STEREO

IMPACT

EMC Test Procedure

IMPACT-EMC_C.doc
Version C – 2004-Sep-23

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David Curtis, UCB IMPACT Project Manager

Date Run:____________________________________

Test Conductors______________________________

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Document Revision Record

Rev.	Date	Description of Change	Approved By
A	2004-Mar-8	Preliminary Draft	-
B	2004-Sep-9	Fill in SEPT, some PLASTIC TBDs	
C	2004-9-23	Make changes agreed upon in pre-test meeting, fill in HET TBDs.	

Distribution List

Dave Curtis, UCB
Peter Berg, UCB
Ron Jackson, UCB
Alan Cummings, Caltech
Reinhold Mueller-Mellin, Kiel
Tycho von Rosenvinge, GSFC
Mario Acuna, GSFC
Peter Walpole, UMd
Steve Turco, UNH
Lillian Reichenthal, GSFC
Michael Tasevoli, GSFC (EMC Committee)
Bob Cowdell, EMC Tempest (facility)

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1. Overview

1.1. *Introduction*

STEREO is a NASA program to launch a pair of nearly identical spacecraft into heliocentric orbit to observe the Sun. STEREO is managed out of Goddard Space Flight Center (GSFC). IMPACT is a suite of instruments for STEREO to measure in-situ particles and magnetic fields. IMPACT is managed by the University of California at Berkeley (UCB) with collaborators from many institutions around the world. PLASTIC is another in-situ particles instrument for STEREO managed by the University of New Hampshire (UNH). PLASTIC shares the IMPACT central processing system, and so can be considered part of the IMPACT suite from a functional standpoint during some tests.

The STEREO IMPACT Suite and (possibly) the PLASTIC instrument shall undergo a complete EMC test sequence as described in this document for the first flight unit (FM1). This document describes that testing. It is expected that this testing will occur at a subcontractor facility, preferably in California.

It is preferable that PLASTIC be part of the IMPACT FM1 suite EMC tests since this will verify the EMC characteristics of the interface between IMPACT and PLASTIC, but it is not a requirement if programmatic issues prevent it.

The second flight unit (FM2) shall undergo a subset of the tests as indicated in reference 2, section 8.1. The FM2 tests only involve Conducted Emissions tests and will be preformed at a lower level of integration (based on having all the flight loads attached to each power converter). The FM2 tests can be performed using commonly available laboratory equipment, and so will probably not involve a subcontractor. UCB will coordinate the IMPACT suite FM2 tests.

In addition to the flight units, the IMPACT/PLASTIC team will provide harnesses and Ground Support Equipment (GSE) to support the test. The flight intra-instrument harness will be used, and a GSE harness shall be provided for the spacecraft interface harness to the GSE, GSE shall be provided to simulate all spacecraft interfaces including power.

This test is modularized. The order in which the individual tests are run is not important unless otherwise stated.

Tests shall be performed in accordance with references 2, 10, and 11. Where these documents differ this document takes precedence, followed by reference 2, followed by reference 10 and 11. Where this document differs from document 2, waivers have been submitted.

1.2. *Document Conventions*

In this document, TBD (To Be Determined) means that no data currently exists. A value followed by TBR (To Be Resolved) means that this value is preliminary. In either case, the value is typically followed by a code such as UCB indicating who is responsible for providing the data, and a unique reference number.

The term “facility” or “EMC facility” in this document refers to the EMC subcontractor facility selected to perform these tests. “IMPACT Team”, “UCB”, “CIT”, or “UNH” refers to the instrument team that will accompany the hardware to the EMC facility. Tests shall be performed cooperatively between the team and the facility, with the facility providing the standard test equipment and facilities and personnel required to perform these tests while the IMPACT team will provide and setup and operate the instrument and instrument Ground Support Equipment (GSE).

Some of these tests will be performed prior to coming to the EMC facility – those tests will be annotated: **UCB, CIT**, or **UNH**.

