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003038

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SPIRE SPIRE OBCP Trigger Test Procedures for IST Sunil D. Sidher

SPIRE OBCP Trigger Test Procedures for IST

SPIRE-RAL-PRC-003038 **Issue 1.6 20th April 2009**

Approved by:

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IST Procedure

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Glossary

AOT	Astronomical Observation Template
BSM	Beam Steering Mirror
CCB	Configuration and Control Board
DTCP	Daily Telecommunication Period
ICC	Instrument Control Centre
ILT	Instrument Level Test
IST	Integrated System Test
LEOP	Launch and Early Orbit Phase
LVDT	Linear Voltage Displacement Transducer
MOC	Mission Operations Centre
MOIS	Mission Operation Information System
MTL	Mission Time Line
OE	Optical Encoder
OPD	Optical Path Difference
PID	Proportional, Integral & Differential (control parameters)
PTC	Photometer Thermal Control
PV	Performance Verification
SMEC	Spectrometer Mechanism
SPIRE	Spectral and Photometric Imaging Receiver
SPT	System Performance Test
PTC	Photometer Thermal Control
PV	Performance Verification
SCOM	SpaceCraft Operations Manager
TBC	To Be Confirmed
TBD	To Be Determined
TBS	To Be Specified
VM	Virtual Machine
ZPD	Zero Path Difference



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1. Introduction

The main purpose of these tests is to check the triggering of spacecraft OBCPs as a result of the instrument generating TM(5,2) exception reports for various instrument anomalies. Four such tests are proposed and the On-board software will generate the following exceptions:

- DPU Anomaly
- DRCU Anomaly
- **Observation Anomaly**
- Observation Anomaly Corrected

For each test the following steps will be executed

- Execute a standalone TCL script from the CCS. This script runs SPIRE commands which generate the required exception report. The script will wait for a time specified in the test and then issue the required event packet.
- On reception of the exception report the appropriate S/C OBCP is triggered.
- The OBCP trigger and execution are monitored.

Procedures are also included for the S/C OBCPs which switch SPIRE OFF in a controlled sequence and for switching SPIRE into Standby mode from an operational mode.

1.1 References

1.1.1 Applicable Documents

AD01	IID Part A (SCI-PT-IIDA-04624), Issue 3.3
AD02	SPIRE Data ICD (SPIRE-RAL-PRJ-001078), Issue 2.1, 12 th July 2007
AD03	SPIRE OBS Upload Procedure (SPIRE-RAL-PRC-002866), Issue 1.2, 6 th Feb 2008
AD04	Payload Management & OBCP (H-P-1-ASP-TN-1072), Issue 4, 20/01/2007 [sic - should
	be 20/01/2008]

1.1.2 Reference Documents

RD01	IID Part B (SCI-PT-IIDB-02124), Issue 3.3
RD02	Herschel IST Test Case 'Test of Instrument FDIR OBCP', HP-2-ASED-TP-0197, Issue
	1.0, 12 th February 2008

1.1.3 Change Record

ISSUE	DATE	
Issue 1	14 th Feb 2008	First Version
Issue 1.1	26 th Feb 2008	
Issue 1.2	24 th April 2008	Procedures SPIRE-DRCU-ANOMALY and SPIRE-OBCP-OFF-CTRL



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		updated after SPIRE FDIR OBCP Debug 22-23 April 2008 and review.
Issue 1.3	25 th April 2008	Updated procedure SPIRE-OFF-CTRL to reflect that the S/C OBCP DB_OBCP_H_SPIRE_OFF_CTRL cannot be interrupted. Instrument is now in REDY mode at the start of this procedure. TBCs removed from SPIRE-OBCP-STANDBY.
Issue 1.4	10 th January 2009	Updated for IST FDIR OBCP tests
Issue 1.5	6 th March 2009	Updated the procedure SPIRE-DRCU-ANOMALY in section 2.2.3 (for NCR-4804) Updated the procedure SPIRE-OBCP-STANDBY in section 2.2.6 (for NCR-4827) Only these two procedures are expected to be run at CSG/Kourou during week beginning 9 th March 2009.
Issue 1.6	20 th April 2009	Updated the procedure SPIRE-OBCP-STANDBY to perform additional checks following update of the OBCP (to fix NCR H-P-112000-ASED-NC-4957)

2. TEST SPECIFICATION

2.1 Prerequisites

- OBS 3.0.B has been uploaded and written to the EEPROM in accordance with AD03.
- The HPSDB on the CCS includes SPIRE MIB 3.0.B2_PR_13Jan2009
- The CCS/I-EGSE communication link is active so that test TM can be received on the I-EGSE

2.2 Test Procedures

The procedures are designed to be executed in the order given below. The sequence is valid for both SPIRE Prime and Redundant instrument.



