BC-SIM-TR-017
Instrument Checkout #2
Data Produced Analysis

Romolo Politi[1], Emanuele Simioni[2], Michele Zusi[1]
Fabrizio Capaccioni[1], Maria Teresa Capria[1], Alain Doressundiram[3], Yves Langevin[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, 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

Approvation

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

Document Change Record

Issue	Revision	Date	Affected Pages	Change description

1. Introduction

1.1. Scope

In this document we will describe all the tests performed during the first Instrument Checkout (ICO#02) for the Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem (SIMBIO-SYS). The checkout session was performed June 7th 2019. For each test will be reported a sheet with the pipeline report and a discussion eventually on the detected anomalies.

1.2. Reference Document

[RD.1] BC-SIM-TN-003 – Reports and Notes Layout and Flow (DOI: http://dx.doi.org/10.20371/INAF/TechRep/36)
[RD.2] BC-SIM-PL-004 Checkout #02 Test Summary (DOI: http://dx.doi.org/10.20371/INAF/TechRep/100)
[RD.3] BC-SIM-TR-001 Technical Report – Software User Manual, in preparation.
[RD.4] BC-SIM-GAF-IC-002_rev12 – SIMBIO-SYS Software Interface Control Document
[RD.5] BC-SIM-TN-006_-_simClean_-_Telemetry_Filter_Tool (DOI: https://doi.org/10.20371/INAF/TechRep/103);

1.3. Attached Document

[AT.1] Command_Stack_ICO01.xlsx
[AT.2] Event_ICO02.log

1.4. Acronyms

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

1.5. Document Format and Repository

This document is compliant with the SIMBIO-SYS Report and Note Layout and Flow [RD.1]**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

The ICO#2 test was planned on one day. Follow the test schema from [RD.2].

#	ID	Description
1	SS-FCP-001	ME OBCP Power On via OBCP
2	HRIC_TEC_INIT_POR	HRIC Channel TEC init
3	HRIC_FUNCT_POR	HRIC Functional Test
4	HRIC_DC_TEST_POR	HRIC Perf. Test
5	SS-FCP-004	HRIC Channel Off via OBCP
6	STC_TEC_INIT_POR	STC Channel TEC init
7	SS-TST-020	STC Functional Test
8	STC_NOMINAL_TEST_POR	STC Perf. Test
9	STC_ALL_FPA_POR_2.0	STC ALL-FPA Test
10	SS-FCP-007	STC Channel Off via OBCP
11	VIHI_ICO#02_POR	This POR contains the following FOP calls: VIHI POWER ON HK RATE = 1sec UPLOAD TEC PARAM DETC ON TEC ON READ ON-BOARD DETEC PARAM CALIBRATION (LED=2000, LAMP=2500) UPLOAD DETEC PARAM CALIBRATION (LED=2000, LAMP=2500) VIHI OBCP POWER OFF
12	SS-FCP-002	ME OBCP Power Off via OBCP

Table 1-1: Timeline of the ICO#02

From the Table 1-1 and the TC Stack in [AT.1]

ID	Start Time	Stop Time	Test description
01	2019-11-27T04:00:00.00Z	2019-11-27T05:19:59.00Z	HRIC Functional Test
02	2019-11-27T05:20:00.00Z	2019-11-27T06:11:59.00Z	HRIC Performance Test
03	2019-11-27T06:12:00.00Z	2019-11-27T06:50:59.00Z	STC Functional Test
04	2019-11-27T06:51:00.00Z	2019-11-27T08:39:59.00Z	STC Performance Test
05	2019-11-27T08:40:00.00Z	2019-11-27T10:15:00.00Z	VIHI Performance Test

Table 1-2: Tests Schedula

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 for the events and telecommand acknowledgments;
- a report of the PE events;
- a check on the lost packets.

The repost includes even two sections with the comparison between the TC and the data results. Eventual problems or discrepancies will be discussed.