1.3. *Applicable Documents*

The following documents are closely interrelated with this specification. Many documents can be found on the Berkeley STEREO/IMPACT FTP site:

http://sprg.ssl.berkeley.edu/impact/dwc/

1. 7381-9012B, IMPACT_ICD (IMPACT/Spacecraft ICD, on the APL web page)
2. 7381-9030, EMC spec (EMC requirements, on the APL web page)
3. 7381-9003, Environmental Spec (STEREO Environmental Test requirements, on APL web page)
4. ICD/IMPACT_CTM (IMPACT command & telemetry database)
5. ICD/IMPACTGrounding (grounding diagram)
6. ICD/IMPACTHarnessSpec (intra-instrument harness specification)
7. Plans/STEREO-IMPACT-PAIP (Performance Assurance Plan)
8. Plans/IMPACTEnvTestPlan (IMPACT Environmental Test Plan)
9. Plans/IMPACTContaminationControlPlan (IMPACT Contamination Control Plan)
10. Mil-Std-461A/B/C - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
11. Mil-Std-462 - Measurement of Electromagnetic Interference Characteristics

2. Test Setup

2.1. *Instrument Setup Issues*

a) Connector savers shall not be used for RE and RS tests (limit and log flight connector mate/demates).
b) Red-tag items shall be removed (except purge manifold) and covers shall be open.
c) SIT shall have an enable plug installed at SIT-J2 which enables high voltage to at most a low level. No external test pulser shall be used, and the enable connector shall be configured like the flight enable connector in terms of EMI close-out.
d) SWEA shall have an enable plug installed at SWEA-J3 that enables the analyzer HV but not the MCP HV. The enable connector shall be configured like the flight enable connector in terms of EMI close-out.
e) PLASTIC HV Enable plug shall not be present, but shall be replaced with a hard limit plug during all testing to insure the instrument high voltages will be limited to small values while in air testing is going on.
f) Flight (intra-instrument) harnesses shall be bagged in llumalloy with only the mating ends exposed. This avoids contaminating the harnesses and also avoids shorting the harness to bench ground between the connectors.
g) The MAG sensor should have a thermal blanket installed and grounded since this is a significant part of the EMI shielding.
h) The “Noisy” operating mode for the instruments used during Emissions tests shall be that mode expected to produce the most noise (subject to high voltage restrictions described above). This shall include internal test pulsers operating and SWEA analyzer voltage sweeping. During Susceptibility tests, “Quiet” mode shall be used, with test pulsers shall be off so that noise-induced events are observable.

2.2. *Issues Concerning the Facility*

i) The facility shall conform to the requirements of reference 10 and 11. Background EMI shall be below the RE test levels called out in reference 2, figures 4.8 and 4.9 (a recent test run demonstrating this should be attached to the test report).
j) The facility shall supply all measurement, antennas, current probes, etc. required to perform the tests in the configurations and to the levels indicated in reference 2 unless otherwise stated here. The current probe required for the CE measurements must be capable of clamping over at least a ½” diameter cable.
k) The instrument suite should be setup in the EMC facility interconnected as shown in figure 2-1, 2-2, and 2-3 by the IMPACT team. For the CE/CS tests some of the GSE may be moved around to the instrument side due to the short length of the test power harness.
l) The instruments shall be purged using the instrument-provided purge manifold and LN2-boil off. We will need to arrange delivery of 160L gas-flow LN2 to EMC facility UCB shall provide an Oxygen sensor to monitor the facility for nitrogen build-up.

