



Rapporti Tecnici INAF INAF Technical Reports

Number	205
Publication Year	2022
Acceptance in OA@INAF	2022-12-09T16:20:07Z
Title	BC-SIM-TR-030 - EGSE ICO#4 Report
Authors	POLITI, ROMOLO, SIMIONI, EMANUELE, ZUSI, MICHELE, CREMONESE, GABRIELE, CAPACCIONI, FABRIZIO, CAPRIA, MARIA TERESA, DORESSOUNDIRAM, ALAIN, PALUMBO, PASQUALE, VINCENDON, MATHIEU
Affiliation of first author	IAPS Roma
Handle	http://hdl.handle.net/20.500.12386/32741 , https://doi.org/10.20371/INAF/TechRep/205

BC-SIM-TR-030

EGSE ICO#4 Report

Romolo Politi¹, Emanuele Simioni², Michele Zusi¹
Gabriele Cremonese², Fabrizio Capaccioni¹, Maria Teresa Capria¹,
Alain Doressoundiram³, Pasquale Palumbo⁴, Mathieu Vincendon⁵

¹INAF- Istituto Astrofisica e Planetologia Spaziali, Via Fosso del Cavaliere 100, 00133, Rome, Italy

²INAF-Osservatorio Astronomico di Padova, Vicolo Osservatorio 5, 35122, Padua, Italy

³Observatoire de Paris - PSL, Laboratoire d'Études Spatiales et d'Instrumentation en Astrophysique (LESIA), 92195 Meudon Cedex, France

⁴Università Parthenope, Centro Direzionale Isola 4, 80133, Naples, Italy

⁵Institut d'Astrophysique Spatiale, CNRS / Université Paris Sud, 91405, Orsay, France



Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
Date	06/12/2022		
Issue	1	Revision	0
Page	2/28		

Index

INDEX	2
1 INTRODUCTION	5
1.1 SCOPE	5
1.2 ACRONYMS	5
1.3 DOCUMENT FORMAT AND REPOSITORY	6
1.4 TEST PLAN	6
1.5 REPORT SCHEMA	6
1.5.1 <i>Data Produced</i>	7
1.5.2 <i>Event Checks</i>	7
1.5.3 <i>PE Events</i>	7
1.5.4 <i>Lost Packets</i>	7
1.5.5 <i>Telecommand Check</i>	8
1.5.6 <i>Test Results</i>	8
2 PREPROCESSING	9
3 ICO#4 RESULTS ANALYSIS	10
3.1 GENERAL CONSIDERATION	10
3.2 HRIC FUNCTIONAL TEST	10
3.2.1 <i>Test Scope</i>	10
3.2.2 <i>Test Execution</i>	10
3.2.3 <i>Science</i>	10
3.2.4 <i>Data Produced</i>	11
3.2.5 <i>ME Events</i>	11
3.2.6 <i>PE Events</i>	11
3.2.7 <i>Lost Packets</i>	11
3.2.8 <i>TC Check</i>	12
3.2.9 <i>Discussion</i>	12
3.3 HRIC PERFORMANCE TEST	13
3.3.1 <i>Test Scope</i>	13
3.3.2 <i>Test Execution</i>	13
3.3.3 <i>Science</i>	13
3.3.4 <i>Data Produced</i>	13
3.3.5 <i>ME Events</i>	14
3.3.6 <i>PE Events</i>	14
3.3.7 <i>Lost Packets</i>	14
3.3.8 <i>TC Check</i>	14
3.3.9 <i>Discussion</i>	14
3.4 STC FUNCTIONAL TEST	15
3.4.1 <i>Test Scope</i>	15
3.4.2 <i>Test Execution</i>	15
3.4.3 <i>Science</i>	15
3.4.4 <i>Data Produced</i>	15
3.4.5 <i>ME Events</i>	16
3.4.6 <i>PE Events</i>	16
3.4.7 <i>Lost Packets</i>	16
3.4.8 <i>TC Check</i>	16
3.4.9 <i>Discussion</i>	16



Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
Date	06/12/2022		
Issue	1	Revision	0
Page	3/28		

