BC-SIM-TR-024
EGSE Report ICO#3

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Change Log

Issue	Revision	Date	Affected Pages	Change description

1 Introduction

1.1 Scope

In this document we will describe all the tests performed during the third Instrument Checkout (ICO#03) for the Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem (SIMBIO-SYS). The checkout session was performed between June 24th and 25th 2020. For each test it will be presented the pipeline report and, where necessary, a discussion on the detected anomalies.

1.2 Reference Document

[RD.1] BC-SIM-PL-005-Checkout_03_Test_Summary (DOI https://doi.org/10.20371/INAF/TechRep/172);
[RD.2] BC-SIM-TN-003_-_Reports_and_Note_Layout_and_Flow – Version 2 (DOI https://doi.org/10.20371/INAF/TechRep/179);
[RD.3] BC-SIM-GAF-IC-002_rev12 – SIMBIO-SYS Software Interface Control Document;
[RD.4] BepiColombo FOP data package 3.1;
[RD.5] BC-ASD-SP-00176_1_4 SIMBIO URD;
[RD.6] BC-SIM-GAF-MA-002 10 001 – SIMBIO-SYS User Manual;
[RD.7] BC-SIM-TN-006_-_simClean_User_Manual (DOI https://doi.org/10.20371/INAF/TechRep/103);
[RD.8] BC-SIM-TR-023_-_Anomalies_in_the_Packet_sorting (DOI https://doi.org/10.20371/INAF/TechRep/176);
[RD.9] BC-SIM-TN-007_-_simResort_-_User_Manual (DOI https://doi.org/10.20371/INAF/TechRep/184);

1.3 Attached Document

[AT.1] ICO03_Events_list
[AT.2] ICO3_Command_Stack

1.4 Acronyms

APID	Application Process IDentifier
CSV	Comma Separated Values
FOP	Flight Operation Plan.
FPA	Focal Plane Assembly
HK	Housekeeping
HRIC	High spatial Resolution Imaging Channel
ICO	Instrument Checkout
ME	Main Electronics
NECP	Near Earth Commissioning Phase
PDS	Planetary Data System
PDOR	Payload Direct Operation Request
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] and will be archived both on the INAF Open Access repository and the SIMBIO-SYS team Archive.

1.6 Test Plan

The ICO#3 test was planned to be executed on two days based on the tests described in **Errore. L'origine riferimento non è stata trovata.**.

ID	Test Description	Start Time	Stop Time
01	HRIC Functional Test	2020-06-24T18:30:00.000000Z	2020-06-24T19:07:05.000000Z
02	HRIC Performance Test	2020-06-24T19:07:00.000000Z	2020-06-24T19:25:00.000000Z
03	STC Functional Test	2020-06-24T19:26:30.000000Z	2020-06-24T20:00:00.000000Z
04	STC Performance Test	2020-06-24T20:06:30.000000Z	2020-06-24T21:55:00.000000Z
05	VIHI Performance Test	2020-06-24T21:56:30.000000Z	2020-06-24T23:25:00.000000Z
06	STC-HRIC Interference Test	2020-06-24T23:26:30.000000Z	2020-06-25T00:16:37.000000Z

Table 1: Tests schedule.

1.7 Report Schema

For each test, the report will be formed by four sections created by an automatic procedure:

- a summary of all the data produced in that test;
- a report with the events and telecommand acknowledgments;
- a report of the PE events;
- a check on the lost packets.

The report includes even two sections with a comparison between the commanded TCs and the data results. Eventual problems or discrepancies will be discussed.

The complete Sections list defined for each test is shown in **Errore. L'origine riferimento non è stata trovata.** and described in the subsections below.

Session #	Session Name
1	Telecommands
2	Data Procedure
3	Events Check
4	PE Event
5	Lost packets
6	Telecommand Check
7	Discussion

Table 2 Section structure defined for each Test.

1.7.1 Telecommands

In this Section, the telecommands used for the test will be reported. For each telecommand an analysis and an evaluation of the produced data will be performed.