m) It is not assumed that the EMC facility shall be clean beyond good housekeeping levels. The instruments will be bagged using llumalloy to prevent contamination. However spacecraft mating interfaces and connectors will be exposed. Handle exposed surfaces and connectors using gloves and ESD protection, and limit the exposure to contamination where possible. UCB/CIT shall provide clean gloves, wipes, smocks, bagging material, etc. as required. UCB shall provide a HEPA filter to help keep the facility clean between measurements.
n) Test facility will provide a "test area" including at least 10' of metal-clad bench top in a low noise facility suitable to make the attached measurements without external interference.
o) In addition there needs to be a close-by "GSE area" to set up the support equipment outside the EMC-quite test area, including ~10' of bench space, and at least 2 15 amp 110VAC services. There needs to be a cable pass-through or feed-throughs between the test area and the GSE area (see figure 2-2).
p) A "Star ground" connected to the test area bench needs to extend into the GSE area to ground GSE equipment to (note the 2.5milliOhm bonding requirement for star ground to bench).
q) At least one 10-base T internet connection in the GSE area with an allocated IP address is desireable
r) Instruments shall be connected to the test area bench ground, which consists of the metallic surface of the bench. The IDPU is designed to be in thermal and electrical contact with the bench, and a special conductive gasket to fit between the IDPU and bench top shall be supplied with the IDPU by UCB. The other instruments are mounted on electrical isolators, with chassis ground connected to bench ground using a short UCB-provided ground strap. Attaching ground straps and IDPU to the bench in order to achieve less than 2.5mOhm bonding resistance is TBD-facility-006.
s) GSE harnesses shall have an external braid terminated to the instrument at one end. The other end shall be terminated at the feed through into the test area to bench ground (or to the test bench during CE/CS tests). The GSE harness shall come with an external shield braid which should contact bench ground only at the feedthrough; insulating material will be needed to avoid shorting the braid to the bench elsewhere.
t) Reference 2 section 5.0 and 5.2 describe other configuration requirements
u) A test report shall be generated by the facility including details about the test equipment used (type, manufacturer, calibration dates, etc), facility equipment configurations, and measured test results. The instrument team shall document any measurements they make and attach them to the as-run version of this document. This shall include the instrument response to the CS and RS tests.

Figure 2-1, IMPACT Intra-instrument Harnessing (PLASTIC not shown)