3.5	STC PERFORMANCE TEST	17
3.5.1	<i>Test Scope</i>	17
3.5.2	<i>Test Execution</i>	17
3.5.3	<i>Science</i>	17
3.5.4	<i>Data Produced</i>	18
3.5.5	<i>ME Events</i>	18
3.5.6	<i>PE Events</i>	18
3.5.7	<i>Lost Packets</i>	19
3.5.8	<i>TC Check</i>	19
3.5.9	<i>Discussion</i>	19
3.6	VIHI PERFORMANCE TEST	20
3.6.1	<i>Test Scope</i>	20
3.6.2	<i>Test Execution</i>	20
3.6.3	<i>Science</i>	20
3.6.4	<i>Data Produced</i>	20
3.6.5	<i>ME Events</i>	21
3.6.6	<i>PE Events</i>	21
3.6.7	<i>Lost Packets</i>	21
3.6.8	<i>TC Check</i>	22
3.6.9	<i>Discussion</i>	22
3.7	INTERFERENCE TEST	23




Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
Date	06/12/2022		
Issue	1	Revision	0
Page	4/28		

Approval

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

Document Change Record

Issue	Revision	Date	Affected Pages	Change description

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	5/28		

1 Introduction



1.1 Scope

In this document we will describe all the tests performed during the fourth Instrument Checkout (ICO#04) for the Spectrometers and Imagers for MPO BepiColombo Integrated Observatory SYStem (SIMBIO-SYS). The checkout session was performed between December 13th and 14th 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-006-Checkout_04_Test_Summary_Issue_1 (DOI: <https://doi.org/10.20371/INAF/TechRep/204>)
- [RD.2] BC-SIM-TN-003 - Reports and Notes Layout and Flow – Version 2 (DOI: <https://doi.org/10.20371/INAF/TechRep/179>)
- [RD.3] BC-SIM-TR-XXX Technical Report - Software User Manual, in preparation;
- [RD.4] BC-SIM-GAF-IC-002_rev12 - SIMBIO-SYS Software Interface Control Document
- [RD.5] BepiColombo FOP data package 3.1
- [RD.6] BC-ASD-SP-00176_1_4 SIMBIO URD
- [RD.7] BC-SIM-GAF-MA-002 10 001 - SIMBIO-SYS User Manual;
- [RD.8] BC-SIM-TN-006_-_simClean_-_User_Manual (DOI: <https://doi.org/10.20371/INAF/TechRep/103>);
- [RD.9] BC-SIM-TR-023_-_Anomalies_in_the_Packet_sorting (DOI: <https://doi.org/10.20371/INAF/TechRep/176>);
- [RD.10] BC-SIM-TN-007_-_simResort_-_User_Manual (DOI: <https://doi.org/10.20371/INAF/TechRep/184>);

1.3 Attached Document

- [AT.1] ICO04_Events_list 
- [AT.2] ICO04_Command_Stack 

1.4 Acronyms

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

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	6/28		

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#4 test was planned to be executed on two days based on the tests described in [RD.1].

ID	Test Description	Start	Stop
1	HRIC Functional Test	2020-12-14T21:00:00.00Z	2020-12-14T21:28:12.00Z
2	HRIC Performance Test	2020-12-14T21:28:15.00Z	2020-12-14T21:36:00.00Z
3	STC Functional Test	2020-12-14T21:42:00.00Z	2020-12-14T22:19:00.00Z
4	STC Performance Test	2020-12-14T22:20:00.00Z	2020-12-14T22:50:00.00Z
5	VIHI Performance Test	2020-12-14T22:52:00.00Z	2020-12-14T23:14:00.00Z
6	Interference Test	2020-12-14T23:20:00.00Z	2020-12-15T02:42:00.00Z

Table 1-1: Test 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 Table 1-2 and described in the subsections below.

Session #	Session Name
1	Telecommands
2	Data Procedure
3	Events Check

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	7/28		

4	PE Event
5	Lost packets
6	Telecommand Check
7	Discussion

Table 1-2: 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 [RD.3]. 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 events 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.4].

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	8/28		

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 event refers to [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 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 1-3: 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.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	9/28		

2 Preprocessing

The TM file downloaded from the EDDS server has been preprocessed using the simClean tools [RD.8] 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.9], and the data was reprocessed using the module simResort described in [RD.10].

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		10/28	

3 ICO#4 Results Analysis

3.1 General consideration

With reference to Table 3-1, we report the following satisfaction table:

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

Table 3-1: 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: 2020-12-14T21:00:00.00Z ÷ 2020-12-14T21:28:12.00Z

In Table 3-2 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 Functional Test.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	11/28		

3.2.3 Science

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

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	213	6 minutes	Continuous	2.0	180	180
1	---	6 minutes	---	---	180	180

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

Table 3-3 describes the duration and the number of images and frames expected for each TCs commanded during the Functional Test.

