BC-SIM-TR-006
Delta NECP
Data Produced Analysis

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1. Introduction

1.1. Scope

This document describes all the tests performed during the second session of the Near Earth Commissioning Phase (dNECP) by the Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem (SIMBIO-SYS). The test session whose plan is described in [RD.1] was performed on June 6th 2019. For each test, a sheet with the pipeline report and a discussion eventually on the detected anomalies is given.

1.2. Reference Documents

[RD.1] BC-SIM-PL-003 Delta NECP Test Summary Issue1 Revision0
(DOI: http://dx.doi.org/10.20371/INAF/TechRep/66
[RD.2] BC-SIM-TN-003 – Reports and Notes Layout and Flow
(DOI: http://dx.doi.org/10.20371/INAF/TechRep/36)
[RD.3] BC-SIM-ICD-001_SIMBIOSYS_EAICD
[RD.4] BC-SIM-GAF-IC-002_rev12 – SIMBIO-SYS Software Interface Control Document
[RD.5] BC-SIM-TN-004_-_SIMBIO-SYS FOP update after NECP
(DOI: http://dx.doi.org/10.20371/INAF/TechRep/58)
[RD.6] BC-ASD-SP-00176_1_4 SIMBIO URD
[RD.7] BC-SIM-GAF-MA-002 10 001 – SIMBIO-SYS User Manual

1.3. Attached Document

[AT.1] Command_Stack_dNECP.xlsx
[AT.2] Event_dNECP.log

1.4. Acronyms

ACK	Acknowledgment
APID	Application Process IDentifier
CSV	Comma Separated Values
FPA	Focal Plane Assembly
HK	Housekeeping
HRIC	High spatial Resolution Imaging Channel
ME	Main Electronics
NECP	Near Earth Commissioning Phase
dNECP	delta Near Earth Commissioning Phase
PDS	Planetary Data System
PE	Proximity Electronics
PNG	Portable Network Graphics
PSC	Packet Sequence Control
SIMBIO-SYS	Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem
SSC	Source Sequence Count

STC	STereo imaging Channel
TC	Telecommand
TM	Telemetry
VIHI	VIsible and Hyper-spectral Imaging channel
XML	eXtensible Markup Language

1.5. Document Format and Repository

This document is compliant with the SIMBIO-SYS Report and Note Layout and Flow [RD.2]**Errore. L'origine riferimento non è stata trovata.** and will be archived both on the INAF Open Access repository and the SIMBIO-SYS team Archive.

1.6. The test plan

According to [RD.1] Table 1-1 reports the list of the performed tests during the dNECP together with:

- the start time, defined as the execution time of the first Telecommand (TC) of the test.
- the stop time, defined as the execution time of the first TC of the next test session minus 1 second or the the execution time of the instrument shutdown.

ID	Test description	Start Time	Stop Time	Test Duration
01	STC All FPA Test	2019-06-06T06:30:00.00Z	2019-06-06T06:59:59.00Z	29m 59s
02	STC Mitigate Reset Test	2019-06-06T07:00:00.00Z	2019-06-06T07:00:24.00Z	24s
03	STC Hot Pixel Test	2019-06-06T07:00:25.00Z	2019-06-06T07:19:25.00Z	19m
04	VIHI Calib Test	2019-06-06T07:19:26.00Z	2019-06-06T08:09:33.00Z	50m 07s
05	VIHI Deector Bias Test	2019-06-06T08:09:35.00Z	2019-06-06T08:43:00.00Z	33m 25s
06	Orbit test	2019-06-06T08:49:00.00Z	2019-06-06T10:20:00.00Z	1h 31m

Table 1-1: Tests Schedula

The entire duration of the dNECP session is 3h 43m 55s.

1.7. Report scheme

For each test we report the analisys of the results according to the structure shown in Table 1-2 and described in the following subsections.

Session Number	Session Name
1	Telecomands
2	Data Procedure
3	Events Check
4	PE Event
5	Lost packets
6	TCs Check
7	Discussion

Table 1-2 Section structure defined for each Test.

1.7.1. Telecommands (TCs)

In this Section the list of TCs used for the test are reported. For each of them, the software performs an analysis of the parameters and an estimation of the produced data. This information is derived by the TC Stack downloaded from the spacecraft.
All the TCs used for the tests and their parameters are described in [AT.1]

1.7.2. Data produced

This Section reports the produced data organized in two subsections:

1. the first one contains the number of valid packets and the data volume downloaded from the instrument;
2. the second one contains the information about the output files, which are:
    a. CSV files for the diagnostic housekeeping (HK);
    b. CSV files for the housekeeping parameters related to a single image;
    c. DAT files containing the image data in binary format.