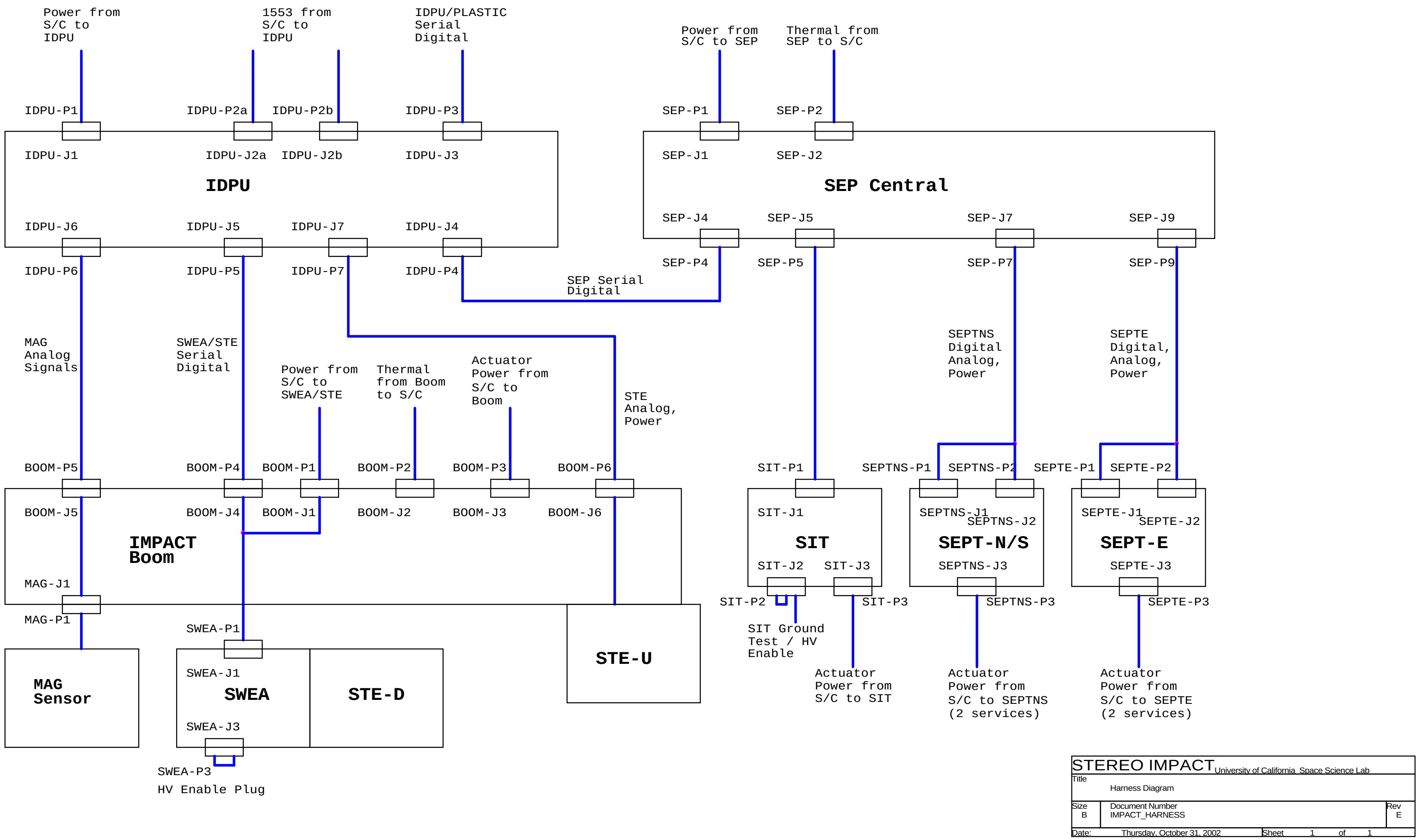
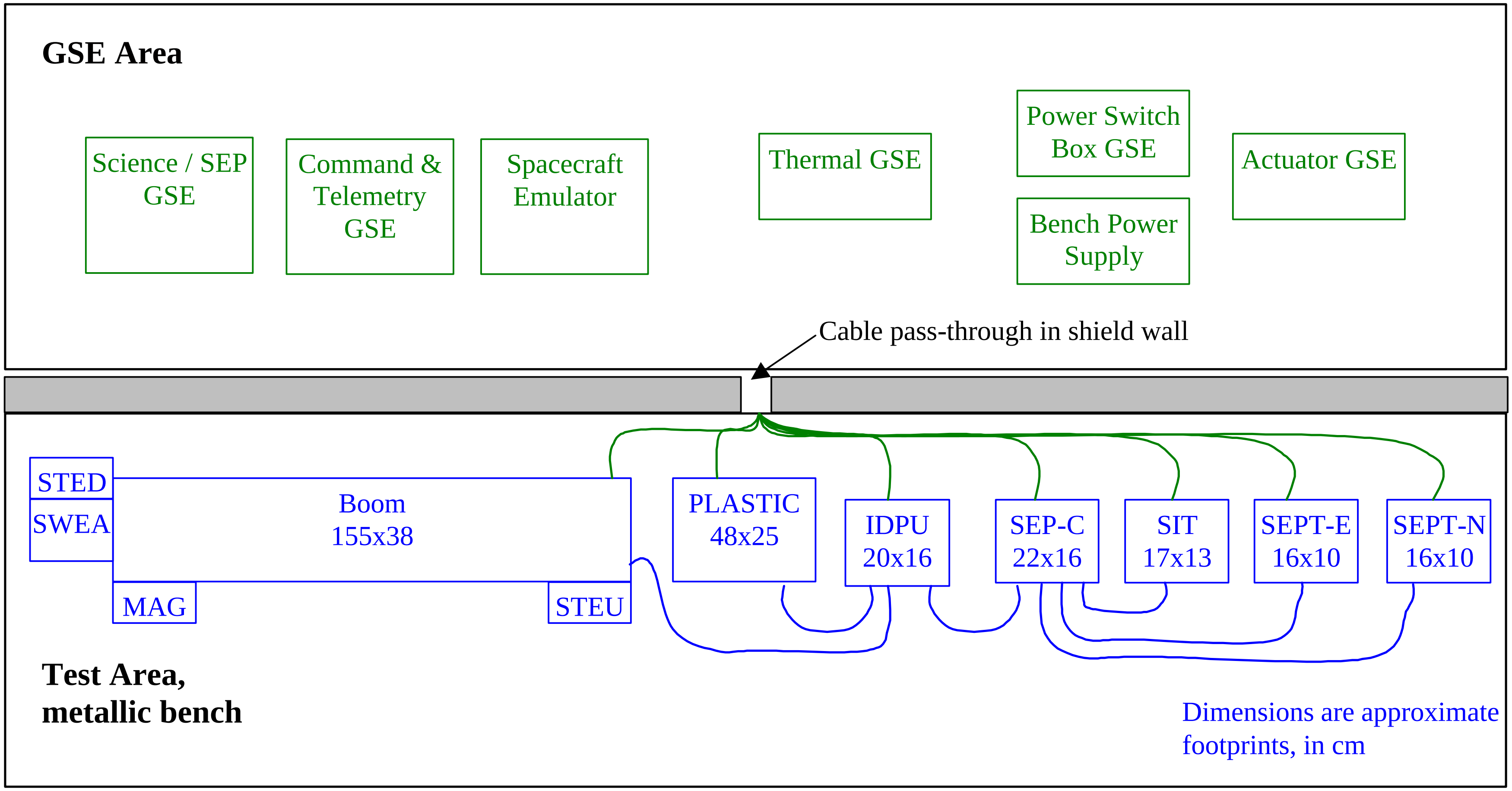