1.7.2 Data Produced

In this Section, a table with the data produced will be reported. The output files consist into two different types of CSVs (one for the diagnostic housekeeping and one with all the housekeeping parameters related to a single image) and a file containing the image in binary format. All data are compliant to the PDS4 format, which means that they include an XML file with all the parameters of each acquisition, both considering as source the instrument or the spacecraft. A complete description of the file structure and the folder tree is reported in **Errore. L'origine riferimento non è stata trovata.**. For each image it is present an additional file in PNG format as a quick preview.
In the summary schema it will be reported the number and the total size of the following file types:

- Diagnostic HKs
- Acquisition HKs;
- Images

1.7.3 Event Checks

In the event checks section it will be reported:

- all the negative telecommand acknowledgments,
- the rejected telecommands, TM(1,2),
- the failed telecommands, TM(1,8).

For each negative event (rejected or failed telecommand), all the information about the telecommand, mnemonic name, description, time of execution, and all associated parameters are reported. For each event it is reported a list for the low severity (TM(5,2)), medium severity (TM(5,3)) and high severity (TM(5,4)) errors with a description of the event.
The complete list of event and telecommand acknowledgments is reported into the Event file stored in each test folder. All the information relative to an event or a telecommand acknowledgments are from [RD.3].

1.7.4 PE Events

From an automatic analysis of the diagnostic HK, a list of the negative event alerts, sent by the PE, is created. Each alert is reported with the associated decimal ID and with its complete description. All the information relative to a PE events refers to [RD.3].

1.7.5 Lost Packets

The automatic check on the lost packets is performed using the Packet Sequence Control (PSC) number (see [RD.3]). The PSC is a serial number associated with the TM packets and follows a different enumeration for different APID. A list of the used APID is reported in the following table:

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 3 List of the APIDs associated to each dataflow.

The PSC number is stored in 14 bits. This means that the maximum value is 16383. After that, the counter restart from 0.
NB: A manual check-in is required in order to evaluate if some packets are lost at the beginning and the end of the acquisition. The automatic check detects only holes in the PSC sequence.

1.7.6 Telecommand Check

In this Section it is checked that the ME and the PE have executed all received telecommand.

1.7.7 Test Results

In this Section we will discuss the results, the discrepancies, and the errors if they are present.

2 Preprocessing

The TM file downloaded from the EDDS server has been preprocessed using the simClean tools [RD.7] to remove the duplicate HK and the duplicated science packets due to the reception of the same one by different antennas. In a preliminary analysis of the data was found the issue described in [RD.8], and the data was reprocessed using the module simResort described in [RD.9].

3 ICO#3 Results Analysis

3.1 General consideration

With reference to Table 1, we report the following satisfaction table:

ID	Test Name	Test result
01	HRIC Functional Test	
02	HRIC Performance Test	
03	STC Functional Test	
04	STC Performance Test	
05	VIHI Performance Test	
06	STC-HRIC Interference Test	

Table 4: Satisfaction table.

for which we use the following color keys in the last column :

Red: test failed;
Yellow: test partially passed;
Green: Test passed;

3.2 HRIC Functional Test

3.2.1 Test Scope

The aim of this test is:

- to check the status and the functionality of the following electric components of the channel:
  - PE;
  - Detector;
  - TEC;
- to modify some configuration parameters;
- to perform some science acquisitions.

3.2.2 Test Execution

Time Frame: 2020-06-24T18:30:00.000Z ÷ 2020-06-24T19:07:00.000Z
In Table 5 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 5: Instrument status before the HRIC Functional Test.

3.2.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	21	06m 05s	Science	continuous	1	360	360
2	23	06m 05s	Science	continuous	1	360	360
3	25	10s	Science	limited	1	10	10
3		12m 20s	-	-	-	730	730

Table 6: Description of the TC used during HRIC Functional Test.

Table 6 describes the duration and the number of images and frames expected for each TCs commanded during the Functional Test.

3.2.4 Data Produced

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	0.8 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	730
		size:	2.9 MB
	DAT:		
		#:	730
		size:	1.8 GB
Science	Sections	#	3

Table 7: Data produced during the HRIC Functional Test

3.2.5 ME Events

None

3.2.6 PE Events

None.

3.2.7 Lost Packets

Telecommand Verification:	52	[lost packet(s): 0]
HK Report:	1880	[lost packet(s): 0]
Event/Anomaly Report:	9	[lost packet(s): 0]
HRIC low Priority:	15330	[lost packet(s): 0]
HRIC high Priority:	0	[lost packet(s): 0]

Table 8: Packets and lost packet report.

3.2.8 TC check

Accepted	26
Executed	26

Table 9: TC accepted and executed

3.2.9 Discussion

Produced output is in line with what expected.
The details are reported in Table 10 with information from section 3.2.3 and 3.2.4.