    All the data are stored in PDS4 format, which means that they include an XML file containing all the acquisition parameters as generated by the instrument or the spacecraft. A complete description of the file structure and the folder tree structure is reported in [RD.3]. Each image has an extra file in PNG format as a quick preview.
    For each output group, the number of files and total data volume is reported.

1.7.3. Events check

In this section, the results of the event checks are reported, including:

- all the negative TC acknowledgments,
- the rejected TC (i.e, for which it is received a TM(1,2)),
- the failed TC (i.e, for which it is received a TM(1,8)).

For each rejected or failed TC event, it is reported a sheet with all the relative information (i.e., mnemonic name, description, time of execution, and all the parameters).

For each event, it is reported a list of low severity (TM(5,2)), medium severity (TM(5,3)), and high severity (TM(5,4)) telemetry errors with a description of the event.

The complete list of events and TC acknowledgments is reported into the Event file [AT.2]. All the information for the event and TC acknowledgments are described in [RD.4].

1.7.4. PE Events

From an automatic analysis of the diagnostic HK, a list of the negative event alerts, sent by the Proximity Electronics (PE) to the Main Eletronics (ME), is created. Each alert is reported with the decimal ID and with its complete description. The information for the PE events is described in [RD.4].

1.7.5. Lost packets

The automatic check on the lost packets is performed using the Packet Sequence Control (PSC) number (see [RD.4]). The PSC is a progressive number associated to the Telemetry packets and follows a different numeration for each different APID. A list of the used APID is reported in Table 1-3 .

APID	Description
801	TC Verification
804	HK Reports
807	Event Reports
828	HRIC Data High Priority
844	STC Data High Priority
860	VIHI Data High Priority
870	HRIC Data Low Priority
892	STC Data Low Priority
908	VIHI Data Low Priority

Table 1-3 List of the APIDs associated to each dataflow.

The PSC number is stored in 14 bits format. This means that the maximum value is 16383, after that the counter is reinitialized.
NB: A manual check in required in order to evaluate if some packets are lost at the begin and at the end of the acquisition. The automatic check detects only gaps in the PSC sequence.

1.7.6. Telecommand Check

This section reports the analysis relative to the acceptance and execution of the TC received by the ME/PE during the test.

1.7.7. Discussion

In this section we will discuss the results and any discrepancies and errors detected during the execution of the test.

2. dNECP Results Analisys

2.1.General Discussion

With reference to Table 1-1, we summarize the following quality table:

Satisfaction Table		
01	STC All FPA Test	8 TC Failed
02	STC Mitigate Reset Test	3 TC Ignored
03	STC Hot Pixel Test	
04	VIHI Calib Test	1 TC time out
05	VIHI Deector Bias Test	
06	Orbit test	3 VIHI Sessions missing

Table 2-1: Quality Table.

2.2.STC All FPA Test

2.2.1. Test Scope

The aim of the test is the monitoring of the Dark Current (DC), Dark Signal Non Uniformity (DSNU) and the ReadOut Noise (RON) with the acquisition of a large area of the detector (all_fpa test).

2.2.2. Test Execution

Time Frame: 2019-06-06T06:30:00.00Z ÷ 2019-06-06T06:59:59.00Z

In the Table 2-2 the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	ON	OFF

Table 2-2: Instrument status before the STC All FPA Test.

2.2.3. Science

Table 2-3 reports the number of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TCs commanded during test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	236	3 seconds	Limited	0.70	5	5
2	237	3 seconds	Limited	0.70	5	5
3	238	25 seconds	Limited	5.0	5	5
4	239	25 seconds	Limited	5.0	5	5
5	240	3 seconds	Limited	0.70	5	5
6	241	3 seconds	Limited	0.70	5	5
7	242	25 seconds	Limited	5.0	5	5
8	243	25 seconds	Limited	5.0	5	5
9	244	6 seconds	Limited	1.2	5	5
10	245	6 seconds	Limited	1.2	5	5

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
11	246	25 seconds	Limited	5.0	5	5
12	247	25 seconds	Limited	5.0	5	5
13	248	6 seconds	Limited	1.2	5	5
14	249	6 seconds	Limited	1.2	5	5
15	250	25 seconds	Limited	5.0	5	5
16	251	25 seconds	Limited	5.0	5	5
17	252	6 seconds	Limited	1.2	5	5
18	253	6 seconds	Limited	1.2	5	5
19	254	25 seconds	Limited	5.0	5	5
20	255	25 seconds	Limited	5.0	5	5
20	---	5 minutes	---	---	100	100

Table 2-3: TC used during the STC ALL FPA Test.

