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SPIRE On-Board Software Verification and Validation Plan/Acceptance Test Plan

Document Ref.: SPIRE-IFS-DOC-001392

Issue: 1.3

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1 Introduction

1.1 Purpose of the document

This document presents the test plan and procedures for the verification and validation of the On-Board Software of the SPIRE instrument at the unit, integration and system level. This test plan deals with all SPIRE OBS components as specified in AD2, except for the Handler of the interface to the Spacecraft CDMS, which is tested under a separate plan (RD1). A subset of this plan will constitute the SPIRE OBS acceptance test plan.

1.2 Acronyms and Glossary

AVM	Avionic Model
BC	Bus Controller
BP	BreakPoint
CDMS	Command and Data Management System
DM	Data Memory (DSP)
DPU	Digital Processing Unit
DSP	Digital Signal Processor
EGSE	Electrical Ground Support Equipment
ESA	European Space Agency
HK	Housekeeping
HW	Hardware
ICE	DSP In-Circuit Emulator
I/F	Interface
IFSI	Istituto di Fisica dello Spazio Interplanetario
NA	Not Applicable
OBS	On-Board Software
PM	Program Memory (DSP)
RAM	Random Access Memory
S/C	Spacecraft
S/S	Subsystem
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TC	Telecommand
TM	Telemetry
VMEC	Virtual Machine Executable Code

1.3 Document List

1.3.1 Applicable Documents

Reference	Name	Number/version/date
AD1	SPIRE OBS User Requirements Document	SPIRE-IFS-PRJ-000444
AD2	SPIRE OBS Software Specifications Document	SPIRE-IFS-PRJ-001036
AD3	Packet Structure Interface Control Document	SCI-PT-ICD-7527
AD4	Herschel/Planck Instrument Data Rates	H-P-1-ASPI-TN-0204
AD5	DPU Switch-on procedure	
AD6	Herschel-Planck CDMS-interface test requirement specifications	SRON-U/HIFI-SP-2000-5

1.3.2 Reference Documents

Reference	Name	Number/version
RD1	DPU/ICU Spacecraft Interface Test Plan	CNR.IFSI.2001TR04
RD2	SPIRE Data ICD	SPIRE-RAL-PRJ-001078
RD3	DRCU/DPU ICD	Sap-SPIRE-CCa-076-02
RD4	Virtual Machine Compiler and Simulator	CNR.IFSI.2003.TR01
RD5	MCU/SCU Command List	LAM/ELE/SPI/011011
RD6	SPIRE OBS User Manual	SPIRE-IFS-PRJ-001391

2 Test Plan

2.1 Test Items

We identify Test Items at the unit, integration and system level. For each test item we list the covered software requirement as per AD2. Any software requirement not referenced in the tables below is meant to be tested by design verification and/or by analysis.

2.1.1 Unit level

At the unit level we identify a test item as a routine, or a group of routines, that perform a specific and self-contained function. At this level the test will only be on the ability of the unit to carry out the task, and not on its ability to do it for all different parameters with which the unit can run. As an example, at unit level the interpretation and execution of commands will be considered tested if for one specific command the OBS performs as expected; the OBS ability to interpret and execute all specified commands (in RD2) will be done at system level.
A list is given below:

Test Item	SP-SR-xxxx covered
TIUL1. TC verification and generation of the acceptance report.	
TIUL2. Identification and execution of DPU commands	
TIUL3. Transmission of commands to the S/Ss via the Low-Speed link	
TIUL4. Reception of S/S parameters via the Low-Speed link	SS4-SS6
TIUL5. Reception of Science Frames from S/Ss	SS9-SS15-SS11-SS12-SS13

TIUL6. Autonomy Functions (N/A in Version 1)	
TIUL7. Event generation (including execution reports)	
TIUL8. Virtual Machine (execution of command lists)	SS8-FU2-FU3-FU4-FU8-FU9-FU11-FU12-FU13
TIUL9. Peak-up (N/A in Version 1)	
TIUL10. S/C-DPU-S/S synchronization	SS2

2.1.2 Integration level

At the integration level we identify a test item as a specific task; a task handles different functions. A list is given below:

Test Item	**SP-SR-xxxx covered**
TIIL1. Command sequencing.	
TIIL2. Request, reception and packing of HK parameters	TM18
TIIL3. Reception and packing of science data	
TIIL4. HK Monitoring (N/A in Version 1)	
TIIL5. TC packet reception	SC1-SC2-SC9-SC15-SC16-SC17-SC18-SC19-MM21
TIIL6. TM packet transmission	SC1-SC2-SC3-SC4-SC5-SC6-SC7-SC8-SC21-SC22-SC23-SC25-SC26-SC27-SC28-SC29-SC32-MM17-SC33-SC34-MM6-MM18

2.1.3 System level

The first item to be tested at system level is the ability to load and execute the OBS either from the EEPROM, and via TCs u.plinked via the 1553 bus. At the system level we also have a set of test items that deal with the correct inter-task communication (Data & Controls flow). Finally, at the system level we also identify as a test item the ability to perform the services specified in AD3 and required from the OBS according to AD1.

Test Item	**SP-SR-xxxx covered**
TISL1. Switch-on	
TISL2. TMTC ←→ CMD_SEQ	MM17-MM21
TISL3. CMD_SEQ ←→ LS	
TISL4. HK_ASK ←→ LS	
TISL5. HK_ASK ←→ TMTC	MM17
TISL6. HS ←→ TMTC	MM17
TISL7. HK_MONITOR ←→ Autonomy (N/A in Version 1)	
TISL8. Autonomy ←→ LS (N/A in Version 1)	
TISL9. VMs ←→ LS	SS8
TISL10. Telecommand Verification	TM2-TC4-TC5-TC6-TC7-TC8-SY6-MM22-TC9-TC10-TC11-

	TM1-SC31
TISL11. Housekeeping Data Reporting	TM3-TM4-TM6-TM9-TM10TM11-TM12-TM13-MM10-SS2-SY6-TC9-TC10-TC11-TM1-SC31
TISL12. Memory Management	MM2-SY6-MM6-MM7-MM8-MM9-MM10-MM11-TC9-TC10-TC11-TM1-SC31
TISL13. Function Management	SY6-TC9-TC10-TC11-TM1-SC31
TISL14. Event Reporting	SY6-TC9-TC10-TC11-TM1-SC31
TISL15. Packet Transmission Control	SY6-TC9-TC10-TC11-TM1-SC31
TISL16. Time Management	SY6-SY7-TC9-TC10-TC11-TM1-SC31
TISL17. Science Data Transfer	SY6-SS10-TM15-TM16-TM17-TM19-MM14-MM15-TC9-TC10-TC11-TM1-SC31
TISL18. Test Service	SY6-TC9-TC10-TC11-TM1-SC31
TISL19. TM Packet Transmission at Nominal Rate	TM20

2.2 Test Deliverables

The items that will be delivered at the end of tests are:

1. Test procedures
2. Test report

2.3 Testing Tasks

These are the tasks needed to prepare and carry out the tests:

1. Preparation of a SPIRE specific MIB for SCOS2000 to be able to generate all TC packets needed for the OBS tests, and to open and interpret HK and Event TM packets
2. Upload the compiled OBS to the DPU
3. Prepare SW tools to perform open science TM packets
4. Execute the tests and compile the test report

2.4 Environmental Needs

The following equipment must be available in order for the complete tests to be carried out:

1. DRCU SW simulator
2. EGSE, complete of:
    a. SCOS2000
    b. Router
    c. CDMS simulator
3. Support SW Tools:

a. ObswLoader script resident on the SCOS2000 computer, used to uplink the series of TC (6,2) commands with the image of the OBS executable. Loading procedure is described in RD6.
b. PacketDisplay tool to list and display in real time all the TC and TM packets flowing between the DPU and SCOS2000. It connects to the SCOS Router and so it can be run on any machine connected to the network.
c. LoadTable TCL script to read an ASCII table, generate and send a complete "Update_Table" TC . The script will be resident on the SCOS computer and will be run from the TOPE environment.
d. CRC program to compute the CRC checkword from a series of data words. It will be resident on any machine.

4. DSP development system, complete of:
   a. ADI C Compiler
   b. DSP21020 Emulator
   c. Licensed VIRTUOSO system

In case only the acceptance tests are carried out, only items 1, 2 and 3 will be needed.

2.5 Test case pass/fail criteria

Test criteria are based on the direct inspection Science, Event and HK TM Packets received by the EGSE. DTST will be used to inspect Science TM packets which SCOS2000 does not open. In case a test item has to be verified before the transmission of a TM packet, the evaluation criteria will be based on the direct inspection of the DSP DM.

3 Test case specifications

3.1 SWITCH_ON

The purpose is to demonstrate the ability of the OBS to correctly initialize and start-up under all foreseen conditions according to the procedure outlined in AD5.

3.1.1 Test Items

TISL1.

3.1.2 Input Specifications

The input to this test case will be two TC(8,4) specified in AD5 to tell the Boot Software to start the OBS. These commands are:

TC Code	Description
TC8.4.70-3.1	*Force_Boot* TC. This TC is interpreted by the Boot Software; it forces the OBS image currently in PM to start. The format is that of a generic (8,4) TC with the following parameters: • One 16-bits word = 0

TC8.4.70-2.1	*Load_TC_and_Boot* TC. This TC is interpreted by the Boot Software; it copies the OBS image from DM to PM and starts it. The format is that of a generic (8,4) TC with the following parameters: • One 16-bits word = 0

In addition, the OBS executable shall be available on the SCOS2000 computer as a set of standard TCs (6,2).

3.1.3 Output specifications

None

3.1.4 Environmental needs

The procedure to load the OBS via TCs from SCOS2000, as described in RD6, will be available on the SCOS2000 computer.

3.2 SAT_TFL

The purpose is to demonstrate that the OBS correctly implements the TM/TC packet transfer protocol as specified in AD3. The testing will be executed along the guidelines for testing the Satellite Data Bus Protocol outlined in AD6. In particular the testing for the TC reception and TM dispatch will verify: i) the correct usage of SAs, ii) the correct interpretation/usage of TC PTD and TM PTR, iii) the correct conversion TC_messages ==> TC_Packet and TM_Packet ==> TM_messages. All 1553 message timing issues (when the various messages are being sent) are BC business and will not be tested here.

3.2.1 Test Items

TIIL5, TIIL6.

3.2.2 Input specifications

The input to this test case is TeleCommand TC6.2.1 (see test case DPU_MEM below). The TC will have all “ack” bits set to 1 in the packet header according to specifications of AD3.

3.2.3 Output specifications

The output of this test case will consist of the HK packets generated by the OBS.

3.2.4 Environmental needs

The TC will reside in SCOS2000 or on the CDMS Simulator.