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2.2.1 Procedure: SPIRE-OBSERVATION-ANOMALY

Version: 1.1

Date: 10th Jan 2009

Purpose:

Trigger the S/C OBCP DB_OBCP_H_SPIRE_OPE_STOP to stop SPIRE operations in the case of an anomaly.

Duration:

 \sim 1-2 seconds to raise the TM(5,2) exception report

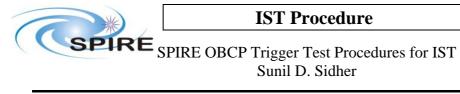
Preconditions:

- SPIRE DPU is ON and generating nominal and critical HK. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-OFF2DPUON.tcl, v 1.1 2007/11/30
- SPIRE DRCU is switched on. This is assumed to have been done executing TCL script SPIRE-IST-DBG-DPUON2STBY.tcl,v 1.1 2007/11/30
- SPIRE FDIR tables have been loaded by running the TCL script SPIRE-IST-FDIR-TABLES.tcl,v 1.1 2009/01/10
- SPIRE is in PHOTOPS operational mode. This is assumed to have been done executing TCL script SPIRE-IST-DBG-STBY2OPS.tcl,v 1.1 2007/11/30

Initial Configuration:

- SPIRE is in PHOTOPS mode
- Nominal and critical HK data are being generated
- Photometer science data are being generated

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-OBCPTest-ObservationAnomaly.tcl • Wait for ~ 1-2 seconds for the reception of TM(5,2) event report with Event ID 0xC100 and SID 0x5200	Event ID SID	0xC100 0x5200		
	The reception of this event should trigger the S/C OBCP to abort the current				



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Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	sub-schedule and stop SPIRE operations.				
	The OBCP should leave the DRCU and DPU switched on.				
	Note that a TM(5,1) event report with Event ID 0x523 and SID 0x5193 is also expected. This is a feature of the way FDIR tables are used in these tests and should be ignored.				
2	Check that SPIRE operations have stopped.				

Final Configuration:

Same as initial configuration except that MTL execution should have stopped



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2.2.2 Procedure: SPIRE-OBSERVATION-ANOMALY-CORRECTED

Version: 1.1

Date: 10th Jan 2009

Purpose:

Trigger the S/C OBCP DB_OBCP_H_SPIRE_OPE_RESUME to resume SPIRE operations after an anomaly has been resolved.

Duration:

~ 1-2 seconds to raise the TM(5,2) exception report

Preconditions:

Procedure SPIRE-OBSERVATION-ANOMALY has been executed beforehand

Initial Configuration:

- SPIRE is in PHOTOPS mode
- Nominal and critical HK data are being generated
- Photometer science data are being generated
- MTL execution has been stopped

Step	Description	Paramete rs	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE- OBCPTest- ObservationAnomalyCorrected.tcl • Wait for ~ 1-2 seconds for the reception of TM(5,2) event report with Event ID 0xC110 and SID 0x5200	Event ID SID	0xC110 0x5200	V dates	
	The reception of this event should trigger the S/C OBCP to resume SPIRE operations by starting from the next sub-schedule				
	Note that a TM(5,1) event report with Event ID 0x523 and SID 0x5193 is also expected. This is a feature of the way FDIR tables are used in these tests and should be ignored.				



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Step	Description	Paramete rs	Expected Values	Actual Values	Success/ Failure
2	Check that the OBCP to resume SPIRE operations has been executed successfully				

Final Configuration:

• Same as initial configuration except that MTL execution should have resumed



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2.2.3 Procedure: SPIRE-DRCU-ANOMALY

Version: 1.2

Date: 6th March 2009

Purpose:

Trigger the S/C OBCP DB_OBCP_H_SPIRE_DRCU_OFF to switch off the DRCU in the case of an anomaly.

Duration:

 \sim 10-15 seconds to raise the TM(5,2) exception reports

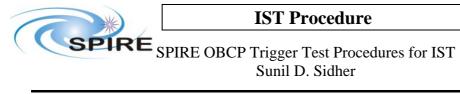
Preconditions:

- SPIRE DPU is ON and generating nominal and critical HK. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-OFF2DPUON.tcl, v 1.1 2007/11/30
- SPIRE DRCU is switched on. This is assumed to have been done executing TCL script SPIRE-IST-DBG-DPUON2STBY.tcl,v 1.1 2007/11/30
- SPIRE FDIR tables have been loaded by running the TCL script SPIRE-IST-FDIR-TABLES.tcl,v 1.3 2009/03/06
- SPIRE is in PHOTOPS operational mode. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-STBY2OPS.tcl,v 1.1 2007/11/30

Initial Configuration:

- SPIRE is in PHOTOPS mode
- Nominal and critical HK data are being generated
- Photometer science data are being generated