3.2.4 Data Produced

3.2.4.1 Data Volume

	#Packets	DV
HK	1334	61.1 kB
HRIC low priority	905	3.0 MB
HRIC high priority	0	0 Bytes

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

3.2.4.2 Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	576.8 kB

Bundle Raw HRIC			
File	CSV		
		#	181
		Size	164.3 kB
File	DAT		
		#	181
		Size	95.1 MB

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

Type of Packets	#	Note
Telecommand Verification	44	[Lost Packet(s) 0]
HK Report	1334	[Lost Packet(s) 0]
Event/Anomaly Report	6	[Lost Packet(s) 0]
HRIC low Priority	905	[Lost Packet(s) 0]

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	12/28		

HRIC high Priority	0	[Lost Packet(s) 0]
--------------------	---	--------------------

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

3.2.8 TC Check

Telecommand Status	#
TC Accepted	22
TC Executed	22
TC Rejected	0
TC Failed	0

Table 3-7: TC report for 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	181	181
Science Sessions	1	1

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

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	13/28		

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: 2020-12-14T21:28:15.000Z ÷ 2020-12-14T21:36:00.000Z

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


Concerning the Science TCs, the following science session has been performed.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	216	9 seconds	Limited	1.0	9	9
2	217	9 seconds	Limited	1.0	9	9
3	218	9 seconds	Limited	1.0	9	9
4	219	9 seconds	Limited	1.0	9	9
5	220	9 seconds	Limited	1.0	9	9
6	221	9 seconds	Limited	1.0	9	9
7	222	9 seconds	Limited	1.0	9	9
8	223	18 seconds	Limited	2.0	9	9
9	224	36 seconds	Limited	4.0	9	9
9	---	1 minute and 57 seconds	---	---	81	81

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

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	216	9 seconds	Limited	1.0	9	9
2	217	9 seconds	Limited	1.0	9	9
3	218	9 seconds	Limited	1.0	9	9
4	219	9 seconds	Limited	1.0	9	9
5	220	9 seconds	Limited	1.0	9	9
6	221	9 seconds	Limited	1.0	9	9
7	222	9 seconds	Limited	1.0	9	9
8	223	18 seconds	Limited	2.0	9	9
9	224	36 seconds	Limited	4.0	9	9
9	---	1 minute and 57 seconds	---	---	81	81

Table 3-10 describes the duration and the number of images and frames expected for each TCs commanded during the Performance Test.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	14/28		

3.3.4 Data Produced

3.3.4.1 Data Volume

	#Packets	DV
HK	38	1.5 kB
HRIC low priority	45446	186.2 MB
HRIC high priority	0	0 Bytes

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

3.3.4.2 Output Files

Bundle Miscellaneous			
File	CSV		
		#	2
		Size	14.9 kB

Bundle Raw HRIC			
File	CSV		
		#	82
		Size	74.5 kB
	DAT		
		#	82
		Size	212.9 MB

Table 3-12: Data produced during the HRIC Performance Test.

3.3.5 ME Events

None.

3.3.6 PE Events

None.


3.3.7 Lost Packets

Type of Packets	#	Note
Telecommand Verification	22	[Lost Packet(s) 0]
HK Report	38	[Lost Packet(s) 0]
Event/Anomaly Report	20	[Lost Packet(s) 0]
HRIC low Priority	45446	[Lost Packet(s) 0]
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 TC Check

Telecommand Status	#
--------------------	---

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	15/28		

TC Accepted	11
TC Executed	11
TC Rejected	0
TC Failed	0

Table 3-14: TC report for the HRIC Performance Test.


3.3.9 Discussion

Produced output is in line with what expected.

The details are reported in Table 3-15 with information from section 3.3.3 and 3.3.4.

	Commanded	From TM
Images	81	81
Science Sessions	9	9

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

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		16/28	

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: 2020-12-14T21:42:00.00Z ÷ 2020-12-14T22:19:00.00Z

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

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 3-16: Instrument status before the STC Functional Test.