3.3 DPU_COMMAND_EXEC

The purpose is to demonstrate the link S/C-DPU by verifying the:

a) Reception, validation and interpretation of TCs
b) Command identification and execution
c) Verification reporting

3.3.1 Test Items

TIUL1, TIUL2, TIIL5, TIIL6, TISL2, TISL10, TISL16, TISL18.

3.3.2 Input specifications

The input to this test case is a set of TCs built according to AD3, and requiring specific functions to be performed by the DPU. For this first test case this set shall be limited to self-contained commands that do not affect units not tested in this test case. Some of the TCs will contain invalid fields (e.g., APID etc.); if SCOS2000 is unable to send invalid packets, those packets will have to available as HEX text files in the CDMS simulator. The set of TCs is specified below:

TC Code	Description
TC17.1.1	*Perform Connection Test* standard TC
TC17.1.2	Same as TC17.1.1, but with an incorrect APID of 0x300
TC17.1.3	Same as TC17.1.1, but with an incorrect packet length of 0xA
TC17.1.4	Same as TC17.1.1, but with an incorrect checksum of 0x1111
TC17.1.5	Same as TC17.1.1, but with an incorrect packet type of 0x1
TC17.1.6	Same as TC17.1.1, but with an incorrect packet subtype of 0xA
TC17.1.7	Same as TC17.1.1, but with the “ack” bits in the TC header set to ‘0000B’
TC17.1.8	Same as TC17.1.1, but with the “ack” bits in the TC header set to ‘0001B’
TC17.1.9	Same as TC17.1.1, but with the “ack” bits in the TC header set to ‘0010B’
TC17.1.10	Same as TC17.1.1, but with the “ack” bits in the TC header set to ‘1000B’
TC9.7.1	*Enable Time Verification* standard TC
TC14.3.1	*Report Enabled Telemetry Packets* standard TC

TC packets from TC17.1.2 to TC17.1.6 will be sent as local commands from the CDMS simulator because SCOS cannot send packets with deliberately wrong header. All the others will be generated from SCOS2000. The TCs will have all “ack” bits set to 1 in the packet header according to specifications of AD3.

3.3.3 Output specifications

The output for this test case will consist in TM packets normally expected for the input TCs.

3.3.4 Environmental needs

None.

3.4 DPU_MEM

The purpose is to demonstrate the ability to load, check and dump memory areas resident on the DPU. This will be done by absolute (via Service 6) and relative (via dedicated functions with

Service 8) addresses in memory. The ability to write the image of the OBS from the PM into the EEPROM and to start again the OBS will also be tested here.

3.4.1 Test Items

TISL12, TISL13.

3.4.2 Input specifications

A set of TCs will be available. The TCs will have all "ack" bits set to 1 in the packet header according to specifications of AD3.

TC Code	Description
TC6.2.1	*Memory Load* standard TC. Application data is structured according to RD2 with the following parameter values: • Memory_ID = 0 (PM) • Start_Address = 0x12000 • NSAU = 15 • 15 data words all = 0xA5A5
TC6.2.2	Same as TC6.2.1, but an incorrect Memory_ID = 4
TC6.2.3	Same as TC6.2.1, but an incorrect Start_Address = 0x80000
TC6.2.4	Same as TC6.2.1, but with Start_Address = 0x7FFF0, NSAU = 0x10 and 48 data words
TC6.2.5	Same as TC6.2.1, but with an incorrect number of 20 data words
TC6.2.6	Same as TC6.2.1, but an incorrect Application Data CRC of 0x1111
TC6.5.1	*Memory Dump* standard TC. Application data is structured according to RD2 with the following parameter values: • Memory_ID = 0 (PM) • Start_Address = 0x12000 • NSAU = 15
TC6.9.1	*Memory Check* standard TC. Application data will be as in RD2 with the following parameter values: • Memory_ID = 0 (PM) • Start_Address = 0x12000 • NSAU = 15
TC8.4.1-1.1	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x30 • Length = 0x32 (in units of 32-bit words)
TC8.4.1-1.2	Same as TC8.4.1-1.1, but with Function_ID of 0xE0
TC8.4.1-1.3	Same as TC8.4.1-1.1, but with Activity_ID of 0xA
TC8.4.1-1.4	Same as TC8.4.1-1.1, but with Table_ID of 0x200
TC8.4.1-1.5	Same as TC8.4.1-1.1, but with Length = 0xFFFF
TC8.4.1-1.6	Same as TC8.4.1-1.1, but with Table_ID = 0x31 and Length = 0xFFFF
TC8.4.1-1.7	Same as TC8.4.1-1.1, but with Table_ID = 0x71 and Length = 0x50
TC8.4.1-1.8	Same as TC8.4.1-1.1, but with Table_ID = 0x72 and Length = 0x50
TC8.4.1-1.9	Same as TC8.4.1-1.1, but with Table_ID = 0x73 and Length = 0x50

TC8.4.1-1.10	Same as TC8.4.1-1.1, but with Table_ID = 0x72 and Length = 0
TC8.4.1-2.1	*Report Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x30 • Index = 0 • Length = 0x32
TC8.4.1-2.2	Same as TC8.4.1-2.1, but with Table_ID = 0x7F (the MOAT – see AD2), Index = 0 and Length = 0 (all the table)
TC8.4.1-3.1	*Update Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x30 • Index = 0 • Length = 0x32 • 50 32-bit words with pattern 0xA5A55A5A
TC8.4.1-3.2	Same as TC8.4.1-3.1, but with Table_ID = 0x33
TC8.4.1-3.3	Same as TC8.4.1-3.1, but with Index = 0x64
TC8.4.1-3.4	Same as TC8.4.1-3.1, but with Length = 0x40
TC8.4.1-3.5	Same as TC8.4.1-3.1, but with Length = 0x33 and 51 data words
TC8.4.1-3.6	Same as TC8.4.1-3.1, but with Table_ID = 0x71, Index = 0, length =0x50 and 80 data words all = 1
TC8.4.1-3.7	Same as TC8.4.1-3.1, but with Table_ID = 0x72, Index = 0, length =0x50 and 80 data words all = 2
TC8.4.1-3.8	Same as TC8.4.1-3.1, but with Table_ID = 0x73, Index = 0, length =0x50 and 80 data words all = 3
TC8.4.1-4.1	*Collect_Garbage* standard TC.
TC8.4.CA-7.1	*Write2EEPROM* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Start Address = 0x4000 • End Address= 0x12000
TC8.4.70-3.1	*Force_Boot* standard TC.

3.4.3 Output specifications

The output will consist of the set of TM packets expected in response to input TCs.

3.4.4 Environmental needs

The required set of input TCs will reside in SCOS2000 or on the CDMS Simulator. At the OBS start-up, packets generation will be enabled for all APIDs.

3.5 HK_COLLECT

The purpose is to test the DPU-S/S chain by demonstrating the collection and transmission of HK packets. The ability to support the TM transmission retry at packet level will also be tested here.

3.5.1 Test Items

TIUL4, TIUL10, TIIL2, TIIL6, TISL4, TISL5, TISL11, TISL12, TISL16, TISL19.

3.5.2 Input specifications

A set of TCs will be available. The TCs will have all “ack” bits set to 1 in the packet header according to specifications of AD3.

TC Code	Description
TC8.4.1-1.10	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 2 • Length = 0x14
TC8.4.1-1.11	Same as TC8.4.1-1.10 but with Table_ID = 3
TC8.4.1-1.12	Same as TC8.4.1-1.10 but with Table_ID = 4
TC8.4.1-1.13	Same as TC8.4.1-1.10 but with Table_ID = 0 and length = 0
TC8.4.1-3.10	*Update Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 2 • Index = 0 • Ndata = 0x14 (in units of 32-bit words) • 40 16-bit data words which will represent 20 HK collection commands (TBD)
TC8.4.1-3.11	Same as TC8.4.1-3.10 but with Table_ID = 3 and a different set of HK collection commands (TBD)
TC8.4.1-4.10	*Collect_Garbage* standard TC.
TC8.4.CA-1.1	*Reset_DRCU_Counter* standard TC.
TC8.4.CA-5.1	*Send_DRCU_Command* standard TC.
TC8.4.CC-1.1	*Define New Housekeeping Parameter Report* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • HKPCKTID = 0x302 • HKSID = 0x302 • HKINTERVAL = 1000 • TABLE_ID = 2
TC8.4.CC-1.2	Same as TC8.4.CC-1.1, but with HKPCKTID = 0x303, HKSID = 0x303 and Table_ID = 3
TC8.4.CC-1.3	Same as TC8.4.CC-1.1, but with HKPCKTID = 0x304
TC8.4.CC-1.4	Same as TC8.4.CC-1.1, but with HKINTERVAL = 5
TC8.4.CC-1.5	Same as TC8.4.CC-1.1, but with HKSID = 0x028
TC8.4.CC-1.6	Same as TC8.4.CC-1.1, but with HKPCKTID = 0x302 and TABLE_ID = 3
TC8.4.CC-1.7	Same as TC8.4.CC-1.1, but with HKPCKTID = 0x303
TC8.4.CC-2.1	*Clear Housekeeping Parameter Report Definition* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters:

	• HKPCKTID = 0x302
TC8.4.CC-2.2	Same as TC8.4.CC-2.1, with HKPCKTID = 0x303
TC8.4.CC-2.3	Same as TC8.4.CC-2.1, with HKPCKTID = 0x300
TC8.4.CC-2.4	Same as TC8.4.CC-2.1, with HKPCKTID = 0x301
TC8.4.CC-3.1	Report Housekeeping Parameter Report Definition standard TC with the following parameter: • HKPCKTID = 0x300
TC8.4.CC-3.2	Report Housekeeping Parameter Report Definition standard TC with the following parameter: • HKPCKTID = 0x301
TC8.4.CC-3.3	Report Housekeeping Parameter Report Definition standard TC with the following parameter: • HKPCKTID = 0x302
TC8.4.CC-3.4	Report Housekeeping Parameter Report Definition standard TC with the following parameter: • HKPCKTID = 0x303
TCTest.1	*Perform Activity of Function* standard TC with function ID = 0xCB and activity ID = 0x01. This TC is used to force a wrong CRC to be attached to a TM packet being dispatched.

3.5.3 Output specifications

The output for this test case will consist in TM packets containing the HK data.

3.5.4 Environmental needs

The DRCU Simulator will be connected to the DPU. The structure of the HK packets will be defined in SCOS2000 so that the packets can be opened and checked. Alternatively, DTSTs will have to be used. At the OBS start-up, packets generation will be enabled for all APIDs, and the default HK and Diagnostic packet structure will be defined on-board. It is assumed that the DRCU simulator will conform to RD3 in its ability to identify and execute commands. The DRCU simulator will allow on-the-fly modification of any HK parameter, without having to stop and restart its software.
A 1553 buslist without “Time Sync” subframes will be available on the CDMS simulator.