	Commanded	From TM
Images	730	730
Science Sessions	3	3

Table 10: Comparison between data commanded and produced.

3.3 HRIC Performance Test

3.3.1 Test Scope

The aim of this test is to perform several acquisitions in dark condition and variable integration times to monitor the DC evolution during the cruise phase.

3.3.2 Test Execution

Time frame: 2020-06-24T19:07:00.000Z ÷ 2020-06-24T19:25:00.000Z.
In Table 11 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	ON	OFF	OFF

Table 11: Instrument status before the HRIC Performance Test.

3.3.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	27	10s	Science	limited	1	10	10
2	28	10s	Science	limited	1	10	10
3	29	10s	Science	limited	1	10	10
4	30	10s	Science	limited	1	10	10
5	31	10s	Science	limited	1	10	10
6	32	10s	Science	limited	1	10	10
7	33	10s	Science	limited	1	10	10
8	34	10s	Science	limited	1	10	10
9	35	10s	Science	limited	1	10	10
10	36	10s	Science	limited	1	10	10
11	37	10s	Science	limited	1	10	10
12	38	10s	Science	limited	1	10	10
13	39	10s	Science	limited	1	10	10
14	40	10s	Science	limited	1	10	10
15	41	10s	Science	limited	1	10	10
16	42	10s	Science	limited	1	10	10
17	43	10s	Science	limited	1	10	10
18	44	10s	Science	limited	1	10	30
19	45	10s	Science	limited	1	10	30
20	46	10s	Science	limited	1	10	30
21	47	10s	Science	limited	1	10	30
22	48	10s	Science	limited	1	10	30
23	49	10s	Science	limited	1	10	30
24	50	10s	Science	limited	1	10	30
25	51	10s	Science	limited	1	10	30
26	52	10s	Science	limited	1	10	30
27	53	10s	Science	limited	1	10	30
28	54	10s	Science	limited	1	10	30
29	55	10s	Science	limited	1	10	30
30	56	10s	Science	limited	1	10	30
31	57	10s	Science	limited	1	10	30
32	58	10s	Science	limited	1	10	30
33	59	10s	Science	limited	1	10	30

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
34	60	10s	Science	limited	1	10	30
34	-	5m 40s	-	-	-	340	680

Table 12: Description of the TC used during HRIC Performance Test.

Errore. L'origine riferimento non è stata trovata. describes the duration and the number of images and frames expected for each TCs commanded during the Functional Test.

3.3.4 Data Produced

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	28 KB

Bundle	RAW	HRIC	
File	CSV:		
		#:	680
		size:	2.9 MB
	DAT:		
		#:	680
		size:	617 MB
Science	Sections	#	34

Table 13: Data produced in the HRIC Performance Test.

3.3.5 ME Events

None.

3.3.6 PE Events

None.

3.3.7 Lost Packets

Telecommand Verification:	70	[lost packet(s): 0]
HK Report:	66	[lost packet(s): 0]
Event/Anomaly Report:	5	[lost packet(s): 0]
HRIC low Priority:	138380	[lost packet(s): 0]
HRIC high Priority:	0	[lost packet(s): 0]

Table 14:Packets and lost packet report for the HRIC Performance Test.

3.3.8 TC check

Accepted	35
Executed	35

Table 15: TC accepted and executed.

3.3.9 Discussion

Produced output is in line with what expected.
The details are reported in Table 16 with information from section 3.3.3 and 3.3.4.

	Commanded	From TM
Images	730	730
Science Sessions	3	3

Table 16:Comparison between data commanded and produced.

3.4 STC Functional Test

3.4.1 Test Scope

The aim of this test is:

- to check the status and the functionality of the following electric components of the channel:
  - PE,
  - Detector and
  - TEC;
- to modify some configuration parameters;
- to perform some science acquisitions.

3.4.2 Test Execution

Time Frame: 2020-06-24T19:26:30.000Z ÷2020-06-24T20:00:00.000Z
In Table 17 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	OFF

Table 17: Status of the instrument before the STC functional Test.

3.4.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	82	20s	Science	continuous	2	10	30
2	83	2m 15.3s	Science	continuous	12.3	11	33
3	84	4.8s	Science	continuous	0.4	12	60
4	85	23.9s	Science	continuous	2.05	12	60
4		3m 04s	-	-	-	730	730

Table 18: Description of the TC used during STC Functional Test.