The data reported in Table 2-3 are in agreement with [RD.1]

2.2.4. Data Produced

2.2.4.1. Data Volume

	#Packets	DV
HK	111	4.1 kib
STC low priority	53880	220.7 Mib
STC high priority	0	0.00 Mib

Table 2-4: DV produced during the STC ALL FPA Test.

2.2.4.2. Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	39.1 kB

Bundle Raw STC			
File	CSV		
		#	60
		Size	55.2 kB
	DAT		
		#	60
		Size	251.7 MB

Table 2-5:Data produced during the STC ALL FPA Test.

2.2.5. ME Events

None.

2.2.6. PE Events

None.

2.2.7. Lost Packets

Telecommand Verification:	66	[lost packet(s): 0]
HK Report:	111	[lost packet(s): 0]
Event/Anomaly Report:	47	[lost packet(s): 0]
HRIC low Priority:	0	[lost packet(s): 0]
STC low Priority:	53880	[lost packet(s): 0]
VIHI low Priority:	0	[lost packet(s): 0]
HRIC high Priority:	0	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]
VIHI high Priority:	0	[lost packet(s): 0]

Table 2-6: Packets and lost packet report for the STC ALL FPA Test.

2.2.8. Telecommands check

Telecommand Status	#
Accepted	33
Executed	25
Refuted	0
Failed	8

Table 2-7: Packets and lost packet report for the STC ALL FPA Test.

2.2.8.1. Failed Telecommands

1. [2019-06-06T06:50:00.017] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 236]
2. [2019-06-06T06:50:30.017] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 237]
3. [2019-06-06T06:51:00.017] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 238]
4. [2019-06-06T06:51:30.017] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 239]
5. [2019-06-06T06:52:00.016] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 240]
6. [2019-06-06T06:52:30.016] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 241]
7. [2019-06-06T06:53:00.016] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 242]
8. [2019-06-06T06:53:30.016] - TM(1,8) - [APID 801] - Event N/A - Telecommand Execution Failure [Failure ID: 40000, APID: 812, Sequence n. 243]

2.2.9. Discussion

8 TC failed due to wrong parameters initialization values. The missing images are related to those TC.

The details are reported in Table 2-8 with information from section 2.2.3 and 2.2.4.

	Commanded	From TM
Images	100	60
Science Sessions	20	12

Table 2-8: Comparison between data commanded and produced during the STC ALL FPA Test.

2.3.STC Mitigate Reset Test

2.3.1. Test Scope

The aim of the test is to monitor offset behaviour (mitigate_reset test)

2.3.2. Test Execution

Time Frame: 2019-06-06T07:00:00.00Z ÷ 2019-06-06T07:00:24.00Z

In Table 2-9 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 2-9: Instrument status before the STC Mitigate Reset Test.

2.3.3. Science

Table 2-10 reports the number of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TC commanded during the test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	256	10 seconds	Limited	0.2	50	250
2	257	20 seconds	Limited	2.0	10	50
3	258	0 milliseconds	Limited	0.15	3	3
4	259	6 seconds	Limited	2.0	3	15
5	260	1 second	Continuous	0.15	6	6
6	261	20 seconds	Limited	2.0	10	50
7	262	0 milliseconds	Limited	0.15	1	1
8	263	20 seconds	Limited	2.0	10	50
9	264	1 second	Limited	0.9	2	2
10	265	20 seconds	Limited	2.0	10	50
11	266	1 second	Limited	0.95	2	2
12	267	20 seconds	Limited	2.0	10	50
13	268	1 second	Limited	0.98	2	2
14	269	20 seconds	Limited	2.0	10	50
15	270	1 second	Limited	0.99	2	2
16	271	20 seconds	Limited	2.0	10	50
17	272	1 second	Limited	0.495	3	3
18	273	20 seconds	Limited	2.0	10	50
19	274	1 second	Limited	1.2	1	1
20	275	20 seconds	Limited	2.0	10	50
21	276	16 seconds	Limited	4.0	4	20
22	277	1 second	Continuous	0.2	5	5
23	278	4 seconds	Limited	4.0	1	5
24	279	1 second	Continuous	0.2	5	5
25	280	4 seconds	Limited	4.0	1	5
26	281	1 second	Continuous	0.2	5	5
27	282	4 seconds	Limited	4.0	1	5
27	**---**	**3 minutes and 59 seconds**	**---**	**---**	**189**	**787**

Table 2-10: TC used during the STC Mitigate Reset Test.