3.4.3 Science

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

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	246	20 seconds	Continuous	2.0	11	33
2	247	2 minutes and 10 seconds	Continuous	12.3	11	33
3	248	4.70 seconds	Continuous	0.4	12	60
4	249	23.90 seconds	Continuous	2.05	12	60
5	252	8 minutes and 59.30 seconds	Continuous	2.0	270	270
5	---	12 minutes and 4 seconds	---	---	316	431

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

Table 3-17 describes the duration and the number of images and frames expected for each TCs commanded during the Performance Test.


3.4.4 Data Produced

3.4.4.1 Data Volume

	#Packets	DV
HK	1419	64.8 kB
STC low priority	1767	6.3 MB
STC high priority	0	0 Bytes

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

Bundle Miscellaneous			
File	CSV		

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	17/28		

#	2
Size	619.5 kB

Bundle Raw		STC	
File	CSV	#	431
		Size	396.5 kB
	DAT	#	431
		Size	44.5 MB

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

3.4.5 ME Events

None.

3.4.6 PE Events

None.

3.4.7 Lost Packets

Type of Packets	#	Note
Telecommand Verification	58	[Lost Packet(s) 0]
HK Report	1419	[Lost Packet(s) 0]
Event/Anomaly Report	5	[Lost Packet(s) 0]
STC low Priority	1767	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]

Table 3-20: Packets and lost packet report for the STC Functional Test.

3.4.8 TC Check

Telecommand Status	#
TC Accepted	29
TC Executed	29
TC Rejected	0
TC Failed	0

Table 3-21: TC report for the STC Functional Test.


3.4.9 Discussion

Produced output is in line with what expected.

The details are reported in Table 3-22 with information from section 3.4.3 and 3.4.4.

	Commanded	From TM
Images	431	431
Science Sessions	5	5

Table 3-22: Comparison between data commanded and produced for the STC Functional Test.

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		18/28	

3.5 STC Performance Test

3.5.1 Test Scope

The aim of this test is to acquire the Dark Current in order to study its evolution during the cruise phase and to test the Mitigate strategy to be used in CM to mitigate the DC reset for a long waiting time.

3.5.2 Test Execution

Time Frame: 2020-12-14T22:20:00.00Z ÷ 2020-12-14T22:50:00.00Z.

In Table 3-23 is reported the initial status of the instrument:


INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
ON	OFF	ON	OFF

Table 3-23: Instrument status before the STC Performance Test.

3.5.3 Science

Concerning the Science TCs, the following science session has been performed.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	254	2 minutes and 3 seconds	Limited	12.3	10	30
2	255	2 minutes and 3 seconds	Limited	12.3	10	30
3	256	2 minutes and 3 seconds	Limited	12.3	10	30
4	257	2 minutes and 3 seconds	Limited	12.3	10	30
5	258	4 seconds	Limited	0.45	10	20
6	259	4 seconds	Limited	0.45	10	20
7	260	4 seconds	Limited	0.45	10	20
8	261	4 seconds	Limited	0.45	10	20
9	262	4 seconds	Limited	0.45	10	20
10	263	4 seconds	Limited	0.45	10	20
11	264	4 seconds	Limited	0.45	10	20
12	265	4 seconds	Limited	0.45	10	20
13	266	4 seconds	Limited	0.45	10	20
14	267	4 seconds	Limited	0.45	10	20
15	268	4 seconds	Limited	0.45	10	20
16	269	4 seconds	Limited	0.45	10	20
17	270	7 seconds	Limited	0.78	10	20
18	271	12 seconds	Limited	1.26	10	20
19	272	51 seconds	Limited	5.10	10	20
20	273	1 minute and 39 seconds	Limited	9.9	10	20
21	274	1 minute and 10 seconds	Limited	7.0	10	20
22	275	1 minute and 10 seconds	Limited	7.0	10	20
23	276	1 minute and 10 seconds	Limited	7.0	10	20
24	277	1 minute and 10 seconds	Limited	7.0	10	20
25	278	1 minute and 11 seconds	Continuous	7.0	10	20
26	280	4 seconds	Continuous	0.4	10	50
27	282	1 second	Limited	0.5	2	2
28	283	4 seconds	Continuous	0.4	10	50
29	285	1 second	Limited	0.25	4	4