Table 18 describes the duration and the number of images and frames expected for each TCs commanded during the Functional Test.

3.4.4 Data Produced

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	596 KB

Bundle	RAW	STC	
File	CSV:		
		#:	183
		size:	732 KB
	DAT:		
		#:	183

		size:	39 MB
Science	Sections	#	4

Table 19:Data produced in the STC Functional Test.

3.4.5 ME Events

None.

3.4.6 PE Events

None.

3.4.7 Lost Packets

Telecommand Verification:	54	[lost packet(s): 0]
HK Report:	1387	[lost packet(s): 0]
Event/Anomaly Report:	3	[lost packet(s): 0]
STC low Priority:	1600	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]

Table 20: Packets and lost packet report for the STC Functional Test.

3.4.8 TC check

Accepted	27
Executed	27

Table 21: TCs accepted and executed.

3.4.9 Discussion

Produced output is in line with what expected.
The details are reported in Table 22 with information from section 3.4.3 and 3.4.4.

	Commanded	From TM
Images	183	183
Science Sessions	4	4

Table 22:Comparison between data commanded and produced.

3.5 STC Performance Test

3.5.1 Test Scope

The aim of this test is to acquire the Dark Current to study its evolution during cruise phase.

3.5.2 Test Execution

Time Frame: 2020-06-24T20:06:30.000Z ÷ 2020-06-24T21:55:00.000Z
In Table 23 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 23: Status of the instrument before the STC Performance Test.

3.5.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	88	2m 20s	Science	limited	14	10	30
2	89	2m 20s	Science	limited	14	10	30
3	90	2m 20s	Science	limited	14	10	30
4	91	2m 20s	Science	limited	14	10	30
5	92	2m 20s	Science	limited	14	10	30
6	93	2m 20s	Science	limited	14	10	30
7	94	2m 20s	Science	limited	14	10	30
8	95	2m 20s	Science	limited	14	10	30
9	96	2m 20s	Science	limited	14	10	30
10	97	2m 20s	Science	limited	14	10	30
11	98	2m 20s	Science	limited	14	10	30
12	99	2m 20s	Science	limited	14	10	30
13	100	2m 20s	Science	limited	14	10	30
14	101	2m 20s	Science	limited	14	10	30
15	102	2m 20s	Science	limited	14	10	30
16	103	2m 20s	Science	limited	14	10	30
17	104	2m 20s	Science	limited	14	10	30
18	105	2m 20s	Science	limited	14	10	30
19	106	2m 20s	Science	limited	14	10	30
20	107	2m 20s	Science	limited	14	10	30
21	108	2m 20s	Science	limited	14	10	30
22	109	35s	Science	limited	7	5	15
23	110	35s	Science	limited	7	5	15
24	111	35s	Science	limited	7	5	15
25	112	35s	Science	limited	7	5	15
26	113	35s	Science	limited	7	5	15
27	114	35s	Science	limited	7	5	15
28	115	35s	Science	limited	7	5	15
29	116	35s	Science	limited	7	5	15
30	117	35s	Science	limited	7	5	15
31	118	35s	Science	limited	7	5	15
32	119	35s	Science	limited	7	5	15
33	120	35s	Science	limited	7	5	15