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

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

Table 1-3 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 a prevision of the data output will be performed.

1.7.2. Data Produced

In this Section a table with the data produced will be reported. The output files are two different type 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 the data are in PDS4 format, that 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 of the folder tree is reported in [RD.1]. For each image is present an extra file in PNG format as quick preview.
In the summary schema will be reported number and total size of the follow file types:

- Diagnostic HKs
- Acquisition HKs;
- Images

1.7.3. Events Check

In 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 telecommand event is reported a sheet with all the information about the telecommand, mnemonic name, description, time of execution and all the parameters.
For each event 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 for the event and telecommand acknowledgments are from [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 PE, is created. Each alert is reported with the decimal ID and with the complete description. All the information for the PE events refers to [RD.4].

1.7.5. Lost Packets

The automatic check on the lost packets is performed using the Packet Sequence Control number (see [RD.4]). The PSC is a progressive number associated to 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 1-4 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 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 holes in the PSC sequence.

1.7.6. Telecommand Check

In this section is checked that all recived telecommand has been executed by the ME/PE.

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.5] to remove the duplicate HK and the duplicated science packets due to the reception of the same one by different antennas.

3. ICO#02 Result Analisys

3.1.General Consideration

With reference to **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 3-1: Quality Table.

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

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

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: 2019-11-27T04:00:00.00Z ÷ 2019-11-27T05:19:59.

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

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 3-2: Instrument status before the HRIC Performance Test.

3.2.3. Science

Table 3-3 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	20 minutes	Continuous	1.0	1201	1201
2	23	20 minutes	Continuous	1.0	1201	1201
3	25	1 minute and 40 seconds	Limited	1.0	100	100
3	---	41 minutes and 40 seconds	---	---	2502	2502

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

3.2.4. Data Produced

3.2.4.1. Data Volume

	#Packets	DV [Mb]
HK	3675	0.17
HRIC low priority	202662	823.14
HRIC high priority	0	0.00

Table 3-4: DV produced during the HRIC Functional Test.

3.2.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	1.6 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	2502
		size:	2.3 MB
	DAT:		
		#:	2502
		size:	6.6 GB
Science	Sections	#	3

Table 3-5: 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:	3675	[lost packet(s): 0]
Event/Anomaly Report:	9	[lost packet(s): 0]
HRIC low Priority:	202662	[lost packet(s): 0]
HRIC high Priority:	0	[lost packet(s): 0]

Table 3-6:Packets and lost packet report for the HRIC Functional Test.

3.2.8. Telecommands Check

Telecommand Status	#
Accepted	26
Executed	26
Rejected	0
Failed	0

Table 3-7:TC accepted and executed during the HRIC Functional Test.

3.2.9. Discussion

Produced output is in line with what expected.
The details are reported in Table 3-8 with information from section 3.2.3 and 3.2.4.

	Commanded	From TM
Images	2502	2502
Science Sessions	3	3

Table 3-8: Comparison between data commanded and producedfor the HRIC Functional Test.

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: 2019-11-27T05:20:00.00Z ÷ 2019-11-27T06:11:59.

In Table 3-9 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	ON	OFF	OFF

Table 3-9: Instrument status before the HRIC Performance Test.

3.3.3. Science

Table 3-10 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 3-10: Description of the TC used during HRIC Performance Test.

3.3.4. Data Produced

3.3.4.1. Data Volume

	#Packets	DV
HK	208	0.07 Mb
HRIC low priority	138380	566 Mb
HRIC high priority	0	0.00 Mb

Table 3-11: DV produced in the HRIC Performance Test.

3.3.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	74.9 kB

Bundle	RAW	HRIC	
File	CSV:		
		#:	680
		size:	617.4 kB
	DAT:		
		#:	680
		size:	646.8 MB
Science	Sections	#	34

Table 3-12: 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:	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	
STC low Priority:	0	[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 3-13: Packets and lost packet report for the HRIC Performance Test.

