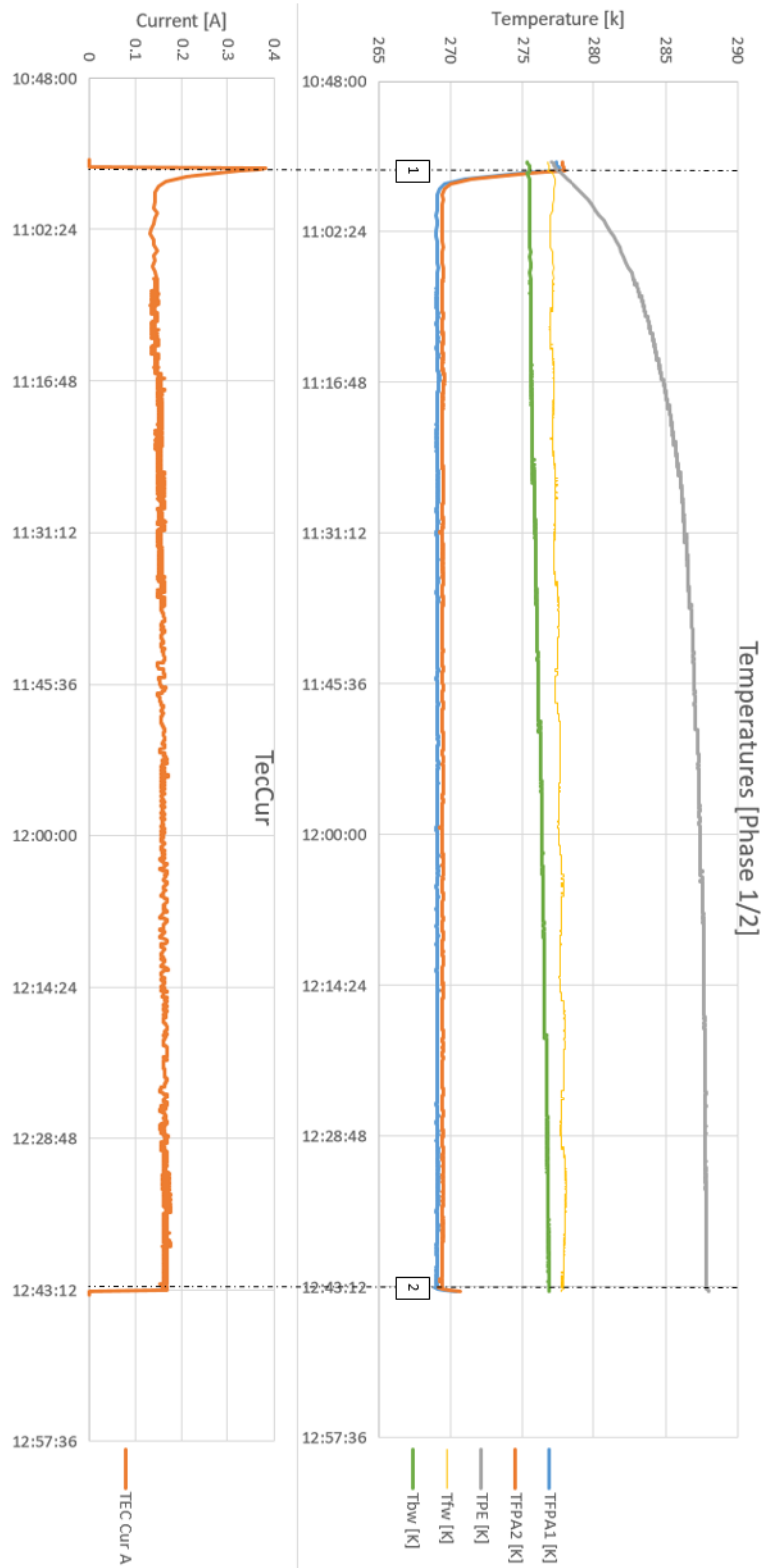


Figure 16 Evolution of the temperatures and TEC current sensors values for the inter-channel test (third day of the NECP). Dotted lines represent the key points associated to the red TCs of Table 15 and there indexed.

9. DAY3 STC Performance Recovery

9.1. Test description

During the DAY3 STC repeated the tests failed during the night because of the FPGA limit. This process was executed after the inter-channel test thanks to a PDOR (*STC_outfilters_bup*).