The data reported in Table 2-10 are in agreement with [RD.1].

2.3.4. Data Produced

2.3.4.1. Data Volume

	#Packets	DV
HK	26	7.72 kb
STC low priority	4381	134.48 Mib
STC high priority	0	0.00 Mib

Table 2-11: DV produced during the STC Mitigate Reset Test.

2.3.4.2. Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	10.1 KB

Bundle Raw STC			
File	CSV		
		#	773
		Size	711.2 kB
	DAT		
		#	773
		Size	76.5 MB

Table 2-12: Data produced during the STC Mitigate Reset Test.

2.3.5. ME Events

None.

2.3.6. PE Events

None.

2.3.7. Lost Packets

Type of Packets	#	Note
Telecommand Verification	51	[Lost Packet(s) 0]
HK Report	26	[Lost Packet(s) 0]
Event/Anomaly Report	25	[Lost Packet(s) 0]
STC low Priority	4381	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]

Table 2-13: Packets and lost packet report for the STC Mitigate Reset Test.

2.3.8. Telecommands check

Telecommand Status	#
Accepted	27
Executed	24
Refuted	0
Failed	0

Table 2-14: Packets and lost packet report for the STC Mitigate Reset Test.

2.3.9. Discussion

The produced output is not in line with what is expected. The TCs with SSC 277, 279, and 281 were ignored. No reject ACK was produced. The missing images are due to the ignored TCs.
The details are reported Table 2-15 in with information from section 2.3.3 and 2.3.4.

	Commanded	From TM
Images	788	773
Science Sessions	27	24

Table 2-15: Comparison between data commanded and produced during the STC Mitigate Reset Test.

2.4.STC Hot Pixel Test

2.4.1. Test Scope

The aim of the test is to monitor the spurious charge and popcorn effect on the hot pixel distribution.

2.4.2. Test Execution

Time Frame: 2019-06-06T07:00:25.00Z ÷ 2019-06-06T07:19:25.00Z

In the table below the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 2-16: Instrument status before the STC Hot Pixel Test.

2.4.3. Science

Table 2-17 reports the number of of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TCs commanded during test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	283	10 seconds	Limited	1.0	10	10
2	284	10 seconds	Limited	1.0	10	10
3	285	10 seconds	Limited	1.0	10	10
4	286	10 seconds	Limited	1.0	10	10
5	287	10 seconds	Limited	1.0	10	10
6	288	10 seconds	Limited	1.0	10	10
7	289	10 seconds	Limited	1.0	10	10
8	290	10 seconds	Limited	1.0	10	10
9	291	10 seconds	Limited	1.0	10	10
10	292	10 seconds	Limited	1.0	10	10
11	293	10 seconds	Limited	1.0	10	10
12	294	10 seconds	Limited	1.0	10	10
13	295	10 seconds	Limited	1.0	10	10
14	296	10 seconds	Limited	1.0	10	10
15	297	10 seconds	Limited	1.0	10	10
16	298	10 seconds	Limited	1.0	10	10
17	299	10 seconds	Limited	1.0	10	10
18	300	10 seconds	Limited	1.0	10	10
19	301	2 minutes	Limited	12.0	10	60
20	302	2 minutes	Limited	12.0	10	60
21	303	2 minutes	Limited	12.0	10	60
21	---	9 minutes	---	---	210	360

Table 2-17: TC used during the STC Hot Pixel Test.

The data reported in Table 2-17 are in line with [RD.1].

2.4.4. Data Produced

2.4.4.1. Data Volume

	#Packets	DV
HK	49	14.36 kb
STC low priority	98230	3.00 Gib
STC high priority	0	0.00 Mib

Table 2-18: DV produced during the STC Hot Pixel Test.

