BC-SIM-TR-011
Instrument Checkout #1
Data Produced Analysis

Romolo Politi[1], Sergio Fonte[1], Emanuele Simioni[2], Michele Zusi[1]
Fabrizio Capaccioni[1], Maria Teresa Capria[1], Alain Doressoundiram[3], Yves Langeven[4],
Pasquale Palumbo[5], Mathieu Vincendon[4], Gabriele Cremonese[2]

[1]INAF-IAPS Via Fosso del Cavaliere 100, 00133, Rome, Italy
[2]INAF-OAPD, Vicolo Osservatorio 5,35122, Padua, Italy
[3]Observatoire de Paris - PSL, Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique (LESIA), 92195 Meudon Cedex, France
[4]Institut d'Astrophysique Spatiale, CNRS / Université Paris Sud, 91405, Orsay, France
[5]Università Parthenope, Centro Direzionale Isola 4, 80133, Naples, Italy

Index

Index 2
1. Introduction 6
1.1. Scope 6
1.2. Reference Document 6
1.3. Acronyms 6
1.4. Document Format and Repository 7
1.5. The test plan 7
1.6. Report schema 7
1.6.1. Telecommands 8
1.6.2. Data produced 8
1.6.3. Events check 8
1.6.4. PE Events 8
1.6.5. Lost packets 8
1.6.6. Telecommand Check 9
1.6.7. Discussion 9
2. ICO#01 Result Analisys 10
2.1. General Consideration 10
2.2. HRIC Functional Test 10
2.2.1. Test Scope 10
2.2.2. Test Execution 10
2.2.3. Science 10
2.2.4. Data Produced 11
2.2.4.1. Data Volume 11
2.2.4.2. Output Files 11
2.2.5. ME Events 11
2.2.6. PE Events 11
2.2.7. Lost Packets 12
2.2.8. TCs Check 12
2.2.9. Discussion 12
2.3. HRIC Performance Test 13
2.3.1. Test Scope 13
2.3.2. Test Execution 13

2.3.3. Science 13
2.3.4. Data Produced 14
2.3.4.1. Data Volume 14
2.3.4.2. Output files 14
2.3.5. ME Events 14
2.3.6. PE Events 14
2.3.7. Lost Packets 14
2.3.8. TCs check 15
2.3.9. Discussion 15
2.4. STC Functional Test 16
2.4.1. Test Scope 16
2.4.2. Test Execution 16
2.4.3. Science 16
2.4.4. Data Produced 16
2.4.4.1. Data Volume 16
2.4.4.2. Output Files 17
2.4.5. ME Events 17
2.4.6. PE Events 17
2.4.7. Lost Packets 17
2.4.8. TCs check 17
2.4.9. Discussion 17
2.5. STC Performance Test 18
2.5.1. Test Scope 18
2.5.2. Test Execution 18
2.5.3. Science 18
2.5.4. Data Produced 20
2.5.4.1. Data Volume 20
2.5.4.2. Output Files 20
2.5.5. ME Events 20
2.5.6. PE Events 20
2.5.7. Lost Packets 20
2.5.8. TCs check 20
2.5.9. Discussion 21

2.6. VIHI Performance Test 22
2.6.1. Test Scope 22
2.6.2. Test Execution 22
2.6.3. Science 22
2.6.4. Data Produced 22
2.6.4.1. Data Volume 22
2.6.4.2. Output Files 23
2.6.5. ME Events 23
2.6.6. PE Events 23
2.6.7. Lost Packets 23
2.6.8. TCs check 23
2.6.9. Discussion 24

Approbation

Edited by:	
	Romolo Politi
	Sergio Fonte
	Emanuele Simioni
	Michele Zusi
Revised by:	
	Fabrizio Capaccioni
	Maria Teresa Capria
	Alain Doressoundiram
	Yves Langevin
	Pasquale Palumbo
	Mathieu Vincendon
Approved by:	
	Gabriele Cremonese

Document Change Record

Issue	Revision	Date	Affected Pages	Change description
1	2	01/10/20	1.6.2	I changed the description of the Section, added the DV data description.
1	3	06/05/20	All	Final review

1. Introduction

1.1. Scope

This document will describe all the tests performed during the first Instrument Checkout (ICO#01) for the Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem (SIMBIO-SYS). The checkout session was performed on June 7th, 2019 and planned in [RD.1]. Each test will be reported on a sheet with the pipeline report and a discussion on the detected anomalies.