In this case HRIC-STC temperature set point was set (TAG1) to 267K to have a difference (in temperature) of 11K and thus activate the “gentle switch on” mode.

9.2. Commanding

CommandName	Description	SequenceName	ExecutionTime
ZSSK4003 [1]	Start OBCP: SIMBIO STC Switch On		2018-12-12T14:22:09.379255Z
ZSS17202	SIMB STC SCIENCE	ASSF300A	2018-12-12T14:37:09.382937Z
ZSS17202	SIMB STC SCIENCE	ASSF300A	2018-12-12T14:45:52.200160Z
ZSSK4006 [2]	Start OBCP: SIMBIO STC Graceful Shutdown	ASSF007A	2018-12-12T15:03:17.629686Z
ZSSK4001	Start OBCP: SIMBIO ME Switch Off	ASSF002A	2018-12-12T16:32:41.482439Z
ZSSK4001	Start OBCP: SIMBIO ME Switch Off	ASSF002A	2018-12-12T16:32:41.482439Z
ZSSK4001	Start OBCP: SIMBIO ME Switch Off	ASSF002A	2018-12-12T16:32:41.482439Z

Table 18 ZSSs Commanded during the repetition of performance failed test. Red rows correspond to the key point depicted in **Figure 17**.

9.3. HKs interpretation

As depicted in **Figure 17** (next page) the commanded temperature set point activated the gentle TEC switch on generating in [1] the current ramp.