3.6 VM

The purpose is to demonstrate that all Virtual Machines described in RD4 and available in the OBS as specified in AD2, can execute in a timely fashion command lists. It will also be shown that all VMs can run in parallel without interfering with one another; this is a potential risk since all VMs use the same interface to send commands and receive parameters from the DRCU.

3.6.1 Test Items

TIUL8, TISL12, TISL13.

3.6.2 Input Specifications

The following set of TCs will be available. The TCs will have all "ack" bits set to 1 in the packet header according to specifications of AD3.

TC Code	Description
TC8.4.1-1.20	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x20 • Length = *length of GET_HK_PAR1*
TC8.4.1-1.21	Same as TC8.4.1-1.20, but with: • Table_ID = 0x21 • Length = *length of GET_HK_PAR2*
TC8.4.1-1.22	Same as TC8.4.1-1.20, but with: • Table_ID = 0x22 • Length = *length of GET_HK_PAR3*
TC8.4.1-1.23	Same as TC8.4.1-1.20, but with: • Table_ID = 0x28 • Length = *length of GET_HK_PAR4*
TC8.4.1-1.24	Same as TC8.4.1-1.20, but with: • Table_ID = 0x29 • Length = *length of DO_NOTHING*
TC8.4.1-1.25	Same as TC8.4.1-1.20, but with: • Table_ID = 0 • Length = 0
TC8.4.1-3.20	*Update Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x20 • INDEX = 0 • NDATA = *length of VME GET_HK_PAR1* • DATA = VME GET_HK_PAR1
TC8.4.1-3.21	Same as TC8.4.1-3.20, but with: • Table_ID = 0x21 • NDATA = *length of VME GET_HK_PAR2* • DATA = VME GET_HK_PAR2
TC8.4.1-3.22	Same as TC8.4.1-3.20, but with: • Table_ID = 0x22 • NDATA = *length of VME GET_HK_PAR3* • DATA = VME GET_HK_PAR3
TC8.4.1-3.23	Same as TC8.4.1-3.20, but with: • Table_ID = 0x28 • NDATA = *length of VME GET_HK_PAR4* • DATA = VME GET_HK_PAR4
TC8.4.1-3.24	Same as TC8.4.1-3.20, but with: • Table_ID = 0x29 • NDATA = *length of DO_NOTHING*

	• DATA = VME DO_NOTHING
TC8.4.1-4.20	*Collect_Garbage* standard TC.
TC8.4.2-1.1	*Execute Command List* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Length = *length of VME ACQ_PHT* Data field contains VME ACQ_PHT
TC8.4.3-2.1	*Run_VM1* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x20 • Index = 0 • N = TBD
TC8.4.4-2.1	*Run_VM2* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x21 • Index = 0 • N = TBD
TC8.4.5-2.1	*Run_VM3* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x22 • Index = 0 • N = TBD
TC8.4.3-3.1	*Halt_VM1* standard TC as specified in RD2
TC8.4.4-3.1	*Halt_VM2* standard TC as specified in RD2
TC8.4.5-3.1	*Halt_VM3* standard TC as specified in RD2
TC8.4.2-2.1	*Run_VM* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x28 • Index = 0 • N = 0
TC8.4.2-3.1	*Halt_VM* standard TC as specified in RD2
TC8.4.CC-2.1	*Clear Housekeeping Parameter Report Definition* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: HKPCKTID = 0x300
TC8.5.2.1	*Report_Function_Status* standard TC with Function_ID = 2 (Hard VM)
TC8.5.3.1	*Report_Function_Status* standard TC with Function_ID = 3 (Soft VM1)
TC8.5.4.1	*Report_Function_Status* standard TC with Function_ID = 4 (Soft VM2)
TC8.5.5.1	*Report_Function_Status* standard TC with Function_ID = 5 (Soft VM3)

The following set of VMEs will be available:

VME Code	**Pseudo-Code**
GET_HK_PAR1	• *While (1)* o *For I=0,49* ▪ *Reserve LS port* ▪ *Wait 2 msec*

	▪ *GetTestPar1* (DCU Get command, CID 0x7FA) ▪ *Wait 2 msec* ▪ *Release LS port* ▪ *If (parameter != 0x7FA) Generate_Event (5,1) with error code 0x50C* ▪ *Wait 10 msec* o *Wait (1 second)*
GET_HK_PAR2	• *While (1)* o *For I=0,49* ▪ *Reserve LS port* ▪ *Wait 2 msec* ▪ *GetTestPar2* (MCU Get command, CID 0x7FB) ▪ *Wait 2 msec* ▪ *Release LS port* ▪ *If (parameter != 0x7FB) Generate_Event (5,1) with error code 0x50C* ▪ *Wait 10 msec* *Wait (1 second)*
GET_HK_PAR3	• *While (1)* o *For I=0,49* ▪ *Reserve LS port* ▪ *Wait 2 msec* ▪ *GetTestPar3* (SCU Get command, CID 0x7FC) ▪ *Wait 2 msec* ▪ *Release LS port* ▪ *If (parameter != 0x7FC) Generate_Event (5,1) with error code 0x50C* ▪ *Wait 10 msec* • *Wait (1 second)*
GET_HK_PAR4	• *While (1)* o *For I=0,49* ▪ *Reserve LS port* ▪ *Wait 2 msec* ▪ *GetTestPar4* (DCU Get command, CID 0x7FD) ▪ *Wait 2 msec* ▪ *Release LS port* ▪ *If (parameter != 0x7FD) Generate_Event (5,1) with error code 0x50C* ▪ *Wait 10 msec* • *Wait (1 second)*
DO_NOTHING	• *For i=0,29* o *Do nothing* o *Wait 1 second* • *Send a TM(1,7) packet to signal completion of procedure.*
ACQ_PHT	• *SetDataMode (00000)* • *SetFrameNber (0xFF)* • *SetStartFrame (1)* • *Wait (5 seconds)*

	• *SetStartFrame (0)* • *Flush FIFOs*

The DRCU commands *GetTestPar1, GetTestPar2 and GetTestPar3* will be custom generated on the DRCU simulator. The CIDs listed in the table above are not used for any of the commands specified in RD3 and RD5. The output buffers of the DRCU simulator will be configured so that the parameters sent in response to the above commands will be identical to the CID; no HK parameter returned in response to standard HK requests will contain any of those values.

3.6.3 Output specifications

Output for this test case will consist of standard HK packets.

3.6.4 Environmental needs

The required set of input TCs will reside in SCOS2000 or on the CDMS Simulator. The DRCU Simulator will be connected to the DPU. A Logic State Analyser will also be used to monitor the GATE lines of the three cables going from the DPU to the DRCU simulator; this will provide evidence of the HK parameter requests traffic on the LS port.

3.7 SPIRE_ICD

The purpose is to demonstrate the reception (from S/Ss), control, packing and transmission (to S/C) of science frames. It will be shown that acquisition of science frames can be initiated by standard TCs. The execution of particular commands will allow testing of other OBS features like the Telemetry Packet Control, the Time Management, the Report Function Status and the "arm-go" feature for the commands to engage/release the launch safety latch of the SPIRE spectrometer mechanisms.

3.7.1 Test Items

TIUL5, TIIL3, TIIL6, TISL6, TISL13, TISL15, TISL16, TISL17, TISL19.

3.7.2 Input specifications

The following set of TCs will be available. The TCs will have all "ack" bits set to 1 in the packet header according to specifications of AD3.

TC Code	Description
TC8.4.1-1.30	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x30 • Length = 0x36
TC8.4.1-1.31	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x31 • Length = 0x36

TC8.4.1-1.32	*Set Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x32 • Length = 0x40
TC8.4.1-3.30	*Update Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x30 • INDEX = 0 • NDATA = 0x36 • DATA = 54 32-bit data words all = 1, but those from the 22nd to the 32nd that will be = 0.
TC8.4.1-3.31	*Update Table* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Table_ID = 0x31 • INDEX = 0 • NDATA = 0x36 • DATA = 54 32-bit data words = 1, but the 4th which will be = 2.
TC8.4.CA-10.1	*Enable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x4 • SELSID = 0xC1A0 • TABLEID = 0x30
TC8.4.CA-10.2	*Enable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x4 • SELSID = 0xC1A0 • TABLEID = 0x31
TC8.4.CA-10.3	*Enable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x4 • SELSID = 0xC1A0 • TABLEID = 0x32
TC8.4.CA-10.4	*Enable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x4 • SELSID = 0xC1A0 • TABLEID = 0x33
TC8.4.CA-10.5	*Enable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x44 • SELSID = 0xC1A0 • TABLEID = 0x30
TC8.4.CA-11.1	*Disable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • FRAMEID = 0x04
TC8.4.CA-11.2	*Disable_Selection* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters:

	• FRAMEID = 0x44
TC8.5.CA.1	*Report_Function_Status* standard TC. Application data will be structured as specified in RD2 and will contain the following parameters: • Function_ID = 0xCA
TC8.4.C1-1.1	*Set Observation ID* standard TC. Application data will be structured as specified in RD2 and will contain the following 2 data words: 0xA5A5, 0x5A5A
TC8.4.C1-2.1	*Set Building Block ID* standard TC. Application data will be structured as specified in RD2 and will contain the following 2 data words: 0x1212, 0x2121
TC8.4.C1-3.1	*Set Observing Mode* standard TC. Application data will be structured as specified in RD2 and will contain the data words: 0xC1C1
TC8.4.C1-4.1	*Set Observation Step* standard TC. Application data will be structured as specified in RD2 and will contain the data word: 0x1
TC8.4.C1-4.4	*Synchronize DRCU Counters* standard TC as in RD2
TC8.4.CA-2.1	*Flush_FIFO* standard TC. The parameter will be 0xf000 to flush all FIFOs
TC8.4.CA-5.1	*Send DRCU Command* standard TC as in RD2. The command takes as parameter the 32-bits command word to be sent to the S/S; the parameter will be specified in the test procedure.
TC8.4.CA-6.1	*Reset_FIFOs* standard TC.

TC14.1.1	*Enable Generation of Telemetry Packets* standard TC. Application data will as specified in AD3 with the following parameters:
	• N=3
	• 1st block
	  o Type = 21
	  o Subtype = 1
	  o SID = 0x200
	• 2nd block
	  o Type = 21
	  o Subtype = 1
	  o SID = 0xA20
	• 3rd block
	  o Type = 3
	  o Subtype = 25
	  o SID = 0x300

TC14.2.1	*Disable Generation of Telemetry Packets* standard TC. Application data will as specified in AD3 with the following parameters:
	• N=3
	• 1st block
	  o Type = 21
	  o Subtype = 1
	  o SID = 0x200
	• 2nd block
	  o Type = 21
	  o Subtype = 1
	  o SID = 0xA20

TC14.2.2	Same as TC14.2.1, but with: • N=1 • Type = 3

	• Subtype = 25 • SID = 0x300
TC14.3.1	*Report Enabled Telemetry Packets* standard TC.
TC8.1.10.1	*Enable_SMEC_Latch* Standard TC.
TC8.4.10-1.1	*Engage_Latch* standard TC.
TC8.4.10-ff.1	*Release_Latch* standard TC.
TC8.4.CA-9.1	*Reset_DPU* standard TC.