1.2. Reference Document

[RD.1] BC-SIM-PL-002 Checkout #01 Test Summary – Version 1
(DOI: http://dx.doi.org/10.20371/INAF/TechRep/64)

[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-GAF-IC-002_rev12 – SIMBIO-SYS Software Interface Control Document

[RD.4] BC-SIM-TN-004_-_SIMBIO-SYS FOP update after NECP
(DOI: http://dx.doi.org/10.20371/INAF/TechRep/58)

[RD.5] BC-ASD-SP-00176_1_4 SIMBIO URD

[RD.6] BC-SIM-GAF-MA-002 10 001 – SIMBIO-SYS User Manual

1.3. Acronyms

Ack	Telecommand Acknowledgment
APID	Application Process IDentifier
CSV	Comma Separated Values
DV	Data Volume
FPA	Focal Plane Assembly
HK	Housekeeping
HRIC	High spatial Resolution Imaging Channel
ICO#01	Instrument Checkout #01
ME	Main Electronics
NECP	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

1.4. 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.**. It will be archived both on the INAF Open Access repository and the SIMBIO-SYS team Archive.

1.5. The test plan

The ICO#1 test was planned for June 5th, 2019, based on the tests described in **Errore. L'origine riferimento non è stata trovata.**.

Before the test HRIC and STC coldfinger temperatures were below the applicable limit. The test was moved to June 7th, 2019. Before the test starts, all the SIMBIO-SYS channels were warmed to the operational temperature range.

The test schedule is reported in [RD.1].
Table 1-1 reports the list of the performed tests during the checkout together with:

- the start time is identified as the execution time of the first TC of the test.
- The stop time is recognized as the execution time of the first TC of the following test session minus 1 second or the execution time of the instrument shutdown.

ID	Test description	Start Time	Stop Time	Test Last
01	HRIC Functional Test	2019-06-07T06:30:00.00Z	2019-06-07T07:19:59.00Z	49m 59s
02	HRIC Performance Test	2019-06-07T07:20:00.00Z	2019-06-07T07:52:59.00Z	32m 59s
03	STC Functional Test	2019-06-07T07:53:00.00Z	2019-06-07T09:02:59.00Z	1h 9m 59s
04	STC Performance Test	2019-06-07T09:03:00.00Z	2019-06-07T10:00:59.00Z	1h 56m
05	VIHI Performance Test	2019-06-07T10:01:00.00Z	2019-06-07T10:51:02.00Z	50m 2s

Table 1-1: Tests schedule.

1.6. Report schema

Each test the report contains will be formed by sections created a procedure for the analysis of the results, and it is shown in **Errore. L'origine riferimento non è stata trovata.** and described in subsections below.

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

Table 1-2 Section structure defined for each test.

1.6.1. Telecommands

In this Section, the telecommands used for the test are reported. For each telecommand, the software performs an analysis and a prevision of the data output. That information is derived by the Telecommand stack downloaded from the spacecraft.

1.6.2. Data produced

This Section reports the produced data 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 has information about the output files, which are:
    a. CSVs for the diagnostic housekeeping
    b. CSVs for the housekeeping parameters related to a single image
    c. DAT files containing the image in binary format.

    All the data are in PDS4 format, which means that they include an XML file with all the acquisition parameters, considering as source the instrument or the spacecraft. A complete description of the file structure and the folder tree is reported in [RD.1]. Each image has an extra file in PNG format as a quick preview.

For each output group, the number of files and total size is reported.

1.6.3. Events check

In this Section, the results of the event checks are reported:

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

For each rejected or failed TC event, a sheet with all the TC information (i.e., mnemonic name, description, time of execution, and all the parameters) is reported.
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)) errors with a description of the event.
The complete list of events and telecommand acknowledgments is reported into the Event file stored in each test folder. All the information for the event and telecommand acknowledgments are from [RD.3].

