HESSI SPACECRAFT
SPECTROMETER WARM UP

HSI_MIT_036A.DOC

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DRAFT

As Run on: ______________________________ (Date/Time)

By ______________________________ (Test Conductor)

DOCUMENT REVISION RECORD

Rev.	Date	Description of Change

Western Range/NASA Safety:______________________________ ____________
Date

Project Manager: ______________________________ ____________
Peter Harvey Date

System Engineer: ______________________________ ____________
David Curtis Date

QA: ______________________________ ____________
Ron Jackson Date

1 INTRODUCTION

This procedure provides the necessary instructions Warm Up the High Energy Solar Spectrographic Imager (HESSI) Spectrometer Germanium Detectors for either Vibration Tests or Launch.

The Spectrometer contains 9 Germanium detectors on a single cold plate, surrounded by a thermal shield, surrounded by thermal blankets and finally the container walls. The entire assembly is a vacuum tight device, maintained at high vacuum on the ground using an external pump cart. Typically, Germanium detectors are kept at cryogenic temperatures using an LN2 fill system.

Each thermal transition has inherent risks and jeopardizes the detectors, so the project spends considerable effort to minimize the number of thermal transitions needed in the environmental test and launch processing sequence.. The warm up procedure has an additional risk of contaminating the detectors with remnant contaminants from the thermal blankets. Thus, the warm up is accomplished by heating the detectors while cooling the thermal shield and blankets.

The following is a photo of the spacecraft during a spectrometer warm up procedure.

HESSI Spacecraft in Horizontal Position with Pump Cart Attached

Reference Documents

1. NHB5300.4(3L) Requirements for Electrostatic Discharge Control
2. FED-STD-209 Airborne Particulate Cleanliness Classes in Clean Rooms and Clean Zones.
3. HSI_MIT_021 Spacecraft Handling Procedure

2.0 APPLICATION

The HESSI payload will be transported from JPL to VAFB Building 836 with the Germanium detectors at cryogenic temperatures. These will be maintained in that condition until just prior to launch processing. The detectors will be warmed up at building 836 in a 3 day 24hr coverage procedure.

3.0 CLEANLINESS AND ENVIRONMENT

The HESSI payload should be treated as ESD sensitive, and handled per MIL-STD-1686 Class 1, and NHB5300.4(3L) Requirements for Electrostatic Discharge Control.

The HESSI payload is contamination sensitive, and must be handled with appropriate care. At all times, the payload will be handled per FED-STD-209 Airborne Particulate Cleanliness Classes in Clean Rooms and Clean Zones.

The payload will be handled only by personnel wearing attire appropriate for a FED-STD-209 Class 100,000 cleanroom, including gloves. If the payload is double bagged, personnel will not need full cleanroom suits. However, gloves and wrist straps will be required.

4.0 REQUIRED PERSONNEL

Only the Project Manager, Project Engineer or Quality Assurance have the authority to make changes in this procedure if the need arises.

5.0 SAFETY

During the operation, there are no hazards to personnel. However, the Spectrometer Cryocooler may get too hot if there is insufficient cooling on the radiator. This condition must be addressed by correcting the air flow across the radiator. If the Cryocooler gets hotter than +40C, the FOT must shut it off. This might allow the thermal shroud temperature to climb higher than the cold plate, possibly contaminating the detectors. If at any time that the thermal shroud is warmer than the cold plate, the Cryocooler must be turned on again.

6.0 PRECAUTIONS

The following precautions shall be taken before starting the Spectrometer Warm Up :

1 Spectrometer Vacuum Pump Should be Connected and Operating
2 LN2 Fill System Should be Disconnected
3 Spacecraft should be Horizontal so the CryoCooler SP4 is Vertical
4 The air conditioner must be directed at the Spectrometer Radiator.

7. TEST PROCEDURE

Outline

- Spacecraft and IDPU are powered ON.
- CryoCooler is Ramped Up to 40W (minimum operating value).
- Cold Plate Heaters are enabled and verified through voltage and current monitors.
- Cold Plate temperature is raised to 27C (300K).
- CryoCooler is Ramped Down and Heaters Turned Off
- Spacecraft and IDPU are powered OFF.