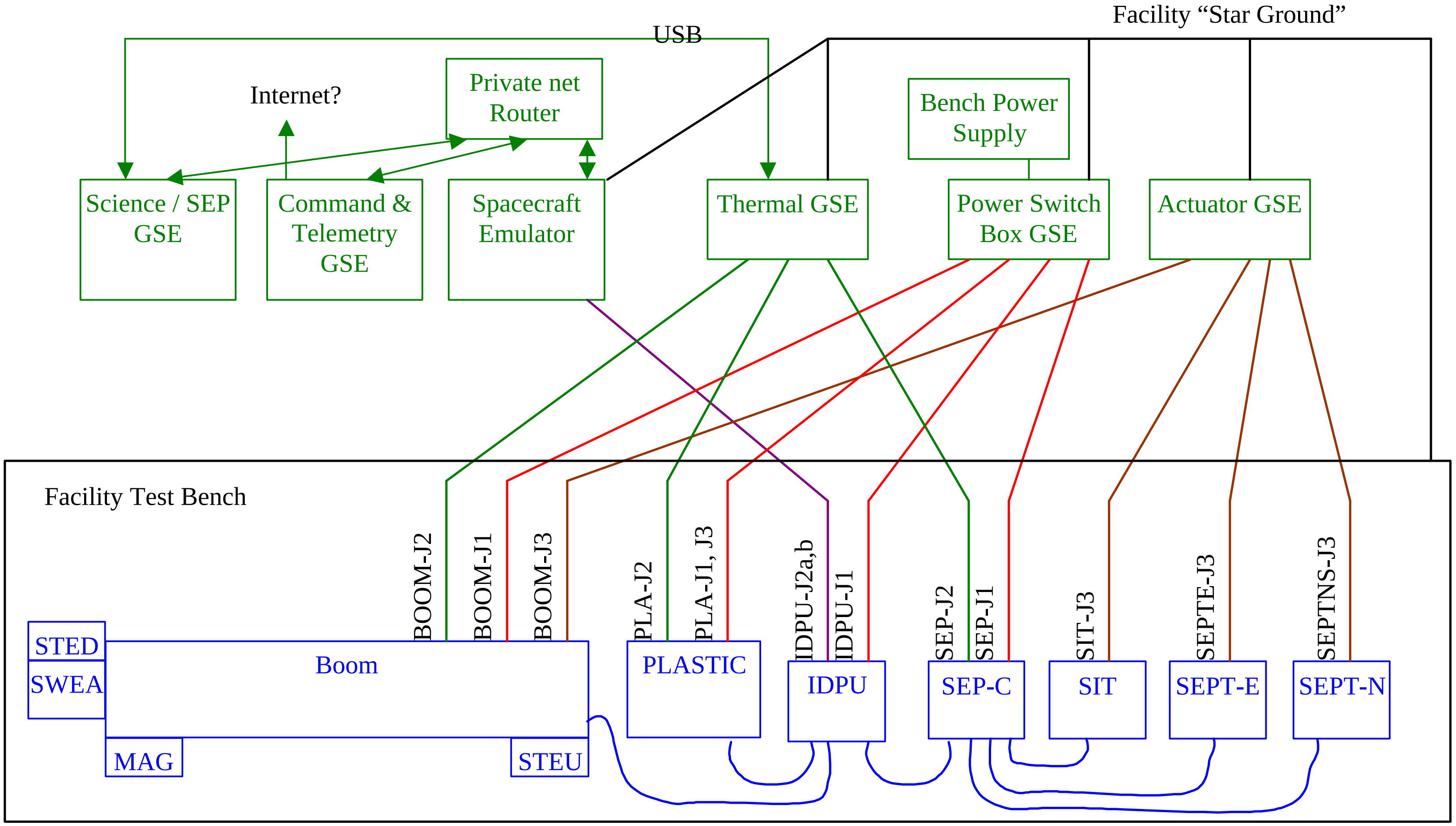