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	19/28		

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
30	286	4 seconds	Continuous	0.4	10	50
31	288	2 seconds	Limited	0.2	10	10
32	289	4 seconds	Continuous	0.4	10	50
33	291	1 minute and 10 seconds	Limited	7.0	10	30
34	292	1 minute and 10 seconds	Limited	7.0	10	30
35	293	1 minute and 10 seconds	Limited	7.0	10	30
36	294	1 minute and 10 seconds	Limited	7.0	10	30
37	295	1 minute and 10 seconds	Limited	7.0	10	30
38	296	8 seconds	Limited	0.8	10	20
39	297	8 seconds	Limited	0.8	10	20
40	298	20 seconds	Limited	2.0	10	20
41	299	20 seconds	Limited	2.0	10	20
42	300	50 seconds	Limited	5.0	10	20
43	301	50 seconds	Limited	5.0	10	20
44	302	1 minute and 10 seconds	Limited	7.0	10	20
44	---	27 minutes and 42 seconds	---	---	426	1046

Table 3-24: Description of the TC used during STC Functional Test.

Table 3-24 describes the duration and the number of images and frames expected for each TCs commanded during the Performance Test.

3.5.4 Data Produced

3.5.4.1 Data Volume

	#Packets	DV
HK	420	18.6 kB
STC low priority	32874	133.6 MB
STC high priority	0	0 Bytes

Table 3-25: DV produced during the STC Performance Test.

3.5.4.2 Output Files


Bundle Miscellaneous			
File	CSV		
		#	2
		Size	177.4 kB

Bundle Raw STC			
File	CSV		
		#	1035
		Size	952.2 kB
	DAT		
		#	1035
		Size	153.2 MB

Table 3-26: Data produced during the STC Performance Test.

3.5.5 ME Events

None.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	20/28		

3.5.6 PE Events

None.

3.5.7 Lost Packets

Type of Packets	#	Note
Telecommand Verification	98	[Lost Packet(s) 0]
HK Report	420	[Lost Packet(s) 0]
Event/Anomaly Report	60	[Lost Packet(s) 0]
STC low Priority	32874	[Lost Packet(s) 0]
STC high Priority	0	[Lost Packet(s) 0]

Table 3-27: Packets and lost packet report for the STC Performance Test.

3.5.8 TC Check

Telecommand Status	#
TC Accepted	49
TC Executed	49
TC Rejected	0
TC Failed	0


Table 3-28: TC report for the STC Performance Test.

3.5.9 Discussion

Produced output is not in line with what is expected. TC # 4 and 5 (SSC 257 and 258) had 27 and 12 images instead of 30 and 20 images commanded due to incorrect distances between the TCs. The details are reported in Table 3-29 with information from section 3.5.3 and 3.5.4.

	Commanded	From TM
Images	1046	1035
Science Sessions	44	44

Table 3-29: Comparison between data commanded and produced for the STC Performance Test.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	21/28		

3.6 VIHI Performance Test

3.6.1 Test Scope

The test will be devoted to the accurate description and understanding of the Dark Current management.

3.6.2 Test Execution

Time Frame: 2020-12-14T22:52:00.00Z ÷ 2020-12-14T23:14:00.00Z.

In Table 3-30 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 3-30: Instrument status before the VIHI Performance Test.

3.6.3 Science

Concerning the Science TCs, the following science session has been performed.

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	321	3 seconds	Continuous	0.13	24	24
2	322	2.88 seconds	Continuous	0.13	24	24
3	323	2.76 seconds	Continuous	0.13	24	24
4	324	19.64 seconds	Continuous	2.015	12	12
5	327	15.46 seconds	Continuous	2.015	8	8
6	328	19.34 seconds	Continuous	2.015	12	12
7	329	15.16 seconds	Continuous	2.015	8	8
8	330	19.04 seconds	Continuous	2.015	12	12
9	331	14.86 seconds	Continuous	2.015	8	8
9	---	2 minutes and 10 seconds	---	---	132	132

Table 3-31: Description of the TC used during VIHI Functional Test.

Table 3-31 describes the duration and the number of images and frames expected for each TCs commanded during the Performance Test.

3.6.4 Data Produced


3.6.4.1 Data Volume

	#Packets	DV
HK	1274	80.7 kB
VIHI low priority	792	3.2 MB
VIHI high priority	0	0 Bytes

Table 3-32: DV produced during the VIHI Performance Test.

3.6.4.2 Output Files

Bundle Miscellaneous

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		22/28	

File	CSV		
		#	2
		Size	879.0 kB

Bundle Raw VIHI			
File	CSV		
		#	24
		Size	34.5 kB
	DAT		
		#	24
		Size	3.2 MB

Table 3-33: Data produced during the VIHI Performance Test.