3.7.3 Output specifications

The output for this test case will consist of science and event TM packets that will be opened using a DTST. HK Packets will be accessed via SCOS2000 to check, via inspection of relevant HK parameters that the expected sequence of actions has been performed as expected.

3.7.4 Environmental needs

The required set of input TCs will reside in SCOS2000 or on the CDMS Simulator. The DRCU Simulator will be connected to the DPU. At the OBS start-up, packets generation will be enabled for all APIDs, and the default HK packet structure will be defined on-board.
Custom commands should be created in the DRCU simulator, one per subsystem, with CIDs 0x7FA, 0x7FB and 0x7FC. The returned parameters will be set equal to CID, making sure that these values are not returned by the DRCU simulator for any of the standard DRCU commands.
A DTST tool consisting in a TCL script to load an ASCII table and create an “Update_Table” TC(8,4) will be available in SCOS2000.

4 Test Procedures

The start/stop/debug functionalities for the OBS on the DPU during these tests are managed from a PC using the DSP In-Circuit Emulator software. In case SCOS2000 can be used to send TC packets, it is assumed that full chain SCOS2000+Router+CDMS Simulator is operational.

4.1 TP0

This procedure executes test case SWITCH_ON. Procedure steps that will be repeated as part of the acceptance tests are lightly shaded.

Step #	Action	Pass/Fail	Test Item
1	Switch-on the DPU. At this point the Boot Software loads the OBS image from the EEPROM to PM. After completion, the Boot SW stops.	An event TM (5,2) should be received by SCOS2000. The last word before the CRC of the received packet should be 0 (no errors).	
2	Send TC8.4.70-3.1 to start the OBS.	Both essential and nominal HK TM packets TM (3,25) should be received by SCOS2000	
3	Switch-off the DPU.		
4	Repeat step 1		
5	Run the **ObswLoader** script (see 3.a in §2.4)	Verify that no TM (5,2) or TM(5,4) are received.	
6	Send TC8.4.70-2.1 to copy the OBS image from DM to PM and start the OBS.	Both essential and nominal HK TM packets TM (3,25) should be received by SCOS2000	TISL1

4.2 TP1

This test procedure executes test case SAT_TFL. Procedure steps that will be repeated as part of the acceptance tests are lightly shaded. OBS loading is performed via ICE; OBS run/stop/restart functions, as well as the setting of breakpoints and memory inspection, are performed using the ICE in CBUG mode, for which the PC hosting the ICE and the DPU will have to be connected with the JTAG probe; these steps will not be repeated at acceptance because the test equipment needed will not be available at the delivery sites.

Step #	Action	Pass/Fail	Test Item
1	Open VIRTUOSO project file in directory where the code resides.		
2	Assign the HK_ASK task to the EXE_NOBOOT group and compile the OBS		

3	Load the OBS in the DPU. Press Ctrl^C on the ICE.		
4	Set a breakpoint in the OBS at the point when the OBS realizes that a new TC has been sent by the CDMS.		
5	Start the CDMS. Start the OBS.		
6	Send TC6.2.1		
7	OBS stops at breakpoint.		
8	Stop CDMS, otherwise continuous 1553 interrupts will not allow DPU memory inspection.		
9	Dump the 1553 chip DPRAM memory areas at the addresses corresponding to the data areas for SA10R (where the TC PTD should be) and SA11R-SA14R (where the TC packet words should be).	Check that a valid TC PTD is found at SA10R	
		Check the consistency between the information contained in the TC PTD (number of messages and number of words in last message) is consistent with the actual TC packet messages contained in SA11R to SA14R.	
		Check that the content of the TC packet messages are identical to the contents of the TC packet resident on the CDMS.	
10	Remove previous breakpoint.		
11	Set new breakpoint where the TC packet is finally store in the internal DPU memory.		
12	Press Ctrl^C to continue with the OBS.		
13	OBS immediately stops at breakpoint.		
14	Inspect DPU memory location where the complete TC packet has been stored.	Check that the TC packet is identical to the one resident on the CDMS.	TIIL5
		Check that a valid TC PTC has been written on SA10T	
15	Open VIRTUOSO project file in directory where the code resides.		
16	Assign the HK_ASK1 task to the EXE group and compile the OBS		
17	Load the OBS in the DPU. Press Ctrl^C on the ICE.		
18	Set a breakpoint in the OBS at the point when the OBS writes a complete TM packet ready to be shipped to the CDMS.		
19	Press Ctrl^C again to start the OBS.		
20	The OBS stops at breakpoint because by default HK packets are generated at startup.		

21	Inspect the DPU memory area where the TM packet has been written. Dump the contents of the packet.		
22	Remove previous breakpoint		
23	Set new breakpoint where the TM packet and the related TM PTR have been written into the 1553 chip DPRAM.		
24	Press Ctrl^C to continue with the OBS		
25	The OBS stops at breakpoint. Inspect the 1553 DPRAM areas corresponding to SA27T and from SA11T to SA26T	The TM packet should be split in groups of 32 words for each SA starting from SA11T. Check consistency with the previously dumped TM packet.	
		Check that a valid TM PTR has been written into SA27T: • the packet number is 0 • the number of messages and the number of words in the last message are consistent with the TM packet length.	
26	Remove previous breakpoint		
27	Press Ctrl^C to continue with the OBS.		
28	Wait 10 seconds and stop OBS by pressing the space bar on the ICE PC. Inspect memory area corresponding to SA27T and from SA11T to SA26T; note that SA11T to SA27T are configured as circular buffers, so that the new TM packets are not overwriting the old ones	The TM packet should be split in groups of 32 words for each SA starting from SA11T. Check that only 4 packets are present in the 1553 DPRAM with increasing counter.	TIIL6
		Check that SA27T is still as in previous step.	
		Inspect the HK memory pool and verify the presence of the other 6 packets (10 packets in total for 10 seconds of operations).	
		Check the TM PTR queue to find PTRs only for the TM packets currently loaded on the 1553 DPRAM	
		Check the HK pool configuration variables and verify that only 6 buffers in the pool are occupied.	

4.3 TP2

This procedure executes the test cases DPU_COMMAND_EXEC and DPU_MEM. Procedure steps that will be repeated as part of the acceptance tests are lightly shaded. The TCs are identified by their codes as specified in 3.3.2 and 3.4.2. OBS loading is performed via ICE; OBS run/stop/restart functions, as well as the setting of breakpoints and memory inspection, are performed using the ICE in CBUG mode.

Step #	Action	Pass/Fail	Test Item
1	Open VIRTUOSO project file in directory where the code resides.		
2	Assign the HK_ASK task to the EXE_NOBOOT group and compile the OBS		
3	Load the OBS in the DPU.		
4	Set a BP in OBS where the TC acceptance report is generated.		
5	Start the OBS.		
6	Start the CDMS Simulator.		
7	Send TC17.1.1	OBS stops at BP	TISL2
8	Inspect the location in the DM where the report TM packet has been written.	Verify format in conformity with AD3.	
		Verify content of packet to reflect TC type (valid/invalid)	TIUL1
9	Remove BP. Restart OBS.		
10	Send TC17.1.1	Verify reception of: TM (1,1), (1,3), (17,2) and (1,7)	TIIL5, TIIL6, TISL2, TISL18,
11	Send TC14.3.1 to dump the list of type-subtype-Sid combinations for all telemetry packets for which generation is enabled.	Verify reception of: TM (1,1) , (1,3), (14,4) and (1,7)	
		Use **PacketDisplay** to verify that the list of SIDs in TM (14,4) matches the list of enabled TM packets (all of them are enabled by defaults at start-up; the list is in RD6).	
12	Send TC9.7.1 to perform time verification.	Verify reception of: TM (1,1), (9,9), (1,3) and (1,7)	TISL16p
13	Stop OBS. Stop CDMS. Open CDMS file APID2RT.txt and associate SPIRE with APID 0x300; this is needed to force the CDMS to send TCs with wrong APID to SPIRE.		
14	Start OBS. Start CDMS.		

15	Send TC17.1.2 to test OBS reaction against wrong APID in TC	Verify reception of TM (1,2) with failure code 0	
16	Stop OBS. Stop CDMS. Open CDMS file APID2RT.txt and change SPIRE's APID back to nominal.		
17	Start OBS. Start CDMS.		
18	Send TC17.1.3 to test OBS reaction against wrong TC packet length.	Verify reception of TM (1,2) with failure code 1	
19	Send TC17.1.4 to test OBS reaction against wrong TC packet checksum.	Verify reception of TM (1,2) with failure code 2	
20	Send TC17.1.5 to test OBS reaction against wrong TC packet type.	Verify reception of TM (1,2) with failure code 3	
21	Send TC17.1.6 to test OBS reaction against wrong TC packet subtype.	Verify reception of TM (1,2) with failure code 4	
22	Send TC17.1.7 to test OBS reaction against different TC "ack" bits	Verify that only TM (17,2) is received	
23	Send TC17.1.8 to test OBS reaction against different TC "ack" bits	Verify that only TM (1,1) and TM (17,2) are received	
24	Send TC17.1.9 to test OBS reaction against different TC "ack" bits	Verify that only TM (1,3) and TM (17,2) are received	
25	Send TC17.1.10 to test OBS reaction against different TC "ack" bits	Verify that only TM (1,7) and TM (17,2) are received	TISL10
26	Send TC6.5.1 to dump a PM memory area from location 0x12000 to 12005 (15 NSAU)	Verify reception of TM (1,1), (1,3), (6,6) and (1,7). Check with **PacketDisplay** that the received words are different from the pattern contained in TC6.2.1	TIUL2
27	Send TC6.2.1 to load a patch in the same memory area as above.	Verify reception of TM (1,1), (1,3) and (1,7)	
28	Send TC6.5.1 to dump again from the same memory area.	Verify reception of TM (1,1), (1,3), (6,6) and (1,7). Use **PacketDisplay** to compare received data words to the pattern uplinked in TC6.2.1. Store received memory words into a text file on the CDMS computer. Run program *"CRC"* on this file and record the computed CRC.	
29	Send TC6.9.1 to compute the CRC checksum over the same memory area.	Verify reception of TM (1,1), (1,3), (6,10) and (1,7). Verify with **PacketDisplay** that the received Checksum is identical to CRC computed in the previous step.	