1.6.4. PE Events

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

1.6.5. Lost packets

The automatic check on the lost packets is performed using the Packet Sequence Control number (see [RD.3]). The PSC is a progressive 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 1-3 List of the APIDs associated with each data flow.

The PSC number is stored in 14 bits. It means that the maximum value is 16383 (2^{14}). After that, the counter is reinitialized.
NB: A manual check is required 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.

1.6.6. Telecommand Check

This Section reported the negative Acks for the telecommands received by the ME/PE and not executed.

1.6.7. Discussion

In this Section, all the results, discrepancies, and errors are discussed if present.

2. ICO#01 Result Analysis

2.1.General Consideration

Concerning **Errore. L'origine riferimento non è stata trovata.**, we summarize the following quality 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	

Table 2-1: Quality table.

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

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

2.2.HRIC Functional Test

2.2.1. 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.

2.2.2. Test Execution

Time Frame: 2019-06-07T06:30:00.00Z ÷ 2019-06-07T07:19:59.00Z

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

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 2-2: SIMBIO-SYS initial status.

2.2.3. Science

Table 2-3 reports the number of performed science sessions reporting the duration, 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	21	2 minutes	Continous	1.0	120	120
2	23	2 minutes	Continous	1.0	120	120
3	25	10 seconds	Limited	1.0	10	10
3	---	4 minutes and 10 seconds	---	---	250	250

Table 2-3: TC used during the HRIC Functional Test.

2.2.4. Data Produced

2.2.4.1. Data Volume

	#Packets	DV [Mb]
HK	1371	0.49
HRIC low priority	20250	658.09
HRIC high priority	0	0.00

Table 2-4: DV produced during the HRIC Functional Test.

2.2.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	1.12 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	250
		size:	0.977 MB
	DAT:		
		#:	250
		size:	625 MB
Science	Sections	#	3

Table 2-5: Data produced during the HRIC Functional Test.

2.2.5. ME Events

None.

2.2.6. PE Events

None.

2.2.7. Lost Packets

Telecommand Verification:	52	[lost packet(s): 0]
HK Report:	1371	[lost packet(s): 0]
Event/Anomaly Report:	13	[lost packet(s): -2]
HRIC low Priority:	20250	[lost packet(s): 0]
HRIC high Priority:	0	[lost packet(s): 0]

Table 2-6: Packets and lost packet report.

2.2.8. TCs Check

Accepted	26
Executed	26

Table 2-7: TCs accepted and executed.

2.2.9. Discussion

The produced output is in line with what is expected.
The details are reported in Table 2-8 with information from sections 2.2.3 and 2.2.4.

	Commanded	From TM
Images	250	250
Science Sessions	3	3

Table 2-8: Comparison between data commanded and produced.

2.3.HRIC Performance Test

2.3.1. Test Scope

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

2.3.2. Test Execution

Time Frame: 2019-06-07T07:20:00.00Z ÷ 2019-06-07T07:52:59.00Z

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

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	ON	OFF	OFF

Table 2-9: Instrument status before the HRIC Performance Test.

2.3.3. Science

Table 2-10 reports the number of performed science sessions, the duration, and the number of images and frames expected for each TCs during the test.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	27	10 seconds	Limited	1.0	10	10
2	28	10 seconds	Limited	1.0	10	10
3	29	10 seconds	Limited	1.0	10	10
4	30	10 seconds	Limited	1.0	10	10
5	31	10 seconds	Limited	1.0	10	10
6	32	10 seconds	Limited	1.0	10	10
7	33	10 seconds	Limited	1.0	10	10
8	34	10 seconds	Limited	1.0	10	10
9	35	10 seconds	Limited	1.0	10	10
10	36	10 seconds	Limited	1.0	10	10
11	37	10 seconds	Limited	1.0	10	10
12	38	10 seconds	Limited	1.0	10	10
13	39	10 seconds	Limited	1.0	10	10
14	40	20 seconds	Limited	2.0	10	10
15	41	20 seconds	Limited	2.0	10	10
16	42	40 seconds	Limited	4.0	10	10
17	43	1 minute and 20 seconds	Limited	8.0	10	10
18	44	20 seconds	Limited	2.0	10	30
19	45	20 seconds	Limited	2.0	10	30
20	46	20 seconds	Limited	2.0	10	30
21	47	20 seconds	Limited	2.0	10	30
22	48	20 seconds	Limited	2.0	10	30
23	49	20 seconds	Limited	2.0	10	30
24	50	20 seconds	Limited	2.0	10	30
25	51	20 seconds	Limited	2.0	10	30
26	52	20 seconds	Limited	2.0	10	30
27	53	20 seconds	Limited	2.0	10	30
28	54	20 seconds	Limited	2.0	10	30
29	55	20 seconds	Limited	2.0	10	30
30	56	20 seconds	Limited	2.0	10	30

