HESSI SPACECRAFT

SPECTROMETER DETECTOR FUNCTIONAL TEST

HSI_MIT_018B

2000-11-15

DAVE SMITH

DRAFT

As Run on: _____ (Date/Time)

By _____ (Test Conductor)

DOCUMENT REVISION RECORD

Rev.	Date	Description of Change
A	2000-3	Original draft
B	2000-11-15	Modify for changed detectors, add optional source test

Western Range/NASA Safety:_____ _____
Date

Project Manager: _____ _____
Peter Harvey Date

System Engineer: _____ _____
David Curtis Date

QA: _____ _____
Ron Jackson Date

1. INTRODUCTION

1.1 Purpose

This document establishes the HESSI Spectrometer Detector Functional test to be performed at the integrated spacecraft level.

1.2 Scope

This procedure will be performed to verify Spectrometer Detector functionality during or following exposure of the bus to qualification or transportation environments.

THE SPECTROMETER COLD PLATE MUST BE BELOW 90K TO RUN THIS TEST

2. SETUP

a. Power-on the spacecraft (bus and instruments) using HSI_MIT_010, Spacecraft On procedure.

b. Spectrometer cold plate cooled to <90K

3. TEST PROCEDURE

3.1 Turn ON the Detectors

a. Bring up the SOH Spectrometer HV ITOS telemetry page

b. Send the ITOS command "dlsetrate rate4mbps". Verify that ITOS telemetry is dicontinued and the BitSync on the signal rack loses lock. TC Verify:_____

c. Set the BitSync to 4Mbps HL (use the preset file). Verify that the BitSync regains lock and ITOS telemetry returns. TC Verify:_____

d. Start the SSRM program on the ITOS1 work station (located in directory ssr). Set the buffer size to 128K, Select Monitor Rates display, and click on the TCP Client OPEN button. Verify that the Connected light turns green. TC Verify:_____

e. On the monitor rates display screen, click at the top of the "front reset" column and then on the rear reset box for G8, so that these 9 entries are highlighted in color (and will therefore plot on the graph screen). TC Verify:_____

f. On the SSR ITOS page, push the "PlayOffset=0" button, then the "Start Record" button. Verify that the record pointer on the SSR ITOS page starts incrementing. TC Verify:_____

g. Turn monitor rate telemetry on, and event telemetry off. (can be accomplished by starting ITOS procedures "idib_tm_on" followed by "idib_tm_off")

TC Verify:_____

h. Turn OFF ADP telemetry: send command "/ITMOFF 10" TC Verify:_____

i. Turn ON Fast Rates telemetry to get a fixed data rate: send command "/ITMON 11" TC Verify:_____

j. Enable Spectrometer HV: Send ITOS command "/idpuarm sphv". VerifySPHV is Enabled on the SOH Spectrometer HV page TC Verify_____

k. Verify 28V HV supply is on: IDPU_P28HV on the SOH Spectrometer HV page is 28V +/-0.5V. TC Verify:_____

l. Begin HV ramp up to 1500 V: Start the ITOS procedure "ihv_ramp1500". Verify that the IHVDAC 1-9 all start to increment. TC Verify_____

m. Wait 60 seconds, then playback 8000 frames of real-time science by sending the ITOS command "/ssrplayrtsci numpackets=8000, bypassedac=0". Verify Monitor Rates packets are received. Periodically repeat this command through turn-on to monitor data (***OR LOOK AT THE REALTIME SOH RATES DIRECTLY IF POSSIBLE***) TC Verify_____

DURING RAMP1500:

Detectors which are coming alive should show Reset, Slow Valid, and Fast Valid counts. For Detector 8, the REAR comes alive first; for the other detectors the FRONT comes alive. "Dead" segments can still show Fast Valid counts. All of the active counters will jump up and down repeatedly as the voltage steps up. Reset rates Verify 1)

That all the reset rate graphs for the 9 active segments are similar, and 2) that none exceed about 2000 resets/second. If any detector is resetting much faster than the others, abort the rampup by shutting off high voltage: ITOS procedure "IHV_OFF". SEE FIGURE 1.

AFTER RAMP1500:

Reset rates should settle down. Live segments (rear of 8, front of others) should have reset rates from 1-10 per sec, except the front of detector 3, which will be around 25. SEE FIGURE 2.

n. Snap the ITOS1 (SSR) screen. If any detector has failed to reach this point successfully, turn the HV and DIBs off (Start ITOS procedure "ihv_off" and "idib_off"), and call David Smith. Otherwise, begin HV rampup to operating values: Start ITOS procedure "ihv_rampfinal". Verify that the IHVDAC 1-9 all start to increment. TC Verify_____

DURING RAMPFINAL:

As this ramp proceeds, the detectors will segment one at a time so that both segments are operating. Detector 3 segments first. Detectors which have segmented should be less noisy: i.e. fast and slow valid rates now remain below 3000 per second, instead of being mostly above. SEE FIGURES 3 & 4. It is natural for the reset rates to increase slightly just before segmentation; however, as in ramp1500, if any detector rises much more than the others, or exceeds 2000 resets/second, shut off the high voltage, abort the test, and call David Smith.