30	Send TC6.2.2 to test the OBS reaction against a wrong Memory ID.	Verify reception of TM (1,1) and TM (1,8) with error code 0x601 (Illegal Memory ID)	
31	Send TC6.2.3 to test the OBS reaction against a wrong start address.	Verify reception of TM (1,1) and TM (1,8) with error code 0x602 (Illegal Start Address)	
32	Send TC6.2.4 to test the OBS reaction against the attempt to write out of memory.	Verify reception of TM (1,1) and TM (1,8) with error code 0x603 (Illegal NSAU)	
33	Send TC6.2.5 to test the OBS reaction against a wrong number of data words in the length field (in the Application Data)	Verify reception of TM (1,1) and TM (1,8) with error code 0x604 (Bad NSAU)	
34	Send TC6.2.6 to test the OBS reaction against a wrong CRC checksum for the uplinked memory patch (not the CRC of the whole TC).	Verify reception of TM (1,1) and TM (1,8) with error code 0x605 (Bad CRC)	TISL12p
35	Stop OBS. Edit OBS code and force a wrong CRC computation when the safety check is done after loading a memory patch with a TC(6,2). Compile, reload and restart the OBS.		
36	Send TC6.2.1 to load a memory patch	Verify reception of TM (1,1) and TM (1,8) with error code 0x606 (Bad Load).	
37	Stop OBS. Edit OBS code and re-establish correct CRC computation. Compile, reload and restart the OBS.		
38	Send TC8.4.1-2.1 to report the contents of an undefined table	Verify reception of TM (1,1) and TM (1,8) with error code 0x0811 (Undefined Table)	
39	Send TC8.4.1-1.1 to create a new table	Verify reception of TM (1,1), (1,3) and (1,7)	
40	Send TC8.4.1-2.1 to report the contents of the newly created table.	Verify reception of TM (1,1), (1,3), (21,4) and (1,7). Check with **PacketDisplay** that the received pattern is all 0s.	
41	Send TC8.4.1-3.1 to update the contents of the newly created table, using the **LoadTable** TOPE script.	Verify reception of TM (1,1), (1,3) and (1,7)	
42	Send TC8.4.1-2.1 to report the contents of the newly updated table.	Verify reception of TM (1,1), (1,3), (21,1) and (1,7). Check with **PacketDisplay** that the received pattern is identical to that uplinked in TC8.4.1-3.1.	
43	Send TC8.4.1-1.2 to test the OBS against a wrong Function_ID in the TC packet.	Verify reception of TM (1,1) and (1,8) with error code 0x0801 (Illegal Function ID)	

44	Send TC8.4.1-1.3 to test the OBS against a wrong Activity_ID in the TC packet.	Verify reception of TM (1,1) and (1,8) with error code 0x0802 (Illegal Activity ID)	
45	Send TC8.4.1-1.4 to test the OBS against an out-of-limits table ID.	Verify reception of TM (1,1) and (1,8) with error code 0x0805 (Illegal Table ID)	
46	Send TC8.4.1-1.5	Verify reception of TM (1,1), (1,3) and (1,7)	
47	Send TC8.4.1-1.6 to update a too-long table with respect to the available space on-board.	Verify reception of TM (1,1) and (1,8) with error code 0x0809 (Table Space Full)	
48	Send TC8.4.1-3.2 to update an undefined table	Verify reception of TM (1,1) and (1,8) with error code 0x0811 (Undefined Table)	
49	Send TC8.4.1-3.3 to update a table starting from an out-of-table index.	Verify reception of TM (1,1) (1,8) with error code 0x0806 (Illegal Table Index)	
50	Send TC8.4.1-3.4 to update a table with a TC where the length on the application data and the number of data words do not coincide.	Verify reception of TM (1,1) and (1,8) with error code 0x0808 (Bad Data)	
51	Send TC8.4.1-3.5 to update a table with more words than the table size.	Verify reception of TM (1,1) and (1,8) with error code 0x080D (Bad NData)	TISL12p
52	Send TC8.4.1-1.7 to create a new table	Verify reception of TM (1,1), (1,3) and (1,7)	
53	Send TC8.4.1-3.6 to load the new table	Verify reception of TM (1,1), (1,3) and (1,7)	
54	Send TC8.4.1-1.8 to create a new table	Verify reception of TM (1,1), (1,3) and (1,7)	
55	Send TC8.4.1-3.7 to load the new table	Verify reception of TM (1,1), (1,3) and (1,7)	
56	Send TC8.4.1-1.9 to create a new table	Verify reception of TM (1,1), (1,3) and (1,7)	
57	Send TC8.4.1-3.8 to load the new table	Verify reception of TM (1,1), (1,3) and (1,7)	
58	Send TC8.4.1-4.1 to dump the MOAT	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,4). Inspect the dumped table and note the start address for the three last created tables	
59	Send TC8.4.1-1.10 to delete Table 0x72	Verify reception of TM (1,1), (1,3) and (1,7)	
60	Send TC8.4.1-4.1 to dump the MOAT	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify reception of TM (21,4). Inspect the dumped table and check that there is no table definition entry with ID 0x72.	
61	Send TC8.4.1-4.1 to reallocate tables	Verify reception of TM (1,1), (1,3) and (1,7)	
62	Send TC8.4.1-4.1 to dump the MOAT	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify reception of TM (21,4). Inspect the dumped table; check that the start address for table 0x73 is different from previous MOAT dump and that table 0x73 is now immediately following table 0x71	
63	Send TC8.4.CA-7.1 to write into the EEPROM a copy of the OBS currently running on the PM	Verify reception of TM (1,1), (1,3) and (1,7)	
64	Switch-off the DPU		
65	Switch-on the DPU	Verify reception of TM (5,2)	
66	Send TC8.4.70-3.1 to force rebooting the DPU		
67	Send TC17.1.1 to perform a connection test and verify the OBS is regularly running.	Verify reception of TM (1,1), (1,3), (17,2) and (1,7)	TISL13p

4.4 TP3

This procedure executes test case HK_COLLECT. It is assumed at this stage that procedures TP0, TP1 and TP2 have been executed successfully. The DPU-S/C interface and the capability of the OBS to receive, interpret and execute commands should have been successfully tested. Procedure steps, which will be repeated as part of the acceptance tests, are lightly shaded. Step 14 validates the ability of the DPU to support the retry-at-packet-level capability of the CDMS.

Step #	Action	Pass/Fail	Test Item
1	Open VIRTUOSO project file in directory where the code resides.		
2	Assign the HK_ASK task to the EXE group and compile the OBS		
3	Configure DRCU Simulator to assign pre-defined values to the set HK parameters that will be sent to the DPU.		
4	Load the OBS in the DPU.		
5	Set a BP in the OBS where task LS reads the commands stored in the low priority command queue, after the commands are actually sent to the S/Ss.		

6	Start OBS	OBS stops at BP about one second after start, at the first periodic request of HK parameters	
7	Remove previous BP. Set a new BP in the OBS where the LS task receives the HK parameters from the S/S.		
8	Start DRCU simulator.		
9	Start OBS.	OBS stops at BP as in step 6+ 2 msec. Verify that the value of the received parameter matches the input value pre-defined in the DRCU Simulator.	TIUL4, TISL4
10	Remove previous BP. Set a new BP in OBS when the notification of complete HK packet is sent to TMTC.		
11	Start OBS.	When the OBS stops, examine the DM area where the HK packet has been stored and inspect its integrity.	TIIL2
12	Remove previous BP.		
13	On the CDMS simulator change bus profile to a buslist that does not contain the "Time Sync" directive. If necessary, cycle the Start/Stop BC button.		
14	Start OBS. Start CDMS Simulator.	Verify periodic (0.5/sec) reception of TM (3,25) Essential HK packets with SID 0x300. Verify periodic (1/sec) reception of TM (3,26) Nominal HK packets with SID 0x301	TISL5
		Check that the MSB of the time field in the HK packets is 1	TISL16p
15	Send TCTest.1 10 times, spaced by at least 3 seconds	Verify reception of TM (1,1), (1,3) and (1,7).	TISL19p
		Verify that no TM (3,25) packets are lost by checking that the received packet counter in the CDMS log window shows no jumps	
16	Find parameter TSYNC on the SCOS2000 Telemetry Desktop. *This is the time when the last valid "Sync" has been received on the 1553 bus*	Verify that the TSYNC time increases of 1 second every second	

17	On the CDMS simulator change bus profile to a buslist that does not contain the "Time Sync" directive. If necessary, cycle the Start/Stop BC button.	Verify that the TSYNC time stops increasing.	
18	On the CDMS change bus profile back to nominal. If necessary, cycle the Start/Stop BC button.	Verify that the TSYNC time increases of 1 second every second	
19	Find parameter TDIFF on the SCOS2000 Telemetry Desktop, and record its value *This is the time difference between the DPU internal time and the CDMS time*		
20	Change system time on the CDMS computer of a given amount and record it		
21	Cycle as fast as possible the Stop/Start BC button on the CDMS simulator *In this way the new PC system time is reloaded into the CDMS simulator*	Verify that the TDIFF value in the SCOS2000 Telemetry Desktop window has changed of an amount equal to the time change carried out on the CDMS computer Using **PacketDisplay** verify also the change in the time stamp of the HK packets received after the new time was loaded by the CDMS.	
22	Find the parameter TRESET on the SCOS2000 Telemetry Desktop, and record its value *This is the time when the last sync signal to the S/S has been sent*		TISL16p
23	Send TC8.4.CA-1.1 to reset DRCU timers	Verify that TRESET time is updated	TIUL10
24	Send TC8.4.CC-1.1 to define an HK packet before the related table ID has been defined.	Verify reception of TM (1,1) and (1,8) with error code 0x0825 (Undefined HK Table)	
25	Send TC8.4.1-1.10	Verify reception of TM (1,1), (1,3) and (1,7).	
26	Send TC8.4.1-1.11	Verify reception of TM (1,1), (1,3) and (1,7).	
27	Send TC8.4.1-3.10	Verify reception of TM (1,1), (1,3) and (1,7).	
28	Send TC8.4.1-3.11	Verify reception of TM (1,1), (1,3) and (1,7).	
29	Send TC8.4.CC-1.1 to start collection of additional HK packets.	Verify reception of TM (1,1), (1,3) and (1,7).	