Figure 2-2 FM1 Physical Layout for Radiated EMC tests



Antenna Area

Figure 2-3, Instrument to GSE Harnessing



2.3. *Configuration (UCB)*

2.3.1. Flight Unit Configuration:

1. IDPU Serial number: ___________
   1.1. IDPU PROM version number:________, Date: __________
   1.2. IDPU EEPROM code version number:_______, Date:______________
2. MAG Sensor serial number: ___________
   2.1. MAG Thermal Blanket Configuration:____________
3. STE-U Preamp/Sensor serial number:__________
   3.1. STE-U Cover status: (open)______________
4. Boom Serial Number: ___________
5. SWEA/STE-D Serial Number:___________
   5.1. SWEA Enable plug status (SWEA-J2)_____________
   5.2. SWEA Internal cover status: (Open) ____________
   5.3. SWEA External cover status: (Removed)_____________
   5.4. STE-D cover status: (open)____________
6. SEP Central Serial Number: ___________
   6.1. SEP Central Software version number:________, Date:____________
7. LET Serial Number: ___________
   7.1. LET Software version number:_________, Date:_____________
8. HET Serial Number: ____________
   8.1. HET Software version:_________, Date:______________
9. SIT Serial Number: ____________
   9.1. SIT Software version:__________, Date:_______________
   9.2. SIT Enable plug (SIT-J2) status:____________
10. SEPT-E Serial number: ____________
    10.1. SEPT-E cover status: (open)_____________
11. SEPT-NS Serial Number: ____________
    11.1. SEPT-NS cover status: (open)____________
12. PLASTIC Serial Number: ____________
13. Intra-instrument Harness:
    13.1. IDPU-J3 to PLASTIC-P4: ___________
    13.2. IDPU-J4 to SEP-J4: ___________
    13.3. IDPU-J5 to BOOM-J4: ___________
    13.4. IDPU-J6 to BOOM-J5: ___________
    13.5. IDPU-J7 to BOOM-J6: ___________
    13.6. SEP-J5 to SIT-J1: ___________
    13.7. SEP-J7 to SEPT-NS-J1, J2: ___________
    13.8. SEP-J9 to SEPT-E-J1, J2: ___________

2.3.2. GSE Configuration:

1. Power Switch GSE:_________________
   1.1. 28V Bench Power Supply________________________
2. Actuator GSE:_______________
3. Thermal GSE:_______________
4. Spacecraft Emulator connected to DCB 1553 interface
   4.1. Emulator software version_______________
5. Command & Telemetry GSE connected to spacecraft emulator via TCP/IP
   5.1. C&T GSE version date_____________
   5.2. C&T Database version:__________, Date:________________
6. Science GSE
   6.1. MAG GSE version: _______________
   6.2. STE GSE version: _______________
   6.3. SWEA GSE version: _______________
7. SEP GSE TBD-CIT-008
8. Instrument to GSE harness:
   8.1. IDPU-J1 to Power: _________
   8.2. IDPU-J2a,b to Emulator:_________
   8.3. BOOM-J1 to Power: _________
   8.4. BOOM-J2 to Thermal: _________
   8.5. BOOM-J3 to Actuator: _________
   8.6. SEP-J1 to Power: _________
   8.7. SEP-J2 to Thermal: _________
   8.8. SIT-J3 to Actuator: _________
   8.9. SEPT-NS-J3 to Actuator:_________
   8.10. SEPT-E-J3 to Actuator:_________
   8.11. PLASTIC-J1 to Power:_________
   8.12. PLASTIC-J2 to Thermal:_______
   8.13. PLASTIC-J3 to Power: ________