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
31	57	20 seconds	Limited	2.0	10	30
32	58	40 seconds	Limited	4.0	10	30
33	59	1 minute	Limited	6.0	10	30
34	60	1 minute and 20 seconds	Limited	8.0	10	30
34	---	12 minutes and 30 seconds	---	---	340	680

Table 2-10: Description of the TC used during HRIC Performance Test.

2.3.4. Data Produced

2.3.4.1. Data Volume

	#Packets	DV
HK	129	0.04 Mb
HRIC low priority	138380	4.53 Gb
HRIC high priority	0	0.00 Mb

Table 2-11: DV produced in the HRIC Performance Test.

2.3.4.2. Output files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	0.09 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	680
		size:	2.66 MB
	DAT:		
		#:	680
		size:	616.5 MB
Science	Sections	#	34

Table 2-12: Data produced in the HRIC Performance Test.

2.3.5. ME Events

None.

2.3.6. PE Events

None.

2.3.7. Lost Packets

Telecommand Verification:	68	[lost packet(s): 0]
HK Report:	129	[lost packet(s): 0]
Event/Anomaly Report:	5	[lost packet(s): 0]
HRIC low Priority:	138380	[lost packet(s): 0]
	[2019-06-07T07:20:53.204000] [position: 30696] packet number(s): 559	
	[2019-06-07T07:20:53.204381] [position: 30697] packet number(s): -560	

	[2019-06-07T07:20:54.204717] [position: 31256] packet number(s): 1	
	[2019-06-07T07:21:48.204000] [position: 61540] packet number(s): -15870	
	[2019-06-07T07:21:48.204366] [position: 61541] packet number(s): 15869	
	[2019-06-07T07:21:49.204717] [position: 62055] packet number(s): 1	
	[2019-06-07T07:25:32.204000] [position: 100937] packet number(s): 158	
	[2019-06-07T07:25:33.078054] [position: 100938] packet number(s): -159	
	[2019-06-07T07:25:33.205358] [position: 101096] packet number(s): 1	
HRIC high Priority:	0	[lost packet(s): 0]

Table 2-13: Packets and lost packet report for the HRIC Performance Test.

2.3.8. TCs check

Accepted	34
Executed	34

Table 2-14: TCs accepted and executed.

2.3.9. Discussion

The produced output is reported in Table 2-15 with information from sections 2.3.3 and 2.3.4.

	Commanded	From TM
Images	680	680
Science Sessions	34	34

Table 2-15: Comparison between data commanded and produced during the HRIC Performance Test.

There is a problem with the ordering of the packets. We found the same problem during the NECP, and it is under investigation.

2.4.STC Functional Test

2.4.1. 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;
  - TEC;
- to modify some configuration parameters;
- to perform some science acquisitions.

2.4.2. Test Execution

Time Frame: 2019-06-07T07:53:00.00Z ÷ 2019-06-07T09:02:59.00Z

In Table 2-16 the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 2-16:Status of the instrument before the STC functional Test.

2.4.3. Science

Table 2-17 reports the number of performed science sessions, the 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	81	20 seconds	Continuous	2.0	10	30
2	82	2 minutes and 10 seconds	Continuous	12.3	12	33
3	83	2.99 seconds	Continuous	0.4	12	60
4	84	23.81 seconds	Continuous	2.05	13	60
4	**---**	**3 minutes and 17 seconds**	**---**	**---**	**43**	**183**

Table 2-17: Description of the TC used during STC Functional Test.