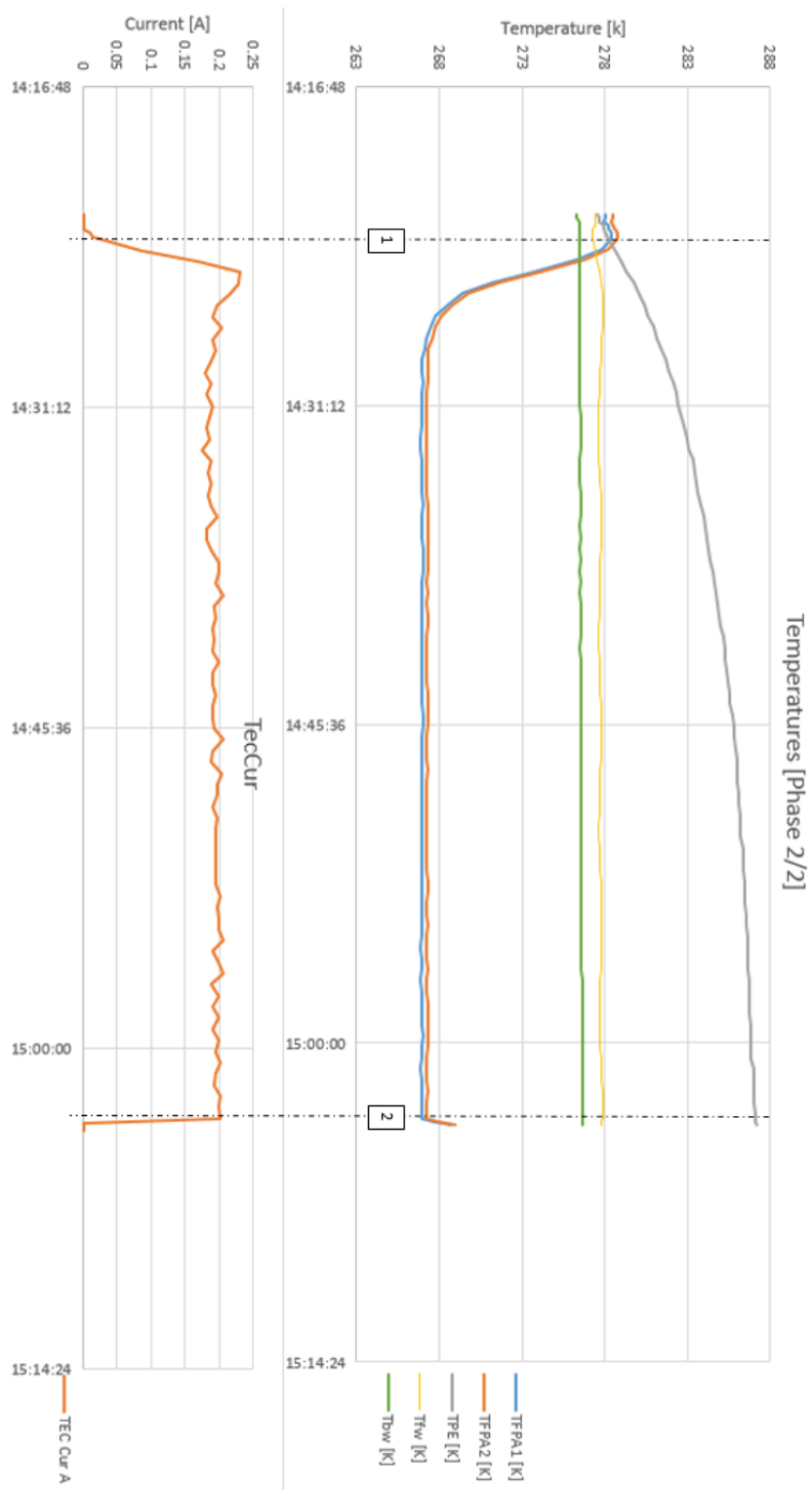


Figure 17 Evolution of the temperatures and TEC current sensors values for the inter-channel test (third day of the NECP).. Dotted lines represent the key points associated to the red TCs in Table 18 of and there indexed.

9.4. Images analysis

The recovery test was the unique test of STC in which was commanded the CBD=128x128 to bypass the limits of the FPGA. The test includes 25 TCs of science with a final STOP TC.

The main aim of the test was to analyse the behaviour of the detector for larger along track acquisitions.

The test analysis revealed two remarks: an overwriting of the SSMM and an anomaly in the packet management.

The overwriting on the SSMM (of the APID “STC low priority”) is due to a capacity limit reached of the SSMM. This means that the PDOR cancelled part of the images data acquired the same day as specified in Section 8.1.

The anomaly in the packets managements had an impact on the (2.2% of the images). A lot of packets were lost or not correctly initialized invalidating the reconstruction of the following images:

NTC	N-ACQ	UTC Time 12/12
0005	2-3	14:39:43.667 14:39:44.867
0022	8-9	14:45:37.467 14:45:38.167
0023	1	14:45:38.867

Table 19 Acquisitions invalidated by packets lost

As example of the resulting acquisition is shown in Figure 18. As explained in [RD 4], this is due to a misalignment between Sequence Counter and Timing at ME level.

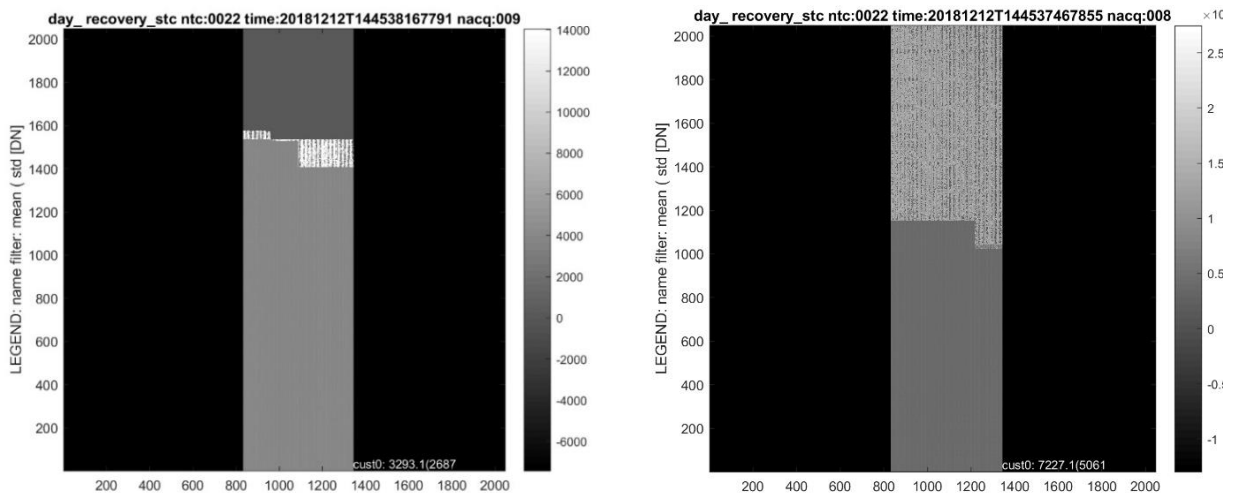


Figure 18 Example of the partial images acquired during the recovery test.