		Verify periodic (1/sec) reception of additional TM (3,25) diagnostic packets with SID 0x302	
30	Send TC8.4.CC-1.2 to start collection of additional HK packets.	Verify reception of TM (1,1), (1,3) and (1,7). Verify periodic (1/sec) reception of additional TM (3,25) diagnostic packets with SID 0x303	
31	Send TC8.4.CC-1.3 to try and define an invalid HK packet ID	Verify reception of TM (1,1) and (1,8) with error code = 0x0821 (Illegal HK Packet ID)	
32	Send TC8.4.CC-1.4 to force HK packet collection with a too short interval	Verify reception of TM (1,1) and (1,8) with error code = 0x0834 (Illegal HK Sampling Interval)	
33	Send TC8.4.CC-1.5 to change an HK packet SID to an out-of-limits value.	Verify reception of TM (1,1) and (1,8) with error code = 0x0822 (Illegal HK SID)	
34	Send TC8.4.CC-1.7 to change the SID to a valid value but while the HK collection is running	Verify reception of TM (1,1) and (1,8) with error code = 0x0827 (err HK Sampling Running)	
35	Send TC8.4.CC-1.6 to change the HK definition table while the HK collection is active	Verify reception of TM (1,1) and (1,8) with error code = 0x0827 (err HK Sampling Running)	
36	Send TC8.4.CC-3.1 to report the definition of the HK packet with ID 0x300	Verify reception of TM (1,1), (1,3), (1,7) and (21,4) with APID = 0x508 and SID = 0x209.	
37	Send TC8.4.CC-3.2 to report the definition of the HK packet with ID 0x301	Verify reception of TM (1,1), (1,3), (1,7) and (21,4) with APID = 0x508 and SID = 0x209.	
38	Send TC8.4.CC-3.3 to report the definition of the HK packet with ID 0x302	Verify reception of TM (1,1), (1,3), (1,7) and (21,4) with APID = 0x508 and SID = 0x209.	
39	Send TC8.4.CC-3.4 to report the definition of the HK packet with ID 0x303	Verify reception of TM (1,1), (1,3), (1,7) and (21,4) with APID = 0x508 and SID = 0x209.	
40	Send TC8.4.CC-2.3 to stop Essential HK collection	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify that reception of TM (3,25) with SID 0x300 has stopped	
41	Send TC8.4.1-1.13 to remove table 0	Verify reception of TM (1,1), (1,3) and (1,7)	
42	Send TC8.4.1-4.10 to re-allocate tables on board. *With this command the HK definition tables for all currently running HK collection tasks will be moved. The test verifies that this does not affect the HK tasks.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the contents of the three HK packets immediately following the issue of the command (1 per SID, excluding 0x300 that is stopped) is not perturbed (i.e. the parameters should always be at the same location).	TISL12p
43	Send TC8.4.1-1.11 to try and reset a table currently being used for HK collection	Verify reception of TM (1,1) and (1,8) with error code = 0x0813 (Busy Table)	
44	Send TC8.4.CC-2.1 to clear the definition of the HK packet with ID 0x302	Verify reception of TM (1,1), (1,3) and (1,7) Verify that reception of TM (3,25) with SID 0x302 has stopped	
45	Send TC8.4.CC-1.5 to change an HK packet SID to a wrong value.	Verify reception of TM (1,1) and (1,8) with error code = 0x0822 (Illegal HK SID)	
46	Send TC8.4.CC-3.3 to report the definition of an HK packet that has been cleared.	Verify reception of TM (1,1) and (1,8) with error code = 0x0829 (Undefined HK ID)	
47	Send TC8.4.CC-2.2 to clear the definition of the HK packet with ID 0x303	Verify reception of TM (1,1), (1,3) and (1,7) Verify that reception of TM (3,25) with SID 0x303 has stopped	
48	Send TC8.4.CC-2.4 to stop collection of nominal HK packets. *All HK tasks are now stopped.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that reception of TM (3,25) with SID 0x301 has stopped	
49	Wait 1 second and stop the OBS by pressing the spacebar on the ICE PC. *At this point the OBS is not generating any TM packets, so the TM PTR should be clear.*	Verify that the first word of the TM PTR in SA27T contains '0000 0000B'	TIIL6p
50	Send TC8.4.1-1.11 to try and reset a table that is no longer used as an HK packet definition.	Verify reception of TM (1,1), (1,3) and (1,7)	

51	Send TC8.4.CC-3.4 to report the definition of an HK packet that has been cleared.	Verify reception of TM (1,1) and (1,8) with error code = 0x0829 (Undefined HK ID)	TISL11
52	Send TC8.4.CA-5.1 with parameter 0x88FF0000 to send an unknown command to the S/S	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL4p
		Verify reception of TM (5,1) with error code = 0x0509 (S/S Command Unknown)	

4.5 TP4

This procedure executes test case VM. It is assumed at this stage that procedures TP0, TP1, TP2 and TP3 have been successfully executed. We will progressively flood the LS port with HK parameter requests to the DRCU simulator up and beyond the maximum number of requests that can be handled in 1 second (about 500). The measurement with the oscilloscope will be used to verify that this is actually happening.
The requests will come from the HK_ASK task, from the H/W VM and from the 3 S/W VMs that should nominally run the PID controls. Each request source expects different parameter values; the test will be passed if each source receives exactly the expected parameter values without any response mixing.

Step #	Action	Pass/Fail	Test Item
1	Create custom commands in the DRCU simulator, one per subsystem, with CIDs 0x7FA, 0x7FB, 0x7FC and 0x7FD. Set the returned parameter to be equal to CID and make sure DRCU simulator for any of the standard DRCU commands does not return these values.		
2	Start OBS. Start CDMS simulator. *At this stage, about 320 HK parameter requests are sent to the DRCU simulator. Each request requires 2msec to be served.*		
3	Send TC8.4.1-1.20 to create table for VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
4	Send TC8.4.1-1.21 to create table for VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
5	Send TC8.4.1-1.22 to create table for VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
6	Send TC8.4.1-1.23 to create table for VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
7	Send TC8.4.1-3.20 to load VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
8	Send TC8.4.1-3.21 to load VM code	Verify reception of TM (1,1), (1,3) and (1,7)	

9	Send TC8.4.1-3.22 to load VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
10	Send TC8.4.1-3.23 to load VM code	Verify reception of TM (1,1), (1,3) and (1,7)	
11	Send TC8.5.2.1 to report the status of the VM	Verify reception of TM (1,1), (1,3), (8,6) confirming VM is inactive, and (1,7)	
12	Send TC8.5.3.1 to report the status of the VM1	Verify reception of TM (1,1), (1,3), (8,6) confirming VM1 is inactive, and (1,7)	
13	Send TC8.5.4.1 to report the status of the VM2	Verify reception of TM (1,1), (1,3), (8,6) confirming VM2 is inactive, and (1,7)	
14	Send TC8.5.5.1 to report the status of the VM3	Verify reception of TM (1,1), (1,3), (8,6) confirming VM3 is inactive, and (1,7)	
15	Send TC8.4.2-2.1 *Now there are 50 additional HK parameter requests going to the LS port; each requires 4 msec in total to be served.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that no TM (5,1) events with error code = 0x050C are received Verify increase of traffic with the DCU on the LSA display.	
16	Send TC8.4.1-4.20 to re-allocate tables on board	Verify reception of TM (1,1) and (1,8) with error code = 0x080C (VM Running)	TISL12p
17	Send TC8.4.3-2.1 *Now there are 50 additional HK parameter requests going to the LS port; each requires 4 msec in total to be served.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that no TM (5,1) events with error code = 0x050C are received Verify increase of traffic with the DCU on the LSA display.	
18	Send TC8.4.4-2.1 *Now there are 50 additional HK parameter requests going to the LS port; each requires 4 msec in total to be served.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that no TM (5,1) events with error code = 0x050C are received Verify increase of traffic with the MCU on the LSA display.	
19	Send TC8.4.5-2.1 *Now there are 50 additional HK parameter requests going to the LS port; each requires 4 msec in total to be served. At this point we have passed the number of total requests (about 500) that can*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that no TM (5,1) events with error code = 0x050C are received	

	go through the LS port each second: we might be losing some HK packets, but this is no problem for the current tests.	Verify reception of TM (5,1) events with error code = 0x050F, notifying the overflow condition on the LS port. Verify increase of traffic with the SCU on the LSA display.	
20	Send TC8.5.2.1 to report the status of the VM	Verify reception of TM (1,1), (1,3), (8,6) confirming VM is active and associated table ID is correct, and (1,7)	
21	Send TC8.5.3.1 to report the status of the VM1	Verify reception of TM (1,1), (1,3), (8,6) confirming VM1 is active and associated table ID is correct, and (1,7)	
22	Send TC8.5.4.1 to report the status of the VM2	Verify reception of TM (1,1), (1,3), (8,6) confirming VM2 is active and associated table ID is correct, and (1,7)	
23	Send TC8.5.5.1 to report the status of the VM3	Verify reception of TM (1,1), (1,3), (8,6) confirming VM3 is active and associated table ID is correct, and (1,7)	TISL13p
24	Send TC8.4.1-1.23 to reset the table being used by the fourth VM	Verify reception of TM (1,1) and (1,8) with error code = 0x0813 (Busy Table)	
25	Send TC8.4.2-2.1 to stop the VM	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (5,1) with error code = 0x50F are no longer received.	
26	Send TC8.4.CC-2.1 to stop collection of Essential HK packets	Verify reception of TM (1,1), (1,3) and (1,7)	
27	Send TC8.4.1-1.25 to cancel table 0	Verify reception of TM (1,1), (1,3) and (1,7)	
28	TC8.4.1-4.20 to re-allocate tables on board	Verify reception of TM (1,1), (1,3) and (1,7) Verify on the DRCU and the LSA that flow of S/S commands is unperturbed, and that no TM (5,1) are received	TISL12p
29	Send TC8.4.3-2.1 to stop the VM1	Verify reception of TM (1,1), (1,3) and (1,7)	
30	Send TC8.4.4-2.1 to stop the VM2	Verify reception of TM (1,1), (1,3) and (1,7)	
31	Send TC8.4.5-2.1 to stop the VM3	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify that the traffic on the LSA display is back to normal.	
32	Send TC8.4.1-1.23 to reset the table that was used by the fourth VM	Verify reception of TM (1,1), (1,3) and (1,7)	
33	Open the file TelemetryA.txt resident on the CDMS simulator		
34	Perform a search for the values 0x7FA, 0x7FB, 0x7FC and 0x7FD	Verify that search produced negative results.	TIUL8

4.6 TP5

This procedure executes test case SPIRE_ICD. It is assumed that test procedures TP0, TP1, TP2, TP3 and TP4 have been successfully executed. The DPU correctly interfaces with the CDMS simulator and the DRCU simulator. Procedure steps that will be repeated as part of the acceptance tests are lightly shaded.