Step	Description	Parameter s	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-OBCPTest-DRCUAnomaly.tcl (Issue 1.3, 6 th March 2009) This script initiates the SAFE mode transition for the SPIRE instrument. Wait for ~ 1-2 seconds for the reception of TM(5,2) event report with Event ID 0xC100 and SID 0x5200 – OPE_STOP The reception of this event should trigger the S/C OBCP to stop the MTL.	Event ID SID	0xC100 0x5200		



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Step	Description	Parameter s	Expected Values	Actual Values	Success/ Failure
	After ~10 seconds a TM(5,2) event report with Event ID 0xC000 and SID 0x5200 should be received – DRCU_OFF				
	The OBCP should then switch off the DRCU but leave the DPU on and generating critical HK only.				
2	Check that the DRCU has been powered off				
	Check that the nominal HK report generation has stopped	THSK	Not increment ing		
	• Check that critical HK report generation is still in progress, i.e. APID 1280, TM(3,25) packets being received at 2 second intervals				
	• Check that the MODE_C parameter is set to 0x900 (SAFE) on the CRITICAL HK PARAMETERS display SA_0_559	MODE_C	0x900		

Final Configuration:

- SPIRE DRCU is powered OFF
- SPIRE DPU is on and generating critical HK
- SPIRE is in SAFE mode



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2.2.4 Procedure: SPIRE-DPU-ANOMALY

Version: 1.1

Date: 10th Jan 2009

Purpose:

Trigger the S/C OBCP DB_OBCP_H_SPIRE_OFF to switch off the DPU in the case of an anomaly.

Duration:

~ 1-2 seconds to raise the exception report

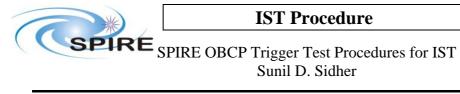
Preconditions:

- SPIRE DPU is ON and generating nominal and critical HK. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-OFF2DPUON.tcl, v 1.1 2007/11/30
- SPIRE DRCU is switched on. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-DPUON2STBY.tcl,v 1.1 2007/11/30
- SPIRE FDIR tables have been loaded by running the TCL script SPIRE-IST-FDIR-TABLES.tcl, v 1.1 2009/01/10

Initial Configuration:

- SPIRE is in REDY mode
- Nominal and critical HK data are being generated

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-OBCPTest- DPUAnomaly.tcl	Event ID SID	0xC010 0x5200		
	• Wait for ~ 1-2 seconds for the reception of TM(5,2) event report with Event ID 0xC010 and SID 0x5200				
	The reception of this event should trigger the S/C OBCP to switch off the DRCU & DPU				
	The OBCP should stop				



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Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	the nominal and critical HK report generation and switch off the DPU				
	Note that a TM(5,1) event report with Event ID 0x523 and SID 0x5193 is also expected. This is a feature of the way FDIR tables are used in these test and should be ignored.				
2	 Check that the nominal and critical HK report generation has stopped Check that the DRCU has been powered off Check that the DPU has been powered off 				

Final Configuration: SPIRE DPU and DRCU are powered OFF



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2.2.5 Procedure: SPIRE-OBCP-OFF-CTRL

Version: 1.3

Date: 10th Jan 2009

Purpose:

Controlled switch off of SPIRE using the S/C OBCP DB_OBCP_H_SPIRE_OFF_CTRL.

Duration:

~ 1-2 minutes

Preconditions:

- SPIRE DPU is ON and generating nominal and critical HK. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-OFF2DPUON.tcl, v 1.1 2007/11/30
- SPIRE DRCU is switched on. This is assumed to have been done executing TCL script SPIRE-IST-DBG-DPUON2STBY.tcl,v 1.1 2007/11/30
- SPIRE FDIR tables have been loaded by running the TCL script SPIRE-IST-FDIR-TABLES.tcl,v 1.1 2009/01/10
- SPIRE is in PHOTOPS operational mode. This is assumed to have been done executing TCL script SPIRE-IST-DBG-STBY2OPS.tcl,v 1.1 2007/11/30

Initial Configuration:

- SPIRE is in PHOTOPS mode
- Nominal and critical HK data are being generated
- Photometer science data are being generated