AFTER RAMPFINAL:

Front segment reset rates should be 0-15. Rear segment reset rates should be less than or about 400, and possibly as low as zero, although no segment should show zero for more than a few seconds at a time. Noise counts (fast/slow valid in both segments) should be less than 200 in all channels except the front of G7, which could read up to 30000. Detector HV values should be within 100V of these values: 3700V for G3 & G5; 4000V for the rest. SEE FIGURE 5.

o. Start the ITOS procedure "idib_setlld" to set thresholds to operating level. The extra noise in G7 front should now have gone away.

TC Verify_____

p. Start the ITOS procedure "idib_tm_on".

q. Send the ITOS command "/ssrplayrtsci numpackets=8000, bypassedac=0". Verify event telemetry is coming to the SSR GSE ("Event Packets" increments).

TC Verify_____

DETECTORS ARE NOW ON.

3.2 FUNCTIONAL TEST

3.2.1 Verify background

a. On the SSR GSE hit the "ONE" button, and send a fresh batch of data from ITOS to SSR by sending the ITOS command "/ssrplayrtsci numpackets=8000, bypassedac=0". An average of 10 samples should be saved in a file MRdata*nn*, where *nn* is an index selected by the program. Rename the file to a format which contains specific information about the date and circumstances. Record the file name for the file just created and print the file.

File Name Mrdata_____

b. Compare the MRdata filer contents with TABLE 1 below. Verify the MRdata file matches this example within the specified tolerances. TC Verify_____

c. **IF** the criteria in step b are not met, shutdown (Start ITOS procedure "ihv_off" and "idib_off") and contact D. Smith.

TABLE 1 - Typical Monitor Rates

	FRONT					REAR				
D	Reset	SLOW	>ULD	FAST	LIVE	Reset	SLOW	>ULD	FAST	LIVE
1	9	414	3	546	990	203	788	11	864	990
2	10	566	4	688	990	72	792	2	828	990
3	8	498	7	1096	990	2704	832	5	1192	990
4	7	450	4	544	990	124	904	5	972	990
5	117	606	4	1640	990	768	864	5	1800	990
6	28	478	6	740	990	1140	904	10	1976	990
7	11	254	7	538	990	51	796	13	868	990
8	7	381	1	652	990	130	908	4	1020	990
9	13	402	6	534	990	18	868	8	936	990

With the thresholds set, TABLE 1 shows some typical recorded values from the monitor rates packet. These are SUMS OF ALL 10 1-SECOND SAMPLES IN A MONITOR RATES PACKET (this is why the livetime is 990%). NOTE: The highlighted section is what appears in the MRdata files.

Livetime that persists < 99% should be recorded as a problem. Any count rates that differ by more than a factor of 2 from these should be flagged as a problem, unless they can be attributed to small-number statistics (for instance, the front reset in detector is 14 per 10 seconds, so a single 1-second sample might be anywhere from 0 to 4 or so. This is why it's better to look at 10-second sums or averages).

3.2.2 Verify Test Pulser Response

a. On the SSR GSE select "Spectra" display.

b. Send ITOS command "/itmoff 11" to stop Fast Rates (not needed any more).

c. Start ITOS procedure "idib_pulser(11)". This will turn on the flight pulser with a frequency on the order of 500 Hz. TC Verify_____

d. Wait 60 seconds. TC Verify_____

e. Send the ITOS command "/ssrplayrtsci numpackets=5000, bypassedac=0". Verify a single narrow line appears in the GSE spectra display for each segment. TC Verify_____

f. Save the spectra to disk by pushing the SNAP NINE button on the SSR GSE. This will make text files for each detector; the file name format is YDDDHHMM.hg?, where YDDDHHMM is the current date, and ? is 1 to 9 (one file per detector). Record the file name: File Name_____

g. Verify that the file does not contain all zeros. If so, repeat step f, after turning off and then on again both the Spectra display and the TCP connection on SSRM. TC Verify_____

h. Adjust the SSR Spectra display to zoom in on the line for the selected detector. Record the approximate line width for each segment in the table below. WITH THE CRYOCOOLER OFF front segments should be 4 channels or less Full Width at Half Maximum (FWHM), and rear segments should be 9 channels or less FWHM. The only exception is the front of G7, which should have resolution similar to a rear segment. Snap the SSR GSE page. TC Verify_____

i. Select the next detector on the SSR spectra display and repeat step e and h. Repeat for each detector. Verify all segment meet the line width criteria.

TC Verify_____

j. Start the ITOS procedure "idib_pulseroff" to turn off the pulser. TC Verify_____

Detector Number	Front Segment FWHM Channels	Nominal Front FWHM Channels	Rear Segment FWHM Channels	Nominal Rear FWHM Channels
1		4		9
2		4		9
3		4		9
4		4		9
5		4		9
6		4		9
7		9		9
8		4		9
9		4		9

3.2.3 OPTIONAL Source test

If a radioactive source is available, and there is time to use it, follow the procedure for exposing the detectors to a source (HSI_MIT_037).

Once this procedure is complete, playback the SSR from the beginning twice, the first time to record spectra (using "snap nine" on the spectrum screen, and re-starting both the spectrum screen and the TCP connection on SSRM before playback), and the second time to record the raw data (using the special button on SSRM for that purpose, which causes the display screens to temporarily disappear). Record the names of the .hg1-9 and .ssr files thus created here:_____