Step #	Action	Pass/Fail	Test Item
1	Load the OBS using the DSP emulator. Open the CBUG tool and set a BP in the OBS soon after reception of Half-FIFO-Full interrupt.		
2	Start OBS. Start CDMS Simulator. Start DRCU simulator.		
3	Send TC8.4.CA-6.1 to reset the DPU FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
4	Send a series of TC8.4.CA-5.1 to configure the DRCU science data frames, using the following list of parameters: • 0x843C0000 *selects Frame_ID 0 from DCU* • 0x8418000C *sets DCU frame timing* • 0x84190070 *sets DCU frame timing* • 0x843D000A *sets DCU to send 10 frames*	Verify the reception of TM (1,1), (1,3) and (1,7) for all commands sent	
5	Send TC8.4.CA-5.1 with parameter 0x843e0001 to command DRCU to start data transfer	OBS should stop at BP.	
6	Using the ICE GUI proceed step-by-step in the code to read the science data present on the FIFOs	Verify correct reception and interpretation of science frames.	TIUL5p
7	Remove previous BP. Set new BP where a complete science TM packet is ready to be sent and the notification from HS is received by TMTC.		
8	Restart OBS		
9	Send TC8.4.CA-6.1 to reset the DPU FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
10	Send TC8.4.CA-5.1 with parameter 0x843e0001	OBS stops at BP.	

	to command DRCU to start data transfer	Using the ICS GUI check the locations of DM where the built packet is held and inspect integrity of header (APID, counter, type and subtype) and content (compare to input data from DRCU Simulator).	TISL6
11	Remove BP.		
12	Restart OBS		
13	Send TC8.4.CA-6.1 to reset the DPU FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
Testing the Reception of all science frames sent by the DRCU			
14	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify start of reception for TM (21,1) science packets	TIIL6, TIUL5p
15	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that a total of 10 TM (21,1) science packets (each containing 1 Frame), has been received. TM packets will have APID=0x504 and SID=0x200. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
16	Send TC8.4.CA-5.1 with parameter 0x843c0004, to configure DRCU to send Spectrometer full-array frames	Verify reception of TM (1,1), (1,3) and (1,7)	
17	Send TC8.4.CA-5.1 with parameter 0x843d0ff, to configure DRCU to send 255 frames	Verify reception of TM (1,1), (1,3) and (1,7)	
18	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	
19	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1) packets containing 255 frames were received, with APID = 0x506 and SID = 0x201. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
20	Send TC8.4.CA-5.1 with parameter 0x91c0000b, to configure sampling rate for SMEC frames	Verify reception of TM (1,1), (1,3) and (1,7)	

21	Send TC8.4.CA-5.1 with parameter 0x91c10001 to start DRCU data transfer from the MCU. *The MCU cannot be commanded to send a fixed number of packets but it sends them continuosly*	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,1) packets with APID = 0x508 and SID = 0x410.	TIUL5p
22	Wait 5 seconds and send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU data transfer	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1) packets stops.	
23	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,1) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
24	Send TC8.4.CA-5.1 with parameter 0x91c2002a, to configure sampling rate for BSM frames	Verify reception of TM (1,1), (1,3), and (1,7)	
25	Send TC8.4.CA-5.1 with parameter 0x91c10001 to start DRCU data transfer from the MCU. *The MCU cannot be commanded to send a fixed number of packets but it sends them continuosly*	Verify reception of TM (1,1), (1,3), and (1,7) Verify continuous reception of TM (21,1) packets with APID = 0x508 and SID = 0x612.	
26	Wait 5 seconds and send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU data transfer	Verify reception of TM (1,1), (1,3), and (1,7) Verify that TM (21,1) packets stops.	
27	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3), and (1,7) Verify that the last TM (21,1) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
28	Send TC8.4.CA-5.1 with parameter 0xa0830000 to configure DRCU to send SCU nominal frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
29	Send TC8.4.CA-5.1 with parameter 0xa084001f to configure DRCU to send 31 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
30	Send TC8.4.CA-5.1 with parameter 0xa0820001 to start DRCU data transfer form the SCU	Verify reception of TM (1,1), (1,3) and (1,7)	
31	Repeat previous step 4 more times	Verify reception, each time, of TM (1,1); (1,3) and (1,7)	TIUL5p

		Verify reception of TM (21,1) with APID = 0x508 and SID = 0xa20.	
32	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception, each time, of TM (1,1); (1,3) and (1,7)	
		Verify that the last TM (21,1) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
33	Send TC8.4.CA-5.1 with parameter 0x843c0001 to configure DRCU to send PSW frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
34	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
35	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,2) packets with APID = 0x504 and SID = 0x102	
36	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,2) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
37	Send TC8.4.CA-5.1 with parameter 0x843c0002 to configure DRCU to send PMW frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
38	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
39	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,2) packets with APID = 0x504 and SID = 0x103	
40	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,2) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
41	Send TC8.4.CA-5.1 with parameter 0x843c0003 to configure DRCU to send PLW frames.	Verify reception of TM (1,1), (1,3) and (1,7)	

42	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
43	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,2) packets with APID = 0x504 and SID = 0x104	TIUL5p
44	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,2) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
45	Send TC8.4.CA-5.1 with parameter 0x843c0005 to configure DRCU to send SSW frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
46	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
47	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,2) packets with APID = 0x506 and SID = 0x105	TIUL5p
48	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,2) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
49	Send TC8.4.CA-5.1 with parameter 0x843c0006 to configure DRCU to send SLW frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
50	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
51	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,2) packets with APID = 0x506 and SID = 0x106	TIUL5p
52	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify that the last TM (21,2) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
53	Send TC8.4.CA-5.1 with parameter 0x843c0008 to configure DRCU to send full Photometer Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
54	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
55	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,3) packets with APID = 0x504 and SID = 0x309	
56	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
57	Send TC8.4.CA-5.1 with parameter 0x843c0009 to configure DRCU to send PSW Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
58	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
59	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,3) packets with APID = 0x504 and SID = 0x30a	
60	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
61	Send TC8.4.CA-5.1 with parameter 0x843c000a to configure DRCU to send PMW Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
62	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
63	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p

		Verify reception of TM (21,3) packets with APID = 0x504 and SID = 0x30b	
64	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
65	Send TC8.4.CA-5.1 with parameter 0x843c000b to configure DRCU to send PLW Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
66	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
67	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,3) packets with APID = 0x504 and SID = 0x30c	
68	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
69	Send TC8.4.CA-5.1 with parameter 0x843c000c to configure DRCU to send Full Spectrometer Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
70	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
71	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,3) packets with APID = 0x506 and SID = 0x30d	
72	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	

73	Send TC8.4.CA-5.1 with parameter 0x843c000d to configure DRCU to send SSW Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
74	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
75	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,3) packets with APID = 0x506 and SID = 0x30e	TIUL5p
76	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
77	Send TC8.4.CA-5.1 with parameter 0x843c000e to configure DRCU to send SLW Test Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
78	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
79	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (21,3) packets with APID = 0x506 and SID = 0x30f	TIUL5p
80	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
81	Send TC8.4.CA-5.1 with parameter 0x91c4000b, to configure sampling rate for MCU Engineering frames	Verify reception of TM (1,1), (1,3) and (1,7)	
82	Send TC8.4.CA-5.1 with parameter 0x91c10001 to start DRCU data transfer from the MCU. *The MCU cannot be commanded to send a fixed number of packets but it sends them continuosly*	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,3) packets with APID = 0x508 and SID = 0x814.	TIUL5p
83	Wait 5 seconds and send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU data transfer	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,3) packets stops.	

84	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
85	Send TC8.4.CA-5.1 with parameter 0x91c5000b, to configure sampling rate for MCU Test frames	Verify reception of TM (1,1), (1,3) and (1,7)	
86	Send TC8.4.CA-5.1 with parameter 0x91c10001 to start DRCU data transfer from the MCU. *The MCU cannot be commanded to send a fixed number of packets but it sends them continuosly*	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,3) packets with APID = 0x508 and SID = 0x915.	TIUL5p
87	Wait 5 seconds and send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU data transfer	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,3) packets stops.	
88	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
89	Send TC8.4.CA-5.1 with parameter 0xa0830001 to configure DRCU to send SCU Test frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
90	Send TC8.4.CA-5.1 with parameter 0xa084001f to configure DRCU to send 31 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
91	Send TC8.4.CA-5.1 with parameter 0xA0820001 to start DRCU data transfer from the SCU.	Verify reception of TM (1,1), (1,3) and (1,7)	
92	Repeat previous step 4 more times	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of four TM (1,1), plus reception of TM (21,3) with APID = 0x508 and SID = 0x1121.	TIUL5p
93	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify that the last TM (21,3) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
94	Send TC8.4.CA-5.1 with parameter 0x843c0010 to configure DRCU to send Full Photometer Offset Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
95	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
96	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,4) packets with APID = 0x504 and SID = 0x207	
97	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,4) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
98	Send TC8.4.CA-5.1 with parameter 0x843c0014 to configure DRCU to send Full Spectrometer Offset Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
99	Send TC8.4.CA-5.1 with parameter 0x843d00ff to configure DRCU to send 255 frames.	Verify reception of TM (1,1), (1,3) and (1,7)	
100	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7)	TIUL5p
		Verify reception of TM (21,4) packets with APID = 0x506 and SID = 0x208	
101	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that the last TM (21,4) are received. Use **PacketDisplay** to inspect and verify received packets against pattern sent by DRCU.	
Testing Science Frames Data Selection			
102	Send TC8.4.CA-10.5 to enable selection from a non-existing science frame.	Verify reception of TM (1,1) and TM (1,8) with error code = 0x815 (Illegal Frame ID)	

103	Send TC8.4.CA-10.4 to enable selection from frame ID 4 (photometer PLW) using an undefined table.	Verify reception of TM (1,1) and TM (1,8) with error code = 0x817 (Undefined Selection Table)	
104	Send TC8.4.1-1.32 to create a Table to be used to select a subset of a science frame.	Verify reception of TM (1,1), (1,3) and (1,7)	
105	Send TC8.4.CA-10.3 to enable selection from frame ID 4 using the newly created table. *The selection tables should have the same length of the frames to which they are associated (which is not the present case, so that an error is expected).*	Verify reception of TM (1,1) and TM (1,8) with error code = 0x818 (Invalid length of Selection Table)	
106	Send TC8.4.1-1.31 to create a Table to be used to select a subset of a science frame.	Verify reception of TM (1,1), (1,3) and (1,7)	
107	Send TC8.4.1-3.31 to load the selection Table to be used for science frame selection.	Verify reception of TM (1,1), (1,3) and (1,7)	
108	Send TC8.4.CA-10.2 to enable selection. *Selection tables should be made of 0s (do not select) or 1 (select), while the present selection table contains a 2 so that an error is expected.*	Verify reception of TM (1,1) and TM (1,8) with error code = 0x819 (Invalid content of Selection Table)	
109	Send TC8.4.1-1.30 to create a Table to be used to select a subset of a science frame.	Verify reception of TM (1,1), (1,3) and (1,7)	
110	Send TC8.4.1-3.30 to load the selection Table to be used for science frame selection.	Verify reception of TM (1,1), (1,3) and (1,7)	
111	Send TC8.4.CA-5.1 with parameter 0x843c0003 to configure DRCU to send PLW Photometer Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
112	Send TC8.4.CA-5.1 with parameter 0x843d0000 to configure DRCU to send frames in continuous mode	Verify reception of TM (1,1), (1,3) and (1,7)	
113	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,3) packets with APID = 0x504 and SID = 0x104	
114	If the DRCU simulator allows it, change the Frame ID to an undefined value in the appropriate box of the DRCU GUI for channel 0	Verify reception of TM (5,1) with error code =0x0506 (Illegal Frame ID) Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are no longer received	
115	Put the Frame ID back to normal value	Verify reception of TM (5,1) with error code =0x8506 to signal exit from previous error condition	

		Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are again received	
116	If the DRCU simulator allows it, change the Frame length to a wrong value in the appropriate box of the DRCU GUI for channel 0	Verify reception of TM (5,1) with error code =0x0507 (Illegal Frame length)	
		Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are no longer received	
117	Put the Frame length back to normal value	Verify reception of TM (5,1) with error code =0x8507 to signal exit from previous error condition	
		Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are again received	
118	If the DRCU simulator allows it, change the checksum method in the appropriate box of the DRCU GUI	Verify reception of TM (5,1) with error code =0x0508 (Illegal checksum)	
		Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are no longer received	
119	Put the checksum method back to normal value	Verify reception of TM (5,1) with error code =0x8508 to signal exit from previous error condition	TIUL5
		Verify that TM (21,3) packets with APID = 0x504 and SID = 0x104 are again received	
120	Send TC8.4.CA-10.1 to enable selection from frame ID 4 (Photometer PLW)	Verify reception of TM (1,1), (1,3) and (1,7)	
		Use **PacketDisplay** to verify that the TM (21,3) now contain the SID = 0xC1A0	
		Use **PacketDisplay** to verify that the TM (21,3) packets now contain frames 10 words shorter.	
121	Send TC8.4.CA-11.2 to disable selection from a non-existent science frame.	Verify reception of TM (1,1) and TM (1,8) with error code = 0x815 (Illegal Frame ID)	
122	Send TC8.5.CA.1 to report science frame selection status.	Verify reception of TM (1,1), (1,3) and (1,7)	

		Use **PacketDisplay** to verify reception of TM (8,6) containing a series of SID – FRAMEID- TABLEID combinations for all science frames for which selection can be active. There should be a group with SID = 0xC1A0, Frame Id = 4 and Table Id = 0x30. All others should contain their nominal SID with Table ID = 0xFFFF (meaning that there is no selection active from that Frame ID.	
123	Send TC8.4.CA-11.1 to disable the presently active selection on frame ID 4	Verify reception of TM (1,1), (1,3) and (1,7) Use **PacketDisplay** to verify that TM (21,3) packets now contain again the nominal SID = 0x104 Use **PacketDisplay** to verify that the TM (21,3) packets now contain nominal Photometer PLW frames.	
124	Send TC8.5.CA.1 to report science frame selection status.	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of TM (8,6). Use **PacketDisplay** to verify that they contain nominal SIDs for all Frame IDs and all Table IDs should be 0xFFFF	TIIL3, TISL13, TISL17
125	Send TC8.4.CA-5.1 with parameter 0x843e0000 to stop DRCU frame transmission from DCU *If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 0 on the DRCU simulator.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0x200) are no longer received	
126	Send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU frame transmission from MCU *If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 1 on the DRCU simulator.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0x410 and 0x612) are no longer received	
127	Send TC8.4.CA-5.1 with parameter 0xa0820000 to stop DRCU frame transmission from SCU	Verify reception of TM (1,1), (1,3) and (1,7)	

	If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 2 on the DRCU simulator.	Verify that TM (21,1,0xa20) are no longer received	
128	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM packets are received	
Testing of Packet Transmission Control			
129	Send TC8.4.CA-5.1 with parameter 0x843c0000 to configure DRCU to send Full Photometer Pattern.	Verify reception of TM (1,1), (1,3) and (1,7)	
130	Send TC8.4.CA-5.1 with parameter 0x843d0000 to configure DRCU to send frames in continuous mode	Verify reception of TM (1,1), (1,3) and (1,7)	
131	Send TC8.4.CA-5.1 with parameter 0x91c0000b to set sampling rate for SMEC frames from MCU	Verify reception of TM (1,1), (1,3) and (1,7)	
132	Send TC8.4.CA-5.1 with parameter 0x91c2002a to set sampling rate for BMS frames from MCU	Verify reception of TM (1,1), (1,3) and (1,7)	
133	Send TC8.4.CA-5.1 with parameter 0xa0830000 to configure DRCU to send nominal SCU frames	Verify reception of TM (1,1), (1,3) and (1,7)	
134	Send TC8.4.CA-5.1 with parameter 0xa0840000 to configure DRCU to send SCU frames in continuous mode.	Verify reception of TM (1,1), (1,3) and (1,7)	
135	Send TC8.4.CA-5.1 with parameter 0x843e0001 to start DRCU data transfer from the DCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,1) packets with APID = 0x504 and SID = 0x200	
136	Send TC8.4.CA-5.1 with parameter 0x91c10001 to start DRCU data transfer from the MCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,1) packets with APID = 0x508 and SID = 0x410 and 0x612	
137	Send TC8.4.CA-5.1 with parameter 0xa0820001 to start DRCU data transfer from the SCU.	Verify reception of TM (1,1), (1,3) and (1,7) Verify continuous reception of TM (21,1) packets with APID = 0x508 and SID = 0xA20	
138	Wait 30 minutes. *In these conditions the DPU is receving data from the three subsystems simultaneously, while also generating both Nominal and Essential*	No TM (5,1) with error code = 0x50D, unless immediately followed by another (5,1) with code =0x850D (exit from anomaly condition).	TISL19

	HouseKeeping packets. The 1553 bus traffic between the DPU and the CDMS is of about 23 TM packets per second, which is the nominal rate foreseen for the SPIRE instrument.	Either using **PacketDisplay**, or by direct inspection of the TelemetryA.txt file on the CDMS, verify that no packets have been lost by checking that there are no jumps in packet counter for packets with the same APID.	
139	Increase science frame flow rate by decreasing of a factor two the timing value in the appropriate box of the DRCU GUI for channel 0	Verify reception of TM (5,1) with error code = 0x050D (Memory pool is more than 80% occupied)	
		After a while verify reception of TMs (5,1) with error code = 0x0505 (memory block not allocated) and 0x8505 (exit from error condition) because also in these overflow conditions blocks will be allocated in few cases.	
140	Change the frame timing back to normal	Verify that reception of TMs (5,1) with error code = 0x0505 or 0x8505 has stopped	
		Verify reception of TM (5,1) with error code = 0x850D (exit from full memory pool condition)	
141	Send TC14.3.1 to report the list of TM packets for which generation is enabled.	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify reception of TM(14,4) packets. Use **PacketDisplay** to check that transmission of all packets is enabled.	
142	Send TC14.2.1 to disable telemetry generation for TM (21,1) from DCU and SCU	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that TM (21,1) with APID = 0x200 and 0xA20 are no longer received.	
143	Send TC14.2.2	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify that TM (3,25) essential HK Packets (SID = 0x300) are no longer received	
144	Send TC14.3.1	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify reception of TM (14,4) packet. Use **Packet-Display** to verify that TM (21,1,0x200 and 0xA20) and TM (3,25,0x300) are not present in the report.	
145	Send TC14.1.1	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0x200 and 0xA20) and TM (3,25,0x300) are again received	
146	Send TC14.3.1	Verify reception of TM (1,1), (1,3) and (1,7) Verify reception of a TM (14,4) packet. Use **Packet-Display** to verify that transmission of all packets is enabled.	TISL15
147	Send TC8.4.CA-5.1 with parameter 0x843e0000 to stop DRCU frame transmission from DCU *If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 0 on the DRCU simulator.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0x200) are no longer received	
148	Send TC8.4.CA-5.1 with parameter 0x91c10000 to stop DRCU frame transmission from MCU *If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 1 on the DRCU simulator.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0x410 and 0x612) are no longer received	
149	Send TC8.4.CA-5.1 with parameter 0xa0820000 to stop DRCU frame transmission from SCU *If the command does not work (the DRCU occasionally does not execute the command), uncheck the "loop" checkbox for channel 2 on the DRCU simulator.*	Verify reception of TM (1,1), (1,3) and (1,7) Verify that TM (21,1,0xa20) are no longer received	
150	Send TC8.4.CA-2.1 to flush the FIFOs	Verify reception of TM (1,1), (1,3) and (1,7) Verify that the last TM packets are received	
Testing of Miscellaneous Issues			
151	Send TC8.4.C1-1.1 to change Observer ID	Verify reception of TM (1,1), (1,3) and (1,7) Verify on SCOS2000 that OBSID value has been updated in nominal HK packet	
152	Send TC8.4.C1-2.1 to change Building Block ID	Verify reception of TM (1,1), (1,3) and (1,7)	

		Verify on SCOS2000 that BBID value has been updated in nominal HK packet	
153	Send TC8.4.C1-3.1 to change Observation MODE	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify reception of TM (5,1) with error code =0x0501 that notifies the current values of MODE and STEP. Verify on SCOS2000 that MODE value has been updated in nominal HK packet.	
154	Send TC8.4.C1-4.1 to change Observation STEP	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify reception of TM (5,1) with error code =0x0501 that notifies the current values of MODE and STEP. Verify on SCOS2000 that STEP value has been updated in nominal HK packet	
155	Send TC8.4.C1-4.4 to reset DRCU internal timer	Verify reception of TM (1,1), (1,3) and (1,7)	TISL16p
		Verify on SCOS2000 that time of last DRCU sync has be reset in the nominal HK packet	
156	Send TC8.4.10-1.1 to engage the SMEC latch without enabling the command.	Verify reception of TM (1,1) and TM (1,8) with error code = 0x831 (Function Stopped) and TM (5,2) with error code = 0x832 (EXCP FX UNARMED ID)	
157	Send TC8.4.10-ff.1 to release the SMEC latch without enabling the command.	Verify reception of TM (1,1) and TM (1,8) with error code = 0x831 (Function Stopped) and TM (5,2) with error code = 0x832 (EXCP FX UNARMED ID)	
158	Send TC8.1.10.1 to enable the SMEC latch engage/release commands.	Verify reception of TM (1,1), (1,3) and (1,7)	
159	Send TC8.4.10-1.1 to engage the SMEC latch	Verify reception of TM (1,1), (1,3) and (1,7)	
		Verify on SCOS2000 that the SMEC latch state has changed in the nominal HK packet.	

160	Send TC8.4.10-ff.1 to release the SMEC latch	Verify reception of TM (1,1) and TM (1,8) with error code = 0x831 (Function Stopped) and TM (5,2) with error code = 0x832 (EXCP FX UNARMED ID)	
161	Send TC8.1.10.1 to enable the SMEC latch engage/release commands.	Verify reception of TM (1,1), (1,3) and (1,7)	
162	Send TC8.4.10-ff.1 to release the SMEC latch	Verify reception of TM (1,1), (1,3) and (1,7) Verify on SCOS2000 that the SMEC latch state has changed in the nominal HK packet.	
163	Send TC8.4.CA-9.1 to reset the OBS forcing a jump to the initial memory location of the code	Verify reception of TM (1,1) and (1,3) Verify that the numbering of the HK packets restarts from 0.	