3.3.8. Telecommands check

Telecommand Status	#
Accepted	34
Executed	34
Rejected	0
Failed	0

Table 3-14: TCs accepted and executed for the HRIC Performance Test.

3.3.9. Discussion

Produced output is reported in Table 3-15 with information from section 3.3.3 and 3.3.4.

	Commanded	From TM
Images	680	680
Science Sessions	34	34

Table 3-15: Comparison between data commanded and produced during the HRIC Performance Test.

The lost packet events found in 3.3.7 are linked to an error in the ordering of the packes. The same issues were found during the NECP.

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

3.4.2. Test Execution

Time Frame: 2019-11-27T06:12:00.00Z ÷ 2019-11-27T06:50:59.

In Table 3-16 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 3-16: Status of the instrument before the STC functional Test.

3.4.3. Science

Table 3-17 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	11	33
3	83	4.70 seconds	Continuous	0.4	12	60
4	84	23.90 seconds	Continuous	2.05	12	60
4	---	3 minutes and 4 seconds	---	---	45	183

Table 3-17: Description of the TC used during STC Functional Test.

3.4.4. Data Produced

3.4.4.1. Data Volume

	#Packets	DV [Mb]
HK	1295	0.58
STC low priority	1600	6.51
STC high priority	0	0.00

Table 3-18: DV produced in the STC Functional Test.

3.4.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	563.7 kB

Bundle	RAW	HRIC	
File	CSV:		
		#:	183
		size:	0.17 MB
	DAT:		
		#:	183
		size:	40.8 MB
Science	Sections	#	4

Table 3-19: Data produced in the STC Functional Test.

3.4.5. ME Events

Severity Level	#
Low Severity Error	1
Medium Severity Error	0
High Severity Error	0

Table 3-20: ME errors during the STC Functional Test.

3.4.5.1. Low Severity Error

- [2019-11-27T06:28:05.100] - TM(5,2) - [APID 807] - Event 40800 - HK discarded due to SpW error on link from the specified channel

3.4.6. PE Events

STC PE negative event(s) : 1

- [639556083.756271] TC Timer Overflow (16)

3.4.7. Lost Packets

Telecommand Verification:	52	[lost packet(s): 0]
HK Report:	1295	[lost packet(s): 0]
Event/Anomaly Report:	5	[lost packet(s): 0]
STC low Priority:	1600	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]

Table 3-21: Packets and lost packet report for the STC Functional Test.

3.4.8. Telecommands check

Telecommand Status	#
Accepted	26
Executed	26
Rejected	0
Failed	0

Table 3-22: TCs accepted and executed for the STC Functional Test.

3.4.9. Discussion

Produced output is in line with what expected.
The details are reported in Table 3-23 with information from section 3.4.3 and 3.4.4.

	Commanded	From TM
Images	183	183
Science Sessions	4	4

Table 3-23: Comparison between data commanded and produced during the STC Functional Test.

The ME and PE errors not compromised the test.

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: 2019-11-27T06:51:00.00Z ÷ 2019-11-27T08:39:59.

Table 3-24 reports**Errore. L'origine riferimento non è stata trovata.** the initial status of the instrument.

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 3-24: Status of the instrument before the STC Performance Test.