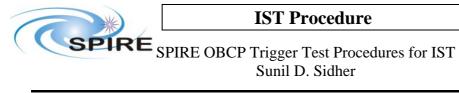
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Cton	Description	Parameters	Expected	Actual	Success/
Step	Description	rarameters	Values	Values	Success/ Failure
1	Execute the S/C OBCP		varues	varaes	Tunuic
	DB_OBCP_H_SPIRE_OFF_				
	CTRL				
2	There are 4 SPIRE TCs in the OBCP				
	which are designed to stop currently running VMs. These are expected to				
	fail with failure code 0x080A – VM				
	not running.				
	The reception of these TM(1,8) packets does not indicate a problem.				
3	DB OBCP H SPIRE OFF CTRL				
	executes the SPIRE TC	C_MODE	0x900		
	RUN_VM (60,0,0,0) to safe the				
	instrument.				
	Ensure that this TC is successfully				
	executed, i.e. $TM(1,1)$, $TM(1,3)$ and				
	TM(1,7) reports are received.				
	W'' 22 Le di TC				
	Wait ~ 2-3 seconds for this TC to put SPIRE into a safe configuration.				
	of the med a safe configuration.				
	Nominal HK generation will stop but				
	Critical HK generation will continue.				
	The C_MODE parameter on the				
	CRITICAL HK PARAMETERS				
	display should read 0x900 (SAFE)				
4	Check that both the SPIRE DRCU				
7	and DPU have been switched off as				
	specified in the OBCP.				
5	Note that three TM(5,4) event reports				
	could be received during the delay				
	between the switch off of the DRCU and DPU:				
	and DI U.				
	• Event ID 0x550C, SID 0x5420:				
	SPIRE_ALARM_LSDCU_DEAD				
	- Front ID 0::550D SID 0::5420				
	• Event ID 0x550D, SID 0x5420:	<u> </u>	ļ		J



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Step	Description	Parameters	Expected	Actual	Success/
			Values	Values	Failure
	SPIRE_ALARM_LSMCU_DEAD				
	• Event ID 0x550E, SID 0x5420: SPIRE_ALARM_LSSCU_DEAD				
	Three TM(5,1) event reports can also be expected during the period between switch off of the DRCU and DPU:				
	• Event ID 0x0520, SID 0x510E: No_DCU_Response_Error				
	• Event ID 0x0521, SID 0x510F: No_MCU_Response_Error				
	• Event ID 0x0522, SID 0x5110: No_MCU_Response_Error				

Final Configuration:

SPIRE DRCU and DPU are both powered OFF



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2.2.6 Procedure: SPIRE-OBCP-STANDBY

Version: 1.4

Date: 20th April 2009

Purpose:

Put SPIRE in Standby mode using the S/C OBCP DB_OBCP_H_SPIRE_STBY.

Duration:

~ 1-2 minutes

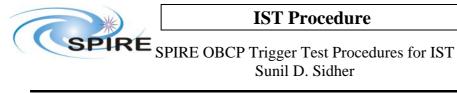
Preconditions:

- SPIRE DPU is ON and generating nominal and critical HK. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-OFF2DPUON.tcl, v 1.1 2007/11/30
- SPIRE DRCU is switched on. This is assumed to have been done executing TCL script SPIRE-IST-DBG-DPUON2STBY.tcl,v 1.1 2007/11/30
- SPIRE FDIR tables have been loaded by running the TCL script SPIRE-IST-FDIR-TABLES.tcl, v 1.3 2009/03/06
- SPIRE is in PHOTOPS operational mode. This is assumed to have been done by executing TCL script SPIRE-IST-DBG-STBY2OPS.tcl,v 1.1 2007/11/30

Initial Configuration:

- SPIRE is in PHOTOPS mode
- Nominal and critical HK data are being generated at 1Hz and 0.5Hz respectively
- Photometer science data are being generated

Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
1	Execute TCL script SPIRE-IST- DBG-RUN-VM.tcl, v1.1 2009/04/20	VMSTAT	0xFD		
	It should run a single VM from Table 253.				
	Check the value of the VMSTAT parameter				
2	Execute the S/C OBCP DB_OBCP_H_SPIRE_ STANDBY				
3	Wait ~2-3 seconds for the following TC to be executed by the OBCP				
	RUN_VM(



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Step	Description	Parameters	Expected Values	Actual Values	Success/ Failure
	TABLEID=61, INDEX=0,				
	N=0,				
	DATA=0				
4	After the OBCP has finished,	THSK	Refreshes		
	check that the sampling of the		every 4		
	Nominal HK Report is 0.25Hz		seconds		
	(OBCP was modified in response to				
	NCR-4827).				
5	Check that the MODE parameter on				
	the DPU & OBS PARAMETERS display is set to REDY	MODE	REDY		
	display is set to RED I	MODE	KLDT		
6	Check that VM parameter	VMSTAT	0xFFFF		
	VMSTAT has been reset to 0xFFFF.				
	This should indicate that the VM run in Step 1 was successfully halted by the OBCP				
7	Check also that the HALT_VM TC executed successfully.				
	But the HALT_VM1, HALT_VM2 and HALT VM3 should all fail with				

Final Configuration:

SPIRE is in REDY mode

failure code 0x080A -

VMs are not running.

- Nominal and critical HK data are being generated at 0.25Hz and 0.5Hz respectively
- Photometer science data generation has stopped

No_Command_List running. This is the expected behaviour when these