3.6.5 ME Events

Severity Level	#
Low Severity Error	11
Medium Severity Error	1
High Severity Error	0

Table 3-34: ME Events occurred during the VIHI Performance Test.

3.6.5.1 Low Severity Error

- 2020-12-14T23:09:43.28672Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:43.43672Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:43.58676Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:43.73678Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:43.88677Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.03677Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.18675Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.33671Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.48664Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.63677Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.
- 2020-12-14T23:09:44.78677Z - TM(5,2) - [APID:807] - Event 40810 - Science rejected From VIHI PE because EOP/EOR not received in time.

3.6.5.2 Medium Severity Error

- 2020-12-14T23:09:44.80677Z - TM(5,3) - [APID:807] - Event 41202 - Stop Science acquisition with VIHI due to persistent ME/PE failure of length/timeout message checks.


3.6.6 PE Events

None.

3.6.7 Lost Packets

Type of Packets	#	Note
Telecommand Verification	62	[Lost Packet(s) 0]
HK Report	1274	[Lost Packet(s) 0]
Event/Anomaly Report	25	[Lost Packet(s) 0]
VIHI low Priority	792	[Lost Packet(s) 0]
VIHI high Priority	0	[Lost Packet(s) 0]

Table 3-35: Packets and lost packet report for the VIHI Performance Test.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	23/28		

3.6.8 TC Check

Telecommand Status	#
TC Accepted	30
TC Executed	21
TC Rejected	0
TC Failed	8

Table 3-36: TC report for the VIHI Performance Test.

3.6.8.1 Failed TC


- 2020-12-14T23:09:46.03463Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 323] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:09:49.03472Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 324] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:10:24.03456Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 326] - Failure ID: 40012 - Recived: Service: 173 SubService: 13
- 2020-12-14T23:11:24.03439Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 327] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:11:44.03465Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 328] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:12:04.03427Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 329] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:12:24.05967Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 330] - Failure ID: 40012 - Recived: Service: 173 SubService: 2
- 2020-12-14T23:12:44.03460Z - TM(1,8) - [APID:801] - Event N/A - Telecommand Executed Failed [APID: 812, Sequence n.: 331] - Failure ID: 40012 - Recived: Service: 173 SubService: 2

3.6.9 Discussion

Produced output is not in line with what expected, it due to the failed TC.
The details are reported in Table 3-29 with information from section 3.5.3 and 3.5.4.

	Commanded	From TM
Images	134	24
Science Sessions	9	1

Table 3-37: Comparison between data commanded and produced for the VIHI Performance Test.

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		24/28	

3.7 Interference test

3.7.1 Test Scope

The aim of this test is to evaluate if and how the cameras (i.e., HRIC and STC) detector reset fluctuations change with respect to the Repetition Time parameter contained in their Science TC. In addition, the test will indicate if the operativity of the VIHI channel influences or not such a fluctuation.

3.7.2 Test Execution

Time Frame: 2020-12-14T23:20:00.00Z ÷ 2020-12-15T02:42:00.00Z

In Table 3-38 is reported the initial status of the instrument:

INSTRUMENT INITIAL STATUS			
ME	HRIC	STC	VIHI
OFF	OFF	OFF	OFF

Table 3-38: Instrument status before the Interference Test.

3.7.3 Science

3.7.3.1 HRIC


ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	335	3 minutes	Continuous	0.5	360	360
2	337	6 minutes	Continuous	1.0	360	360
3	339	9 minutes	Continuous	1.5	360	360
4	341	14 minutes	Continuous	2.0	420	420
5	345	3 minutes	Continuous	0.5	360	360
6	347	6 minutes	Continuous	1.0	360	360
7	349	9 minutes	Continuous	1.5	360	360
8	351	14 minutes	Continuous	2.0	420	420
9	363	3 minutes	Continuous	0.5	360	360
10	365	6 minutes	Continuous	1.0	360	360
11	367	9 minutes	Continuous	1.5	360	360
12	370	14 minutes	Continuous	2.0	420	420
13	375	3 minutes	Continuous	0.5	360	360
14	378	6 minutes	Continuous	1.0	360	360
15	380	9 minutes	Continuous	1.5	360	360
16	383	14 minutes	Continuous	2.0	420	420
16	---	2 hours and 8 minutes	---	---	6000	6000

Table 3-39: Description of the science TC used by HRIC during the Interference Test.