3.5.3. Science

Table 3-25 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

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
31	117	1 minute and 10 seconds	Limited	7.0	10	30
32	118	1 minute and 10 seconds	Limited	7.0	10	30
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	3 seconds	Limited	0.70	5	5
44	130	3 seconds	Limited	0.70	5	5
45	131	25 seconds	Limited	5.0	5	5
46	132	25 seconds	Limited	5.0	5	5
47	133	3 seconds	Limited	0.70	5	5
48	134	3 seconds	Limited	0.70	5	5
49	135	25 seconds	Limited	5.0	5	5
50	136	25 seconds	Limited	5.0	5	5
51	137	6 seconds	Limited	1.2	5	5
52	138	6 seconds	Limited	1.2	5	5
53	139	25 seconds	Limited	5.0	5	5
54	140	25 seconds	Limited	5.0	5	5
55	141	6 seconds	Limited	1.2	5	5
56	142	6 seconds	Limited	1.2	5	5
57	143	25 seconds	Limited	5.0	5	5
58	144	25 seconds	Limited	5.0	5	5
59	145	6 seconds	Limited	1.2	5	5
60	146	6 seconds	Limited	1.2	5	5
61	147	25 seconds	Limited	5.0	5	5
62	148	25 seconds	Limited	5.0	5	5
63	149	0 milliseconds	Limited	0.3	2	6
64	150	2 seconds	Limited	1.0	2	6
65	151	2 seconds	Limited	1.0	2	6
66	152	2 seconds	Limited	1.0	2	6
67	153	2 seconds	Limited	1.0	2	6
68	154	2 seconds	Limited	1.0	2	6
68	---	**34 minutes and 16 seconds**	---	---	**532**	**1396**

Table 3-25: Description of the TC used during STC Performance Test.

3.5.4. Data Produced

3.5.4.1. Data Volume

	#Packets	DV
HK	3012	0.13 Mb
STC low priority	241175	988Mb
STC high priority	0	0.00 Mb

Table 3-26: DV produced in the STC Performance Test.

Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	0.63 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	1396
		size:	1.3 MB
	DAT:		
		#:	1396
		size:	959.4 MB
Science	Sections	#	68

Table 3-27: Data produced in the STC Performance Test.

3.5.5. ME Events

None.

3.5.6. PE Events

None.

3.5.7. Lost Packets

Telecommand Verification:	136	[lost packet(s): 0]
HK Report:	1506	[lost packet(s): 0]
Event/Anomaly Report:	137	[lost packet(s): 0]
STC low Priority:	203154	[lost packet(s): 0]
STC high Priority:	0	[lost packet(s): 0]

Table 3-28: Packets and lost packet report for the STC Functional Test.

3.5.8. Telecommands check

Telecommand Status	#
Accepted	68
Executed	68
Rejected	0
Failed	0

Table 3-29: TCs accepted and executed during the STC Performance Test.

3.5.9. Discussion

The produced output is in line with what is expected.
The details are reported in Table 3-30 with information from section 3.5.3 and 3.5.4.

	Commanded	From TM
Images	1396	1396
Science Sessions	68	68

Table 3-30: Comparison between data commanded and produced during the STC Performance Test.

3.6.VIHI Performance Test

3.6.1. Test Scope

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

3.6.2. Test Execution

Time frame: 2019-11-27T08:40:00.00Z ÷ 2019-11-27T10:15:00.

Table 3-31 reports the initial status of the instrument.

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	OFF	ON

Table 3-31: Status of the instrument before the VIHI Performance Test.

3.6.3. Science

Table 3-32 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	173	15 seconds	Continuous	1.020	16	16
2	174	14.70 seconds	Continuous	1.020	16	16
3	175	15.42 seconds	Continuous	1.020	16	16
4	176	15.20 seconds	Continuous	1.020	16	16
5	179	1 minute and 59.90 seconds	Continuous	2.010	60	60
6	181	1 minute and 59.30 seconds	Continuous	2.025	60	60
7	183	1 minute and 59.82 seconds	Continuous	2.010	60	60
8	185	1 minute and 59.22 seconds	Continuous	2.015	60	60
9	188	2 minutes and 0.34 seconds	Continuous	2.025	60	60
10	190	2 minutes and 0.86 seconds	Continuous	2.010	60	60
11	192	2 minutes and 0.26 seconds	Continuous	2.010	60	60
12	194	1 minute and 59.66 seconds	Continuous	2.010	60	60
13	196	1 minute and 59.06 seconds	Continuous	2.010	60	60
14	200	2 minutes and 0.47 seconds	Continuous	2.010	60	60
15	202	1 minute and 59.87 seconds	Continuous	2.015	60	60
16	204	2 minutes and 0.98 seconds	Continuous	2.015	60	60
17	206	2 minutes and 0.09 seconds	Continuous	2.015	60	60
18	218	14.19 seconds	Continuous	1.020	16	16
19	219	14.90 seconds	Continuous	1.020	16	16
20	220	14.61 seconds	Continuous	1.020	16	16
21	221	15.39 seconds	Continuous	1.020	16	16
22	224	2 minutes and 0.10 seconds	Continuous	2.010	60	60
23	226	1 minute and 59.49 seconds	Continuous	2.025	60	60
24	228	2 minutes and 0.02 seconds	Continuous	2.010	60	60
25	230	1 minute and 59.42 seconds	Continuous	2.015	60	60
26	233	2 minutes and 0.54 seconds	Continuous	2.025	60	60
27	235	1 minute and 59.03 seconds	Continuous	2.010	60	60
28	237	2 minutes and 0.45 seconds	Continuous	2.010	60	60
29	239	1 minute and 59.84 seconds	Continuous	2.010	60	60