2.4.4. Data Produced

2.4.4.1. Data Volume

	#Packets	DV [Mb]
HK	1742	0.62
STC low priority	1600	52.08
STC high priority	0	0.00

Table 2-18:DV produced in the STC Functional Test.

2.4.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	1.43 MB

Bundle	RAW	STC	
File	CSV:		
		#:	183
		size:	168.4 kB
	DAT:		
		#:	183
		size:	40.8 MB
Science	Sections	#	4

Table 2-19: Data produced in the STC Functional Test.

2.4.5. ME Events

None.

2.4.6. PE Events

None.

2.4.7. Lost Packets

Telecommand Verification:	52	[lost packet(s): 0]
HK Report:	1742	[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 2-20: Packets and lost packet report for the STC Functional Test.

2.4.8. TCs check

Accepted	26
Executed	26

Table 2-21: TCs accepted and executed.

2.4.9. Discussion

The produced output is in line with what is expected.
The details are reported in Table 2-22 with information from sections 2.4.3 and 2.4.4.

	Commanded	From TM
Images	183	183
Science Sessions	4	4

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

2.5. STC Performance Test

2.5.1. Test Scope

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

2.5.2. Test Execution

Time Frame: 2019-06-07T09:03:00.00Z ÷ 2019-06-07T10:00:59.00Z
In Table 2-23 the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 2-23: Status of the instrument before the STC Performance Test.

2.5.3. Science

Table 2-24 reports the number of performed science, the duration, 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	87	4 seconds	Limited	0.45	10	30
2	88	4 seconds	Limited	0.45	10	30
3	89	4 seconds	Limited	0.45	10	30
4	90	4 seconds	Limited	0.45	10	30
5	91	4 seconds	Limited	0.45	10	30
6	92	4 seconds	Limited	0.45	10	30
7	93	4 seconds	Limited	0.45	10	30
8	94	4 seconds	Limited	0.45	10	30
9	95	4 seconds	Limited	0.45	10	30
10	96	4 seconds	Limited	0.45	10	30
11	97	4 seconds	Limited	0.45	10	30
12	98	4 seconds	Limited	0.45	10	30
13	99	4 seconds	Limited	0.45	10	30
14	100	4 seconds	Limited	0.45	10	30
15	101	4 seconds	Limited	0.45	10	30
16	102	4 seconds	Limited	0.45	10	30
17	103	4 seconds	Limited	0.45	10	30
18	104	7 seconds	Limited	0.78	10	30
19	105	12 seconds	Limited	1.26	10	30
20	106	51 seconds	Limited	5.10	10	30
21	107	1 minute and 39 seconds	Limited	9.9	10	30
22	108	1 minute and 10 seconds	Limited	7.0	10	30
23	109	1 minute and 10 seconds	Limited	7.0	10	30
24	110	1 minute and 10 seconds	Limited	7.0	10	30
25	111	1 minute and 10 seconds	Limited	7.0	10	30
26	112	1 minute and 10 seconds	Limited	7.0	10	30
27	113	1 minute and 10 seconds	Limited	7.0	10	30
28	114	1 minute and 10 seconds	Limited	7.0	10	30
29	115	1 minute and 10 seconds	Limited	7.0	10	30
30	116	1 minute and 10 seconds	Limited	7.0	10	30
31	117	1 minute and 10 seconds	Limited	7.0	10	30
32	118	1 minute and 10 seconds	Limited	7.0	10	30