2.4.4.2. Output Files

Bundle Miscellaneous			
File	**CSV**		
		#	2
		Size	18.1 KB

Bundle Raw STC			
File	**CSV**		
		#	360
		Size	331.2 KB
	DAT		
		#	360
		Size	459.1 MB

Table 2-19: Data produced during the STC Hot Pixel Test.

2.4.5. ME Events

None.

2.4.6. PE Events

None.

2.4.7. Lost Packets

Type of Packets	#	Note
Telecommand Verification	42	[Lost Packet(s) 0]
HK Report	49	[Lost Packet(s) 0]
Event/Anomaly Report	36	[Lost Packet(s) 0]
HRIC low Priority	0	[Lost Packet(s) 0]
STC low Priority	98230	[Lost Packet(s) 1]
	[2019-06-06T07:07:50.628159Z] [Position : 31606] packet number(s): 895	
	[2019-06-06T07:07:50.628190Z] [Position : 31607] packet number(s): -896	
	[2019-06-06T07:07:51.628937Z] [Position : 32502] packet number(s): 1	
VIHI low Priority	0	[Lost Packet(s) 0]
HRIC high Priority	0	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]
VIHI high Priority	0	[Lost Packet(s) 0]

Table 2-20: Packets and lost packet report for the STC Hot Pixel Test.

The first two missing packets error suggest a misplaced packet. The wrong position of a packet is currently under investigation.

2.4.8. Telecommands check

Telecommand Status	#
Accepted	21
Executed	21
Refuted	0
Failed	0

Table 2-21: Comparison between data commanded and produced during the STC Hot Pixel Test.

2.4.9. Discussion

The analysis shows the presence of a badly positioned packet. The packet is in the right position when sorting according to the time index, but in a wrong position when sorting to the SSC index. The issue is under investigation.
The details are reported in Table 2-22 with information from Section 2.4.3 and 2.4.4.

	Commanded	From TM
Images	360	360
Science Sessions	21	21

Table 2-22: Comparison between data commanded and produced during the STC Hot Pixel Test.

2.5.VIHI Calib Test

2.5.1. Test Scope

The aim of this test is to verify the performance of the internal calibration by changing some parameters controlling the Focal Plane Assembly (FPA).
In particular, the FPA parameters VDet_Com and VDet_Adj have been programmed onboard with non-nominal values; the correct values are listed in [RD.7], chapter 8.3.1.10.
During the test an Internal Calibration sequence was executed two times: the first by commanding onboard non-nominal parameters; the second with the the nominal values.

2.5.2. Test Execution

Time Frame: 2019-06-06T07:19:26.00Z ÷ 2019-06-06T08:09:33.00Z

In the table the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	ON

Table 2-23: Instrument status before the VIHI Calib Test.

2.5.3. Science

Table 2-24 reports the number of of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TCs commanded during test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	321	15 seconds	Continuous	1.020	15	15
2	322	14.28 seconds	Continuous	1.020	15	15
3	323	13.98 seconds	Continuous	1.015	15	15
4	324	14.22 seconds	Continuous	1.020	15	15
5	327	1 minute and 59.04 seconds	Continuous	2.010	60	60
6	329	1 minute and 59.56 seconds	Continuous	2.025	60	60
7	331	1 minute and 59.92 seconds	Continuous	2.010	61	61
8	333	1 minute and 58.67 seconds	Continuous	2.015	60	60
9	336	1 minute and 58.21 seconds	Continuous	2.025	59	59
10	338	1 minute and 59.25 seconds	Continuous	2.010	60	60
11	340	1 minute and 59.34 seconds	Continuous	2.010	60	60
12	342	1 minute and 59.26 seconds	Continuous	2.010	60	60
13	344	1 minute and 59.34 seconds	Continuous	2.010	60	60
14	348	1 minute and 59.26 seconds	Continuous	2.010	60	60
15	350	1 minute and 59.34 seconds	Continuous	2.015	60	60
16	352	1 minute and 59.56 seconds	Continuous	2.015	60	60
17	354	1 minute and 59.34 seconds	Continuous	2.015	60	60
17	**---**	**27 minutes and 12 seconds**	**---**	**---**	**840**	**840**

Table 2-24: TC used during the VIHI Calib Test.

The data reported in Table 2-24 are in line with [RD.1].

2.5.4. Data Produced

2.5.4.1. Data Volume

	#Packets	DV
HK	2120	1.01 Mib
VIHI low priority	26760	812.46 Mib
VIHI high priority	0	0.00 Mib

Table 2-25: DV produced during the VIHI Calib Test.