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
34	121	35s	Science	limited	7	5	15
35	122	35s	Science	limited	7	5	15
36	123	35s	Science	limited	7	5	15
37	124	35s	Science	limited	7	5	15
38	125	35s	Science	limited	7	5	15
39	126	35s	Science	limited	7	5	15
40	127	35s	Science	limited	7	5	15
41	128	35s	Science	limited	7	5	15
42	129	49.5s	Science	limited	9.9	5	15
43	130	8s	Science	limited	0.8	10	50
44	131	8s	Science	limited	0.8	10	50
45	132	8s	Science	limited	0.8	10	50
46	133	8s	Science	limited	0.8	10	50
47	134	8s	Science	limited	0.8	10	50
48	135	8s	Science	limited	0.8	10	50
49	136	8s	Science	limited	0.8	10	50
50	137	8s	Science	limited	0.8	10	50
51	138	8s	Science	limited	0.8	10	50
52	139	8s	Science	limited	0.8	10	50
53	140	8s	Science	limited	0.8	10	50
54	141	8s	Science	limited	0.8	10	50
55	142	8s	Science	limited	0.8	10	50
56	143	8s	Science	limited	0.8	10	50
57	144	8s	Science	limited	0.8	10	50
58	145	8s	Science	limited	0.8	10	50
69	146	8s	Science	limited	0.8	10	50
60	147	8s	Science	limited	0.8	10	20
61	148	16s	Science	limited	1.6	10	20
62	149	51s	Science	limited	5.1	10	20
63	150	1m 39s	Science	limited	9.9	10	20
64	151	50s	Science	limited	5	10	50
65	152	50s	Science	limited	5	10	50
66	153	50s	Science	limited	5	10	50
67	154	50s	Science	limited	5	10	50
68	155	50s	Science	limited	5	10	50
69	156	50s	Science	limited	5	10	50
70	157	50s	Science	limited	5	10	50
71	158	50s	Science	limited	5	10	50
72	159	50s	Science	limited	5	10	50
73	160	50s	Science	limited	5	10	50
74	161	50s	Science	limited	5	10	50
77	162	50s	Science	limited	5	10	50
76	163	50s	Science	limited	5	10	50
77	164	50s	Science	limited	5	10	50
78	165	50s	Science	limited	5	10	50
79	166	50s	Science	limited	5	10	50
80	167	50s	Science	limited	5	10	50
81	168	50s	Science	limited	5	10	20
82	169	50s	Science	limited	5	10	20
83	170	50s	Science	limited	5	10	20
84	171	1m 39s	Science	limited	9.9	10	20
85	172	2.25s	Science	limited	0.45	5	5
86	173	2.25s	Science	limited	0.45	5	5
87	174	2.25s	Science	limited	0.45	5	5
88	175	2.25s	Science	limited	0.45	5	5
89	176	2.25s	Science	limited	0.45	5	5

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
90	177	2.25s	Science	limited	0.45	5	5
91	178	2.25s	Science	limited	0.45	5	5
92	179	2.25s	Science	limited	0.45	5	5
93	180	2.25s	Science	limited	0.45	5	5
94	181	2.25s	Science	limited	0.45	5	5
95	182	2.25s	Science	limited	0.45	5	5
96	183	2.25s	Science	limited	0.45	5	5
97	184	2.25s	Science	limited	0.45	5	5
98	185	2.25s	Science	limited	0.45	5	5
99	186	2.25s	Science	limited	0.45	5	5
100	187	2.25s	Science	limited	0.45	5	5
101	188	2.25s	Science	limited	0.45	5	5
102	189	3.9s	Science	limited	0.78	5	5
103	190	2.3s	Science	limited	1.26	5	5
104	191	25.5s	Science	limited	5.1	5	5
105	192	49.5s	Science	limited	9.9	5	5
105		1h 26m 40.45s	-	-	-	840	2910

Table 24: Description of the TC used during STC Performance Test.

Table 24 describes the duration and the number of images and frames expected for each TCs commanded during the Performance Test.

3.5.4 Data Produced

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	608 KB

Bundle	RAW	STC	
File	CSV:		
		#:	2280
		size:	9 MB
	DAT:		
		#:	2280
		size:	306 MB
Science	Sections	#	84

Table 25:Data produced in the STC Performance Test.

3.5.5 ME Events

Failed 21 TC. Follow an extract from [AT.1] reporting the *Failure ID* and the *Sequence Number*. The last one could be used to found the TC info and parameters in [AT.2].

```
[2020-06-24T20:06:30.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 88]
[2020-06-24T20:08:52.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 89]
[2020-06-24T20:11:14.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 90]
[2020-06-24T20:13:36.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 91]
[2020-06-24T20:15:58.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 92]
[2020-06-24T20:18:20.084] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 93]
[2020-06-24T20:20:42.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 94]
[2020-06-24T20:23:04.084] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 95]
[2020-06-24T20:25:26.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 96]
[2020-06-24T20:27:48.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 97]
```

```
[2020-06-24T20:30:10.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 98]
[2020-06-24T20:32:32.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 99]
[2020-06-24T20:34:54.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 100]
[2020-06-24T20:37:16.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 101]
[2020-06-24T20:39:38.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 102]
[2020-06-24T20:42:00.084] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 103]
[2020-06-24T20:44:22.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 104]
[2020-06-24T20:46:44.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 105]
[2020-06-24T20:49:06.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 106]
[2020-06-24T20:51:28.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 107]
[2020-06-24T20:53:50.083] - TM(1,8) - [APID 801] - [Failure ID: 40000, APID: 812, Sequence n. 108]
```

See STC ICO#03 report for details.