3.7.3.2 STC

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	334	28 minutes	Continuous	2.0	840	840
2	344	28 minutes	Continuous	1.0	1680	1680
3	362	28 minutes	Continuous	2.0	840	840
4	374	28 minutes	Continuous	1.0	1680	1680
4	---	1 hour and 52 minutes	---	---	5040	5040

Table 3-40: Description of the science TC used by STC during the Interference Test.

	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	25/28		

3.7.3.3 VIHI

ID	SSC	Duration	Mode	Repetition Time [s]	Expected Acquisition	Expected Frame
1	361	15 minutes	Continuous	0.5	1800	1800
2	368	15 minutes	Continuous	0.5	1800	1800
3	372	15 minutes	Continuous	0.5	1800	1800
4	376	10 minutes and 30 seconds	Continuous	0.425	1484	1484
4	---	55 minutes and 30 seconds	---	---	6884	6884

Table 3-41: Description of the science TC used by VIHI during the Interference Test.

3.7.4 Data Produced

3.7.4.1 Data Volume

	#Packets	DV
HK	1186	48.7 kB
HRIC low priority	12000	25.2 MB
HRIC high priority	0	0 Bytes
STC low priority	5040	2.9 MB
STC high priority	0	0 Bytes

Table 3-42: DV produced during the Interference Test.

3.7.4.2 Output Files

Bundle Miscellaneous			
File	CSV		
	#	3	
	Size	457.6 kB	

Bundle Raw HRIC			
File	CSV		
	#	6000	
	Size	5.4 MB	
	DAT		
	#	6000	
	Size	791.9 MB	

Bundle Raw STC			
File	CSV		
	#	5040	
	Size	4.6 MB	
	DAT		
	#	5040	
	Size	87.2 MB	

Bundle Raw VIHI			
File	CSV		
	#	0	
	Size	0 MB	
	DAT		
	#	0	
	Size	0 MB	


	Document	BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report		
	Date	06/12/2022		
	Issue	1	Revision	0
	Page	26/28		

Table 3-43: Data produced during the Interference Test.

3.7.5 ME Error

None.

3.7.6 PE Error

None.

3.7.7 Lost Packets

Type of Packets	#	Note
Telecommand Verification	80	[Lost Packet(s) 0]
HK Report	1186	[Lost Packet(s) 0]
Event/Anomaly Report	44	[Lost Packet(s) 0]
HRIC low Priority	12000	[Lost Packet(s) 0]
STC low Priority	5040	[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 3-44: Packets and lost packet report for the Interference Test.

3.7.8 TC Check

Telecommand Status	#
TC Accepted	40
TC Executed	40
TC Rejected	0
TC Failed	0

Table 3-45: TC Report for the Interference Test.

NB: In the list of the accepted and executed TC there are no VIHI TC.

In the Event List there are no information about the TC with SSC 354, VIHI Power On.

3.7.9 Discussion


Produced output is in line with what is expected for the HRIC and STC channels. VIHI has not acquired any images.

The details are reported in the following tables with information from section 3.7.3 and 3.7.4.

3.7.9.1 HRIC

	Commanded	From TM
Images	6000	6000
Science Sessions	16	16

Table 3-46: Comparison between data commanded and produced by HRIC for the Interference Test.

	Document		BC-SIM-TR-XXX - EGSE ICO#4 ReportBC-SIM-TR-XXX - EGSE ICO#4 Report	
	Date		06/12/2022	
	Issue	1	Revision	0
	Page		27/28	

3.7.9.2 STC

	Commanded	From TM
Images	5040	5040
Science Sessions	4	4

Table 3-47: Comparison between data commanded and produced by STC for the Interference Test.

3.7.9.3 VIHI

	Commanded	From TM
Images	6882	0
Science Sessions	4	0

Table 3-48: Comparison between data commanded and produced by VIHI for the Interference Test.

3.7.9.4 Graphical Summary

In the following figure is reported the timeline of the test.