2.5.4.2. Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	1.5 MB

Bundle Raw VIHI			
File	CSV		
		#	840
		Size	1.2 MB
	DAT		
		#	840
		Size	107.4 MB

Table 2-26: Data produced during the VIHI Calib Test.

2.5.5. ME Events

None.

2.5.6. PE Events

VIHI PE Negative events: 1

- [2019-06-06T08:08:56.021019Z] TC time-out (32)

2.5.7. Lost Packets

Type of Packets	#	Note
Telecommand Verification	124	[Lost Packet(s) 0]
HK Report	2120	[Lost Packet(s) 0]
Event/Anomaly Report	29	[Lost Packet(s) 0]
VIHI low Priority	26760	[Lost Packet(s) 0]
VIHI high Priority	0	[Lost Packet(s) 0]

Table 2-27: Packets and lost packet report for the VIHI Calib Test.

2.5.8. Telecommands check

Accepted	62
Executed	62

Table 2-28: Comparison between data commanded and produced during the VIHI Calib Test.

2.5.9. Discussion

The details are reported in Table 2-29 with information from section 2.5.3 and 2.5.4.

	Commanded	From TM
Images	840	840
Science Sessions	17	17

Table 2-29: Comparison between data commanded and produced during the VIHI Calib Test.

Although the number of sessions and images are correct, there is a TC timeout message by the PE in the HK

2.6.VIHI Detector Bias Test

2.6.1. Test Scope

The scope of this test is to detect the presence of detector bias.

2.6.2. Test Execution

Time Frame: 2019-06-06T08:09:35.00Z ÷ 2019-06-06T08:43:00.00Z

In the table below the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	ON

Table 2-30: Instrument status before the VIHI Detector Bias Test.

2.6.3. Science

Table 2-31 reports the number of of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TCs commanded during test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	366	15 seconds	Continuous	1.020	15	15
2	367	14.28 seconds	Continuous	1.020	15	15
3	368	13.98 seconds	Continuous	1.015	15	15
4	369	14.22 seconds	Continuous	1.020	15	15
5	372	1 minute and 59.04 seconds	Continuous	2.010	60	60
6	374	1 minute and 59.56 seconds	Continuous	2.025	60	60
7	376	1 minute and 59.92 seconds	Continuous	2.010	61	61
8	378	1 minute and 58.67 seconds	Continuous	2.015	60	60
9	381	1 minute and 58.21 seconds	Continuous	2.025	59	59
10	383	1 minute and 59.25 seconds	Continuous	2.010	60	60
11	385	1 minute and 59.34 seconds	Continuous	2.010	60	60
12	387	1 minute and 59.26 seconds	Continuous	2.010	60	60
13	389	1 minute and 59.34 seconds	Continuous	2.010	60	60
14	393	1 minute and 59.26 seconds	Continuous	2.010	60	60
15	395	1 minute and 59.34 seconds	Continuous	2.015	60	60
16	397	1 minute and 59.56 seconds	Continuous	2.015	60	60
17	399	1 minute and 59.34 seconds	Continuous	2.015	60	60
17	**---**	**27 minutes and 12 seconds**	**---**	**---**	**840**	**840**

Table 2-31: TC used during the VIHI Detector Bias Test.

The data reported in Table 2-31 are in line with [RD.1].

2.6.4. Data Produced

2.6.4.1. Data Volume

	#Packets	DV
HK	2037	0.997 Mib
VIHI low priority	26760	812.46 Mib
VIHI high priority	0	0.00 Mib

Table 2-32: DV produced during the VIHI Detector Bias Test.

2.6.4.2. Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	1.4 MB

Bundle Raw VIHI			
File	CSV		
		#	840
		Size	1.2 MB
	DAT		
		#	840
		Size	107.4 MB

Table 2-33: Data produced during the VIHI Detector Bias Test.

2.6.5. ME Events

None.

2.6.6. PE Events

None.

2.6.7. Lost Packets

Type of Packets	#	Note
Telecommand Verification	124	[Lost Packet(s) 0]
HK Report	2120	[Lost Packet(s) 0]
Event/Anomaly Report	29	[Lost Packet(s) 0]
HRIC low Priority	0	[Lost Packet(s) 0]
STC low Priority	0	[Lost Packet(s) 0]
VIHI low Priority	26760	[Lost Packet(s) 0]
HRIC high Priority	0	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]
VIHI high Priority	0	[Lost Packet(s) 0]

Table 2-34: Packets and lost packet report for the VIHI Detector Bias Test.