3.5.6 PE Events

None.

3.5.7 Lost Packets

Telecommand Verification:	210	[lost packet(s): 0]
HK Report:	1469	[lost packet(s): 0]
Event/Anomaly Report:	169	[lost packet(s): 0]
STC low Priority:	57810	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]

Table 26: Packets and lost packet report for the STC Functional Test.

3.5.8 TC check

Accepted	105
Failed	21
Executed	84

Table 27: TC accepted and executed.

3.5.9 Discussion

21 TC Failed. It is due to an incompatibility of one parameter (RT) in two different TCs (SCIENCE and SCIENCE 1 ms).
Produced output is less than what expected.
The details are reported in Table 28 with information from section 3.5.3, 3.5.4 and 3.5.5.

	Commanded	From TM	Missing
Images	2910	2280	630
Science Sessions	105	84	21

Table 28:Comparison between data commanded and produced.

The missing Science sessions are due to the failed TCs that had to produce precisely 630 images.

3.6 VIHI Performance Test

3.6.1 Test Scope

This test combines functional and performance verification.
The part related to the Functional test implies operation of TEC, Detector, Shutter, Lamp and LED during the internal calibration which provides the Performance verification part of the test.

3.6.2 Test Execution

Time Frame: 2020-06-24T21:56:30.000Z ÷2020-06-24T23:25:00.000Z
In Table 29 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	OFF

Table 29: Status of the instrument before the VIHI Performance Test.

3.6.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	211	16s	Dark	continuos	1,02	16	16
2	212	16s	Dark	continuos	1,02	16	16
3	213	16s	Dark	continuos	1,02	16	16
4	214	16s	Dark	continuos	1,02	12	12
5	217	2m	Science	continuos	2,01	60	60
6	219	2m	Science	continuos	2,03	60	60
7	221	2m	Science	continuos	2,03	60	60
8	223	2m	Science	continuos	2,03	60	60
9	226	2m	Lamp	continuos	2,03	60	60
10	228	2m	Lamp	continuos	2,03	60	60
11	230	2m	Lamp	continuos	2,03	60	60
12	232	2m	Lamp	continuos	2,03	60	60
13	234	2m	Lamp	continuos	2,03	60	60
14	238	2m	Led	continuos	2,03	60	60
15	240	2m	Led	continuos	2,03	60	60
16	242	2m	Led	continuos	2,03	60	60
17	244	2m	Led	continuos	2,03	60	60
18	256	16s	Dark	continuos	1,2	16	16
19	257	16s	Dark	continuos	1,2	16	16
20	258	16s	Dark	continuos	1,2	16	16
21	259	12s	Dark	continuos	1,2	12	12
22	262	2m	Science	continuos	2,01	60	60
23	264	2m	Science	continuos	2,03	60	60
24	266	2m	Science	continuos	2,03	60	60
25	268	2m	Science	continuos	2,03	60	60
26	271	2m	Lamp	continuos	2,03	60	60
27	273	2m	Lamp	continuos	2,03	60	60
28	275	2m	Lamp	continuos	2,03	60	60
29	277	2m	Lamp	continuos	2,03	60	60
30	279	2m	Lamp	continuos	2,03	60	60
31	283	2m	Led	continuos	2,03	60	60
32	285	2m	Led	continuos	2,03	60	60

N(TC)	SSC	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
33	287	2m	Led	continuos	2,03	60	60
34	289	2m	Led	continuos	2,03	60	60
34		7m 16s				1680	1680

Table 30:Description of the TC used during VIHI Functional Test.

Table 30 describes the duration and the number of images and frames expected for each TCs commanded during the Test.

3.6.4 Data Produced

In the telemetry of this test is present a misplacing of some packets. The issue is due to the limited number of bits for the recording of the fine time of the Spacecraft Time, as reported in [RD.8]. To solve the issue, we used the tool simResort, it is described in [RD.9].

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	3.4 MB

Bundle	RAW	VIHI	
File	CSV:		
		#:	1680
		size:	6.6 MB
	DAT:		
		#:	1680
		size:	203 MB
Science	Sections	#	34

Table 31:Data produced in the VIHI Functional Test.

3.6.5 ME Events

None.

3.6.6 PE Events

None.