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
33	119	1 minute and 10 seconds	Limited	7.0	10	30
34	120	1 minute and 10 seconds	Limited	7.0	10	30
35	121	1 minute and 10 seconds	Limited	7.0	10	30
36	122	1 minute and 10 seconds	Limited	7.0	10	30
37	123	1 minute and 10 seconds	Limited	7.0	10	30
38	124	1 minute and 10 seconds	Limited	7.0	10	30
39	125	1 minute and 10 seconds	Limited	7.0	10	30
40	126	1 minute and 10 seconds	Limited	7.0	10	30
41	127	1 minute and 10 seconds	Limited	7.0	10	30
42	128	1 minute and 39 seconds	Limited	9.9	10	30
43	129	2 seconds	Limited	0.25	10	50
44	130	2 seconds	Limited	0.25	10	50
45	131	2 seconds	Limited	0.25	10	50
46	132	2 seconds	Limited	0.25	10	50
47	133	2 seconds	Limited	0.25	10	50
48	134	2 seconds	Limited	0.25	10	50
49	135	2 seconds	Limited	0.25	10	50
50	136	2 seconds	Limited	0.25	10	50
51	137	2 seconds	Limited	0.25	10	50
52	138	2 seconds	Limited	0.25	10	50
53	139	2 seconds	Limited	0.25	10	50
54	140	2 seconds	Limited	0.25	10	50
55	141	2 seconds	Limited	0.25	10	50
56	142	2 seconds	Limited	0.25	10	50
57	143	2 seconds	Limited	0.25	10	50
58	144	2 seconds	Limited	0.25	10	50
59	145	5 seconds	Limited	0.57	10	50
60	146	7 seconds	Limited	0.78	10	50
61	147	12 seconds	Limited	1.26	10	50
62	148	51 seconds	Limited	5.10	10	50
63	149	1 minute and 39 seconds	Limited	9.9	10	50
64	150	50 seconds	Limited	5.0	10	50
65	151	50 seconds	Limited	5.0	10	50
66	152	50 seconds	Limited	5.0	10	50
67	153	50 seconds	Limited	5.0	10	50
68	154	50 seconds	Limited	5.0	10	50
69	155	50 seconds	Limited	5.0	10	50
70	156	50 seconds	Limited	5.0	10	50
71	157	50 seconds	Limited	5.0	10	50
72	158	50 seconds	Limited	5.0	10	50
73	159	50 seconds	Limited	5.0	10	50
74	160	50 seconds	Limited	5.0	10	50
75	161	50 seconds	Limited	5.0	10	50
76	162	50 seconds	Limited	5.0	10	50
77	163	50 seconds	Limited	5.0	10	50
78	164	50 seconds	Limited	5.0	10	50
79	165	50 seconds	Limited	5.0	10	50
80	166	50 seconds	Limited	5.0	10	50
81	167	50 seconds	Limited	5.0	10	50
82	168	50 seconds	Limited	5.0	10	50
83	169	50 seconds	Limited	5.0	10	50
84	170	1 minute and 39 seconds	Limited	9.9	10	50
84	**---**	**51 minutes and 1 second**	**---**	**---**	**840**	**3360**

Table 2-24: Description of the TC used during STC Performance Test.

2.5.4. Data Produced

2.5.4.1. Data Volume

	#Packets	DV
HK	780	0.27 Mb
STC low priority	0	0.00 Mb
STC high priority	168000	5.50 Gb

Table 2-25: DV produced in the STC Performance Test.

2.5.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	0,63 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	3360
		size:	13.12 MB
	DAT:		
		#:	3360
		size:	748.15 MB
Science	Sections	#	84

Table 2-26: Data produced in the STC Performance Test.

2.5.5. ME Events

None.

2.5.6. PE Events

None.

2.5.7. Lost Packets

Telecommand Verification:	168	[lost packet(s): 0]
HK Report:	780	[lost packet(s): 0]
Event/Anomaly Report:	169	[lost packet(s): 0]
STC low Priority:	0	[lost packet(s): 0]
STC high Priority:	168000	[lost packet(s): 0]

Table 2-27: Packets and lost packet report for the STC Functional Test.

2.5.8. TCs check

Accepted	84
Executed	84

Table 2-28: TCs accepted and executed during the STC Performance Test.

2.5.9. Discussion

The produced output is in line with what is expected.
The details are reported in Table 2-29 with information from sections 2.5.3 and 2.5.4.

	Commanded	From TM
Images	3360	3360
Science Sessions	84	84

Table 2-29: Comparison between data commanded and produced during the STC Performance Test.

2.6.VIHI Performance Test

2.6.1. Test Scope

The aim of this test is to perform a VIHI internal calibration using the internal light sources. It is also used to verify the shutter operability.
In addition, the detector bias shall be changed from the onboard values.