2.4. *Instrument Testing (UCB, CIT, UNH)*

a) Prior to arrival at the EMC facility the instrument suite will have completed a Comprehensive Performance Test (CPT) to verify the functionality of the instruments.
b) Safe-to-mate testing shall be performed prior to powering up at the EMC facility. Power isolation tests in section 3.1 may be made at that time if not done previously.
c) After setup in the EMC facility the instruments will perform a Limited Performance Test (LPT, a subset of the CPT lasting ~1 hour) to verify everything is connected up correctly and survived transportation.

   Test Procs:________________________________
   ____
   ____
   ____
   ____

d) During Emissions tests the instruments shall be put into the standard operating mode. MCP High Voltage Supplies shall be off.
e) Prior to Susceptibility tests, the instrument team will verify the correct background levels on selected telemetry as called in the test.
f) During Susceptibility tests the instrument team will continuously monitor selected telemetry for signs of noise or changes caused by EMI. All telemetry shall be recorded for later analysis.
g) After the Conducted Susceptibility test sequence and again after the Radiated Susceptibility test sequence an instrument LPT will be performed to verify the instruments were not damaged during the tests.
h) After leaving the EMC facility another CPT will be performed as final verification that the suite survived EMC.

3. EMC Tests

3.1. *Bonding & Isolation*

These tests are described in reference 2 section 5.3. Some tests (marked **UCB, CIT**, or **UNH**) will be performed prior to delivery to the EMC facility (internal instrument bonding tests in particular must be done in a clean area, and so cannot be done at the EMC facility). Tests not marked shall be performed by the facility.

Power isolation measurements shall be made at the level of assembly that shares a power converter (i.e. boom suite with IDPU, SEP suite, and PLASTIC). Harnesses between parts if these assemblies shall be in place except where that connector is removed to measure a pin.

3.1.1. IDPU Power Isolation (**UCB**)

a) Primary power to chassis isolation. Measure resistance between primary power return (IDPU-J1 pin 10) to IDPU chassis ground (>1Mohm):

__________Ohms

b) Primary power to secondary isolation. Measure the resistance between primary power return (IDPU-J1 pin 10) and secondary signal ground (IDPU-J3 pin 2) (>1Mohm)

__________Ohms

c) MAG Heater power to chassis isolation. Measure resistance between MAG Heater primary power return (IDPU-J1 pin 13) to IDPU chassis ground (>1Mohm):

__________Ohms

d) MAG Heater power to secondary isolation. Measure resistance between MAG Heater primary power return (IDPU-J1 pin 13) to secondary signal ground (IDPU-J3 pin 2) (>1Mohm):

__________Ohms

TC Initials:__________

3.1.2. IDPU Chassis Bonding (**UCB**)

Measure the bonding resistance between each adjacent pair of trays and between the top tray and the lid.

a) LVPS tray to DCB tray (<2.5milliOhm) __________mOhms
b) DCB tray to STE-U tray (<2.5milliOhm) __________mOhms
c) STE-U tray to MAG tray (<2.5milliOhm) __________mOhms
d) MAG tray to IDPU Lid (<2.5milliOhm) __________mOhms
e)

TC Initials:__________

3.1.3. SEP Power Isolation (**CIT**)

a) Primary power to chassis isolation. Measure resistance between primary power return (SEP-J1 pin 10) to SEP Central chassis ground (>1Mohm):

__________Ohms

b) Primary power to secondary isolation. Measure the resistance between primary power return (SEP-J1 pin 10) and secondary signal ground (SEP-J4 pin 2) (>1Mohm)

__________Ohms

c) SEP Heater power to chassis isolation. Measure resistance between Heater primary power return (SEP-J1 pin 13) to SEP Central chassis ground (>1Mohm):

__________Ohms

d) SEP Heater power to secondary isolation. Measure resistance between Heater primary power return (SEP-J1 pin 13) to secondary signal ground (SEP-J4 pin 2) (>1Mohm):