Operator Information

Date and Time Run: ____________________________

Test Lead: ____________________________

Time Estimate: 48 to 72 hours plus setup time

Turn On

Step	Procedure	Measurement
1.	**Power on and configure the spacecraft bus at 30V**	_______OK
1.1	Verify spacecraft operating nominally via state-of-health telemetry	_______OK
2.0	**Power On IDPU, IPC and CPC**	
2.1	Start SC_IDPUON	_______OK
2.2	Start SC_IDPU_SPWRON	_______OK
2.3	Turn on CPC • Disable Over Current Trips • /ICPCRESET Value=1 • Start SC_CPCON • Enable Over Current Trips	_______OK
3.	**Check IDPU Status**	
3.1	Verify IDPU Mode is SAFE	_______ OK
3.2	Verify IDPU Current at 28V between 450mA and 600mA.	_______ mA
3.3	Verify IDPU Voltages Nominal	_______ OK
3.4	Verify Executive Status Nominal	_______ OK
3.5	Verify IDPUT between -30C and +40C. Record Temp.	_______ C
3.6	Verify IPCT between -30C and +40C. Record Temp.	_______ C
3.7	Verify Spectrometer Temperatures on page "igsespc"	_______ OK
3.8	Verify Radiator Temperatures	_______ OK
4.	**Initialize IDPU**	
4.1	Start IDPU_INIT and Verify that Reset Counter is Cleared, Mode = Normal	_______ OK
4.2	Record Version (page igseexec) is 2.1	__________

Spectrometer Warm Up

Item	Description	Note
1.	**Enable Mode**	
1.1	/IDPUENGIN Engineering Mode	________ OK
1.2	/IDPUARM CP to enable Coldplate Heater Voltage	________ OK
1.3	/IPWMMODE CP=0,RAS=OFF,UGT=OFF,LGT=OFF	________ OK
1.4	Measure IDPU_CURR Baseline Current	________mA
2	**Turn on Plus 100V Supply to Spectrometer Heaters**	
2.1	/ICPSUPPLY ON	________ OK
2.2	/ICPSETPT Value=30	________ OK
2.3	Verify IDPU_P100V is 100V or more	________ OK
2.4	Measure IDPU_CURR	________mA
2.5	Subtract IDPU_CURR in step 1.4 to obtain P100V current	________mA
3.0	**Measure Currents and Temps at Start**	
3.1	Record IDPU_CURR	________mA
3.2	Record ICP1T (Cold Plate)	________K
3.3	Record ICP2T	________K
3.4	Record ICT1T (Cold Tip)	________K
3.5	Record ICT2T	________K
3.6	Record ITST (Thermal Shroud)	________K
3.7	**Verify CT1 and CT2 are below 100K - IF NOT, STOP PROCEDURE**	________OK
4.0	**Ramp Cryo to 40W**	
4.1	"cfgmon cryopwr" to read CryoCooler Power conversion	________ OK
4.2	Start cryo_up (Phase=160, steps cryomain from 100 to 150)	________ OK
4.3	Adjust ICRYOMAIN so CRYOPOWER is 40W	________ OK
4.4	Record ICRYOMAIN	________
4.5	Record ICRYOBAL	________
4.6	Record ICRYOPHASE	________
4.7	Verify IACCEL below 100 mG	________ mG
4.8	Verify ICPCT below 40C	________ C
4.9	Verify IRAD1T below 40C	________ C
5	**Power All CP Heaters**	
5.1	/IPWMMODE CP=7,RAS=OFF,UGT=OFF,LGT=OFF	________ OK
5.2	Verify ICPHTR1, ICPHTR2, and ICPHTR3 are > 60V	________ OK
5.3	Measure IDPU_CURR Increase over step 2.3 at .70 to .80 A	________ mA
6	**Warm Up**	
6.1	Record Temperatures and Currents each Hour for 48 hours until CP=27C	________ OK
6.2	Monitor IRAD1T <40C, ICPCT < 40C Monitor CRYOPOWER > 40W, IACCEL < 100mG Monitor ICPHTR1-3 are >60V but not >85V	
7	**Turn OFF Cryo**	
7.1	Step /ICRYOMAIN and ICRYOBAL down to 0 (by 10's)	________ OK
7.2	Start SC_CPCOFF	________ OK
8	**Turn Off Heaters**	
8.1	/IPWMMODE CP=0,RAS=OFF,UGT=OFF,LGT=OFF	________ OK
8.2	/ICPSUPPLY OFF	________ OK
8.3	/IDPUDISARM CP	________ OK
8.4	Verify IDPU_P100V is 3V or less	________ V
8.5	Measure IDPU_CURR	________mA

Turn OFF

Item	Description	OK
1	**Instrument OFF**	
1.1	Start SC_IDPU_SPWROFF	________ OK
1.2	Start SC_IDPUOFF	________ OK
2	**Spacecraft OFF**	
2.1	SSR OFF	________ OK
2.2	S/C Power OFF	________ OK

Procedure Complete
Date/Time :________________________

PROBLEMS / NOTES

System	Description of Problem