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
30	241	1 minute and 59.24 seconds	Continuous	2.010	60	60
31	245	2 minutes and 0.66 seconds	Continuous	2.010	60	60
32	247	2 minutes and 0.06 seconds	Continuous	2.015	60	60
33	249	1 minute and 59.16 seconds	Continuous	2.015	60	60
34	251	2 minutes and 0.27 seconds	Continuous	2.015	60	60
34	---	**54 minutes**	---	---	**1688**	**1688**

Table 3-32: Description of the TC used during VIHI Functional Test.

3.6.4. Data Produced

3.6.4.1. Data Volume

	#Packets	DV
HK	5113	0.32 Mb
VIHI low priority	53520	212.98 Mb
VIHI high priority	0	0 Mb

Table 3-33: Table 2 32: DV produced in the VIHI Functional Test.

3.6.4.2. Output Files

Bundle	Miscellaneous		
File	CSV:		
		#:	2
		size	3.5 MB

Bundle	RAW	HRIC	
File	CSV:		
		#:	1680
		size:	2.4 MB
	DAT:		
		#:	1680
		size:	214.8 MB
Science	Sections	#	34

Table 3-34: 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:	5113	[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 3-35: Packets and lost packet report for the VIHI Functional Test.

3.6.8. Telecommands check

Telecommand Status	#
Accepted	100
Executed	100
Rejected	0
Failed	0

Table 3-36: TCs accepted and executed.

3.6.9. Discussion

Produced output is in line with what expected.
The details are reported in Table 3-37with information from section 3.6.3 and 3.6.4**Errore. L'origine riferimento non è stata trovata.**.

	Commanded	From TM
Images	1680	1680
Science Sessions	34	34

Table 3-37: 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	41m 40s	3	0.17	823.14	0	0	0	0	0	2502	0	0	0	0	0	0	0	0	0	0	0
02	HRIC Performance Test	12m 30s	34	0.07	566.00	0	0	0	0	0	680	0	0	0	0	0	0	0	0	0	0	0
03	STC Functional Test	3m 4s	4	0.58	0	6.51	0	0	0	0	0	183	0	0	0	0	0	1	1	0	0	0
04	STC Performance Test	34m 16s	68	0.13	0	988.00	0	0	0	0	0	1396	0	0	0	0	0	0	0	0	0	0
05	VIHI Performance Test	54m	34	0.32	0	0	212.98	0	0	0	0	0	1680	0	0	0	0	0	0	0	0	0
		2h 25m 30s	143	1.27	1389.14	994.51	212.98	0	0	0	3182	1579	1680	0	0	0	0	1	1	0	0	0

Table 4-1: ICO#2 Summary of all the tests.

	Data Volume [Mb]
HK	1.27
HRIC	1389.14
STC	994.51
VIHI	212.98
	2597.90

Table 4-2: Data volume produced in the ICO#2.