2.6.2. Test Execution

Time frame: 2019-06-07T10:01:00.00Z ÷ 2019-06-07T10:51:02.00Z
In Table 2-30 the initial status of the instrument is reported:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	ON

Table 2-30: Status of the instrument before the VIHI Performance Test.

2.6.3. Science

Table 2-31 reports the number of performed science sessions, the duration, 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	186	15 seconds	Continuous	1.02	16	16
2	187	14.28 seconds	Continuous	1.02	16	16
3	188	13.98 seconds	Continuous	1.02	16	16
4	189	14.22 seconds	Continuous	1.02	12	12
5	192	1 minute and 59.04 seconds	Continuous	2.01	60	60
6	194	1 minute and 59.56 seconds	Continuous	2.025	60	60
7	196	1 minute and 59.92 seconds	Continuous	2.01	60	60
8	198	1 minute and 58.67 seconds	Continuous	2.015	60	60
9	201	1 minute and 58.21 seconds	Continuous	2.025	60	60
10	203	1 minute and 59.25 seconds	Continuous	2.01	60	60
11	205	1 minute and 59.34 seconds	Continuous	2.01	60	60
12	207	1 minute and 59.26 seconds	Continuous	2.01	60	60
13	209	1 minute and 59.34 seconds	Continuous	2.01	60	60
14	213	1 minute and 59.26 seconds	Continuous	2.01	60	60
15	215	1 minute and 59.34 seconds	Continuous	2.015	60	60
16	217	1 minute and 59.56 seconds	Continuous	2.015	60	60
17	219	1 minute and 59.34 seconds	Continuous	2.015	60	60
17	**---**	**27 minutes and 12 seconds**	**---**	**---**	**840**	**840**

Table 2-31: Description of the TC used during VIHI Functional Test.

2.6.4. Data Produced

2.6.4.1. Data Volume

	#Packets	DV
HK	2112	1.05 Mb
VIHI low priority	26760	0.00 Mb
VIHI high priority	0	851.93 Mb

Table 2-32: DV produced in the VIHI Functional Test

2.6.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	2.75 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	840
		size:	3.28 MB
	DAT:		
		#:	840
		size:	101.25 MB
Science	Sections	#	17

Table 2-33: Data produced in the VIHI Functional Test.

2.6.5. ME Events

None.

2.6.6. PE Events

None.

2.6.7. Lost Packets

Telecommand Verification:	104	[lost packet(s): 0]
HK Report:	2112	[lost packet(s): 0]
Event/Anomaly Report:	30	[lost packet(s): 0]
VIHI low Priority:	26760	[lost packet(s): 0]
VIHI high Priority:	0	[lost packet(s): 0]

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

2.6.8. TCs check

Accepted	52
Executed	52

Table 2-35: TCs accepted and executed.

2.6.9. Discussion

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

	Commanded	From TM
Images	840	840
Science Sessions	17	17

Table 2-36: Comparison between data commanded and produced.

3. 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	49m 59s	3	0.49	658.09	0	0	0	0	0	250	0	0	0	0	0	0	0	0	0	0	0
02	HRIC Performance Test	32m 59s	34	0.04	4533.16	0	0	0	0	0	680	0	0	0	0	0	0	0	0	0	0	0
03	STC Functional Test	1h 9m 59s	4	0.62	0	52.08	0	0	0	0	0	183	0	0	0	0	0	0	0	0	0	0
04	STC Performance Test	1h 56m	84	0.27	0	0	0	0	5505.53	0	0	3650	0	0	0	0	0	0	0	0	0	0
05	VIHI Performance Test	50m 2s	17	1.05	0	0	851.93	0	0	0	0	0	840	0	0	0	0	0	0	0	0	0
		5h 18m 59s	**142**	**2.47**	**5191.25**	**52.08**	**851.93**	**0**	**5505.53**	**0**	**930**	**3833**	**840**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 3-1: ICO#1 Summary of all the tests

	Data Volume [Mb]
HRIC	5191.25
STC	5557.61
VIHI	851.93
	11600.79

Table 3-2: Data volume produced in the ICO#1