2.6.8. Telecommands check

Telecommand Status	#
Accepted	62
Executed	62
Refuted	0
Failed	0

Table 2-35: Comparison between data commanded and produced during the VIHI Detector Bias Test.

2.6.9. Discussion

The produced output is in line with what expected.
The details are reported in Table 2-36 with information from section 2.6.3 and 2.6.4.

	Commanded	From TM
Images	824	840
Science Sessions	17	17

Table 2-36: Comparison between data commanded and produced during the VIHI Detector Bias Test.

2.7.Orbit Test

2.7.1. Test Scope

The aim of this test is the repetition of the test performed during the NECP and obtain the complete dataset.

2.7.2. Test Execution

Time Frame: 2019-06-06T08:49:00.00Z ÷ 2019-06-06T10:20:00.00Z

In the table below the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	ON	ON	ON

Table 2-37: Instrument status before the Orbit Test.

2.7.3. Science

Table 2-38, Table 2-39, and Table 2-40 report, for each channel, the number of the performed science sessions with an indication of their duration, and the number of images and frames expected for each TCs commanded during test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	421	4 minutes	Limited	2.0	120	120
2	427	2 minutes	Limited	1.5	80	80
3	436	2 seconds	Limited	2.5	1	1
3	**---**	**6 minutes and 2 seconds**	**---**	**---**	**201**	**201**

Table 2-38: TC used during the Orbit Test by HRIC.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	416	9 minutes	Continuous	12.300	45	132
2	419	4 minutes and 48.93 seconds	Continuous	11.575	26	78
3	422	2 minutes and 48.89 seconds	Continuous	10.320	18	54
4	423	4 minutes and 56.18 seconds	Continuous	8.700	35	102
5	425	12 minutes and 59.65 seconds	Continuous	7.665	103	306
6	428	3 minutes and 54.48 seconds	Continuous	7.970	30	90
7	429	2 minutes and 56.65 seconds	Continuous	8.695	21	63
8	431	3 minutes and 57.22 seconds	Continuous	9.635	25	75
9	432	2 minutes and 54.03 seconds	Continuous	11.24	16	48
9	**---**	**49 minutes and 35 seconds**	**---**	**---**	**319**	**948**

Table 2-39: TC used during the Orbit Test by STC.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	417	4 minutes	Continuous	0.13	1847	1847
2	418	7 minutes and 59.98 seconds	Continuous	0.1	4800	2400[1]
3	420	4 minutes and 59.92 seconds	Continuous	0.08	3748	1874[1]
4	424	7 minutes	Continuous	0.06	7000	1750[2]
5	426	15 minutes	Continuous	0.04	22496	5624[2]
6	430	11 minutes	Continuous	0.05	13200	6600[2]
7	434	3 minutes	Continuous	0.07	2571	2571
8	435	5 minutes and 59.97 seconds	Continuous	0.08	4500	4500
8	---	59 minutes	---	---	60162	27166

Table 2-40: TC used during the Orbit Test by VIHI.

The data reported in Table 2-38 and Table 2-40 are in line with [RD.1]. The data reported in Table 2-39 show some discrepancies.

2.7.4. Data Produced

2.7.4.1. Data Volume

	#Packets	DV
HK	1035	423.13 kib
HRIC low priority	16584	513.95 Mib
STC low priority	7006	216.39 Mib
VIHI low priority	18248	295.89 Mib
HRIC high priority	0	0.00
STC high priority	0	0.00
VIHI high priority	0	0.00

Table 2-41: DV produced during the Orbit Test.

2.7.4.2. Output Files

Bundle Miscellaneous			
File	CSV		
		#	4
		Size	566.4 kB

Bundle Raw HRIC			
File	CSV		
		#	201
		Size	182.5 kB
	DAT		
		#	201
		Size	527.1 MB

Bundle Raw STC			
File	CSV		
		#	948
		Size	872.2 kB
	DAT		

[1] The acquisition is performed with a frame binning equal to 1, binning on 2 frames.
[2] The acquisition is performed with a frame binning equal to 2, binning on 4 frames.

		#	948
		Size	225.3 MB

Bundle Raw VIHI			
File	CSV		
		#	18248
		Size	26.2 MB
	DAT		
		#	18248
		Size	325.2 MB

Table 2-42: Data produced during the Orbit Test.