3.6.7 Lost Packets

Telecommand Verification:	200	[lost packet(s): 0]
HK Report:	5108	[lost packet(s): 0]
Event/Anomaly Report:	58	[lost packet(s): 0]
VIHI low Priority:	53520	[lost packet(s): 0]
VIHI high Priority:	0	[lost packet(s): 0]

Table 32: Packets and lost packet report for the VIHI Functional Test.

3.6.8 TCs check

Accepted	100
Executed	100

Table 33: TCs accepted and executed.

3.6.9 Discussion

Produced output is in line with what expected.
The details are reported in Table 34with information from section 3.6.3 and 3.6.4.

	Commanded	From TM
Images	1680	1680
Science Sessions	34	34

Table 34:Comparison between data commanded and produced.

3.7 STC-HRIC Interference Test

3.7.1 Test Scope

The test aims to check the existence of interference between the two cameras and evaluate them if they exist.

3.7.2 Test Execution

Time Frame: 2020-06-24T23:26:30.000Z ÷ 2020-06-25T00:16:37.000Z
In Table 35 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 35: Status of the instrument before the STC-HRIC Interference Test.

3.7.3 Science

Concerning the Science TCs, the following three science sessions have been performed.

N(TC)	SSC	Channel	Duration	ZSS	Mode	Repetition Time [s]	Expected Acquisitions	Expected Frames
1	293	STC	15m	Science	continuous	2	450	450
2	294	HRIC	15m	Science	continuous	2	450	1350
2			20m	-	-	-	900	1800

Table 36: Description of the TC used during STC-HRIC Interference Test.

Table 18 describes the duration and the number of images and frames expected for each TCs commanded during the Functional Test.

3.7.4 Data Produced

Bundle	Miscellaneous		
File	CSV:		
		#:	3
		size	108 KB

Bundle	RAW	HRIC	
File	CSV:		
		#:	450
		size:	1.8 MB
	DAT:		
		#:	450
		size:	1.1 GB
Science	Sections	#	1

Bundle	RAW	STC	
File	CSV:		
		#:	1350
		size:	5.3 MB

	DAT:		
		#:	1350
		size:	598 MB
Science	Sections	#	1

Table 37:Data produced in the STC-HRIC Interference Test.

3.7.5 ME Events

None.

3.7.6 PE Events

None.

3.7.7 Lost Packets

Telecommand Verification:	8	[lost packet(s): 0]
HK Report:	278	[lost packet(s): 0]
Event/Anomaly Report:	8	[lost packet(s): 0]
HRIC low Priority	9450	[lost packet(s): 0]
HRIC high Priority	0	[lost packet(s): 0]
STC low Priority:	8550	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]

Table 38: Packets and lost packet report for the STC-HRIC Interference Test.

3.7.8 TC check

Accepted	4
Executed	4

Table 39: TC accepted and executed.

3.7.9 Discussion

Produced output is in line with what expected.
The details are reported in Table 40 with information from section 3.7.3 and 3.7.3.

	Commanded	From TM
Images	1800	1800
Science Sessions	2	2

Table 40:Comparison between data commanded and produced.

4 Summary

ID	Test description	Test Last	Science Sessions	Data from TLM [Mb]							# 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	HRIC Functional Test	12m 20s	3	2.7	1800.0	0	0	0	0	0	730	0	0	0	0	0	0	0	0	0	0	0
02	HRIC Performance Test	5m 40s	34	2.90	617.0	0	0	0	0	0	680	0	0	0	0	0	0	0	0	0	0	0
03	STC Functional Test	3m 04s	4	1.3	0	39.0	0	0	0	0	0	183	0	0	0	0	0	0	0	0	0	0
04	STC Performance Test	1h 26m 40s	105	9.6	0	306.0	0	0	0	0	0	2280	0	0	0	0	21	0	0	0	0	0
05	VIHI Performance Test	7m 16s	34	10.0	0	0	203	0	0	0	0	0	1680	0	0	0	0	0	0	0	0	0
06	STC-HRIC Interference Test	20m	2	7.2	1100	598.0	0	0	0	0	450	1350	0	0	0	0	0	0	0	0	0	0
		2h 13m	186	33.7	3517.0	943.0	203.0	0	0	0	1860	3813	1680	0	0	0	21	0	0	0	0	0

Table 41: ICO#3 Summary of all the tests.

	Data Volume [Mb]
HK	33.7
HRIC	3517.0
STC	943.0
VIHI	203,0
	4696.7

Table 42: Data volume produced in the ICO#3.