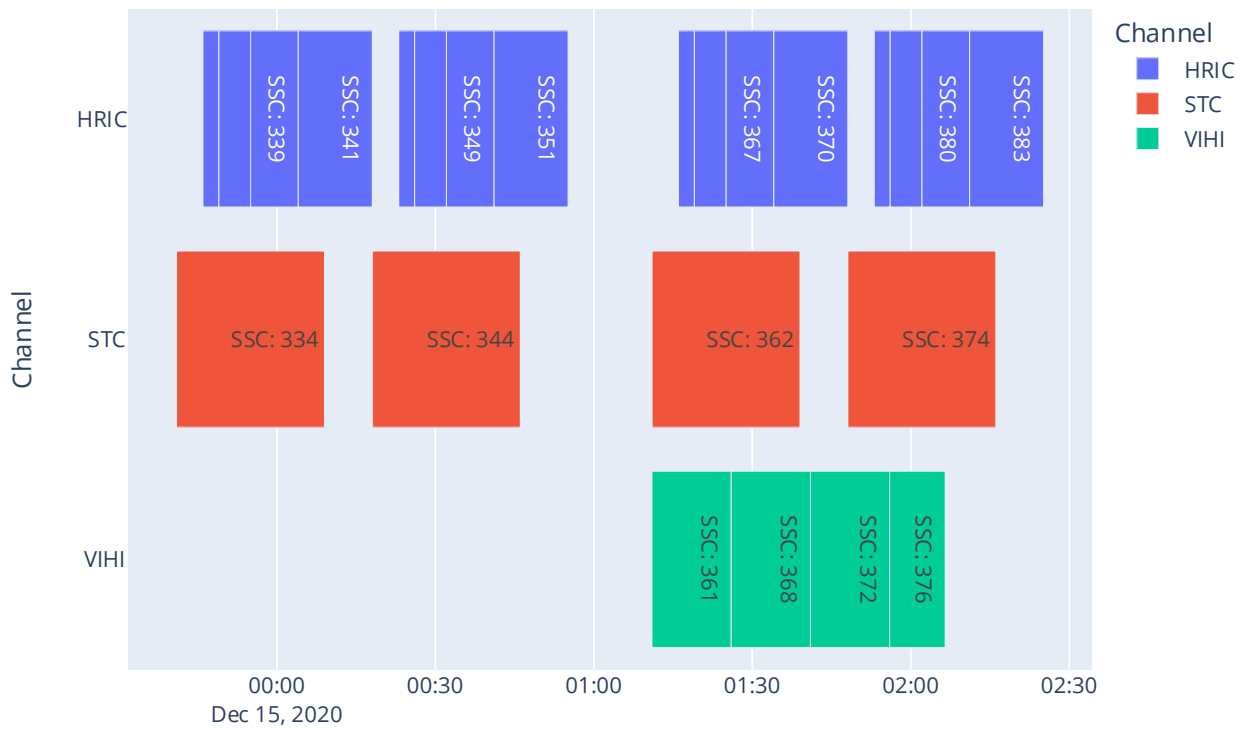


Figure 1: Graphical summary of the Interference Test.



Document	BC-SIM-TR-XXX - EGSE ICO#4 Report		
Date	06/12/2022		
Issue	1	Revision	0
Page	28/28		

4 Summary

ID	Test description	Test Last	Science Sessions	Data from TLM [Mb]							# Images			Failure										
				HK	HRIC LP	STC LP	VIHI LP	HRIC HP	STC HP	VIHI HP	HRIC	STC	VIHI	HRIC			STC			VIHI				
														TC	ME	PE	TC	ME	PE	TC	ME	PE		
01	HRIC Functional Test	6m	1	0.06	3.00	0	0	0	0	0	181	0	0	0	0	0	0	0	0	0	0	0	0	0
02	HRIC Performance Test	1m 57s	9	0.00	186.20	0	0	0	0	0	82	0	0	0	0	0	0	0	0	0	0	0	0	0
03	STC Functional Test	12m 4s	5	0.06	0	6.30	0	0	0	0	0	431	0	0	0	0	0	0	0	0	0	0	0	0
04	STC Performance Test	27m 42s	44	0.02	0	133.6	0	0	0	0	0	1035	0	0	0	0	0	0	0	0	0	0	0	0
05	VIHI Performance Test	2m 10s	9	0.08	0	0	3.2	0	0	0	0	0	24	0	0	0	0	0	0	0	8	12	0	0
06	Interference Test	2h 10m	22	0.04	25.2	2.9	0	0	0	0	6000	5040	0	0	0	0	0	0	0	0	0	0	0	0
		2h 49m 53s	90	0.62	214.4	142.8	3.2	0	0	0.8	6263	6506	24	0	0	0	0	0	0	0	8	12	0	0

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

Data Volume [Mb]	
HK	0.62
HRIC	214.4
STC	142.8
VIHI	3.2
	361.02

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