2.7.5. ME Events

None.

2.7.6. PE Events

None.

2.7.7. Lost Packets

Type of Packets	#	Note
Telecommand Verification	70	[Lost Packet(s) 0]
HK Report	1035	[Lost Packet(s) 0]
Event/Anomaly Report	15	[Lost Packet(s) 0]
HRIC low Priority	16584	[Lost Packet(s) 0]
STC low Priority	7006	[Lost Packet(s) 0]
VIHI low Priority	18248	[Lost Packet(s) 0]
HRIC high Priority	0	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]
VIHI high Priority	0	[Lost Packet(s) 0]

Table 2-43: Packets and lost packet report for the Orbit Test.

2.7.8. Telecommands check

Telecommand Status	#
Accepted	35
Executed	35
Refuted	0
Failed	0

Table 2-44: Comparison between data commanded and produced during the Orbit Test.

2.7.9. Discussion

For three TCs the ME returns Executed ACKs but the PE does not perform the corresponding commanded acquisitions.
In Table 2-45 are reported the science sessions commanded and acquired:

Session #	SSD	Execution Time	First image time
1	417	2019-06-06T09:09:28.000000Z	MISSING
2	418	2019-06-06T09:13:28.000000Z	2019-06-06T09:13:26.963064
3	420	2019-06-06T09:21:28.000000Z	2019-06-06T09:21:26.963644
4	424	2019-06-06T09:26:28.000000Z	2019-06-06T09:26:26.924078
5	426	2019-06-06T09:33:28.000000Z	2019-06-06T09:33:26.884710
6	430	2019-06-06T09:48:28.000000Z	2019-06-06T09:48:26.656545
7	434	2019-06-06T09:59:28.000000Z	MISSING
8	435	2019-06-06T10:02:28.000000Z	MISSING

Table 2-45: Details of the VIHI Science Session

The details of all the acquisition are reported in Table 2-46 with information from section 2.7.3 and 2.7.4.

HRIC	Commanded	From TM
Images	201	201
Science Sessions	3	3
STC	Commanded	From TM
Images	948	948
Science Sessions	9	9
VIHI	Commanded	From TM
Images	60166	18248
Science Sessions	8	5

Table 2-46: Comparison between data commanded and produced during the Orbit Test.

3. Summary

ID	Test description	Test Last	Science Sessions	Data from TLM							# Images			Failure								
														HRIC			STC			VIHI		
				HK	HRIC LP	STC LP	VIHI LP	HRIC HP	STC HP	VIHI HP	HRIC	STC	VIHI	TC	ME	PE	TC	ME	PE	TC	ME	PE
01	STC All FPA Test	5 minutes	20	4.1 kib	0	270.7 Mib	0	0	0	0	0	60	0	0	0	0	8	0	0	0	0	0
02	STC Mitigate Reset Test	3 minutes and 59 seconds	27	7.72 kib	0	134.48 Mib	0	0	0	0	0	773	0	0	0	0	3[3]	0	0	0	0	0
03	STC Hot Pixel Test	9 minutes	21	14.36 kib	0	3.00 Gib	0	0	0	0	0	360	0	0	0	0	0	0	0	0	0	0
04	VIHI Calib Test	27 minutes and 12 seconds	17	1.01 Mib	0	0	812.46 Mib	0	0	0	0	0	840	0	0	0	0	0	0	0	0	1
05	VIHI Deector Bias Test	27 minutes and 12 seconds	17	0.997 Mib	0	0	812.46 Mib	0	0	0	0	0	840	0	0	0	0	0	0	0	0	0
06	Orbit test	1 hour and 31 minutes	20	423.13kib	513.95 Mib	216.39 Mib	295.89 Mib	0	0	0	201	948	18248	0	0	0	0	0	0	3[3]	0	0
		3h 43m 55s	**122**	**2.46 Mib**	**538.92Mib**	**3.60 Gib**	**1.86 Gib**	**0**	**0**	**0**	**201**	**2141**	**19928**	**0**	**0**	**0**	**11**	**0**	**0**	**3**	**0**	**1**

Table 3-1: dNECP Summary of all the tests

	Data Volume
HRIC	538.92 Mib
STC	3.60 Gib
VIHI	1.86 Gib
	5.99 Gib

Table 3-2: Data volume produced in the dNECP

[3] No failure ACKs were produced.