__________Ohms

e) SEPT-E Secondary Digital Return to SEP Central Chassis isolation. Measure resistance between SEPT-E power return (SEP-J9 pin 5) to SEP Central Chassis ground (>1Mohm):

__________Ohms

f) SEPT-E Secondary Digital Return to SEP Central secondary signal ground isolation. Measure resistance between SEPT-E power return (SEP-J9 pin 5) to SEP Central secondary signal ground (SEP-J9 pin 10) (>1Mohm):

__________Ohms

g) SEPT-E Secondary Analog Return to SEP Central Chassis isolation. Measure resistance between SEPT-E power return (SEP-J9 pin 3) to SEP Central Chassis ground (>1Mohm):

__________Ohms

h) SEPT-E Secondary Analog Return to SEP Central secondary signal ground isolation. Measure resistance between SEPT-E power return (SEP-J9 pin 3) to SEP Central secondary signal ground (SEP-J9 pin 10) (>1Mohm):

__________Ohms

i) SEPT-NS Secondary Digital Return to SEP Central Chassis isolation. Measure resistance between SEPT-NS power return (SEP-J7 pin 5) to SEP Central Chassis ground (>1Mohm):

__________Ohms

j) SEPT-NS Secondary Digital Return to SEP Central secondary signal ground isolation. Measure resistance between SEPT-NS power return (SEP-J7 pin 5) to SEP Central secondary signal ground (SEP-J7 pin 10) (>1Mohm):

__________Ohms

k) SEPT-NS Secondary Analog Return to SEP Central Chassis isolation. Measure resistance between SEPT-NS power return (SEP-J7 pin 3) to SEP Central Chassis ground (>1Mohm):

__________Ohms

l) SEPT-NS Secondary Analog Return to SEP Central secondary signal ground isolation. Measure resistance between SEPT-NS power return (SEP-J7 pin 3) to SEP Central secondary signal ground (SEP-J7 pin 10) (>1Mohm):

__________Ohms

TC Initials:__________

3.1.4. SEP Central Chassis Bonding (**CIT**)

TBD-CIT-009

3.1.5. SIT Chassis Bonding (**CIT**)

TBD-CIT-010

3.1.6. SEPT-NS Chassis Bonding (**CIT**)

a) Ebox housing to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
b) Sensor housing to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
c) Ebox thermostat shield to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
d) Pinpuller shield to Ebox grounding stud (< 1 Ohm) ______Ohms
e) Ebox heater shield to Ebox grounding stud (< 1 Ohm) ______Ohms
f) Door, open, front left to Ebox grounding stud (< 100 Ohm) ______Ohms
g) Door, open, front right to Ebox grounding stud (< 100 Ohm) ______Ohms
h) Door, open, rear left to Ebox grounding stud (< 100 Ohm) ______Ohms
i) Door, open, rear right to Ebox grounding stud (< 100 Ohm) ______Ohms

TC Initials:___________

3.1.7. SEPT-E Chassis Bonding (**CIT**)

a) Ebox housing to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
b) Sensor housing to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
c) Ebox thermostat shield to Ebox grounding stud (< 2.5 milliOhm) ______mOhms
d) Pinpuller shield to Ebox grounding stud (< 1 Ohm) ______Ohms
e) Ebox heater shield to Ebox grounding stud (< 1 Ohm) ______Ohms
f) Door, open, front left to Ebox grounding stud (< 100 Ohm) ______Ohms
g) Door, open, front right to Ebox grounding stud (< 100 Ohm) ______Ohms
h) Door, open, rear left to Ebox grounding stud (< 100 Ohm) ______Ohms
i) Door, open, rear right to Ebox grounding stud (< 100 Ohm) ______Ohms

TC Initials:___________

3.1.8. SWEA/STE-D Power Isolation (**UCB**)

a) Primary power to chassis isolation. Measure resistance between primary power return (BOOM-J1 pin 10) to SWEA chassis ground (>1Mohm):

__________Ohms

b) Primary power to secondary isolation. Measure the resistance between primary power return (BOOM-J1 pin 10) and secondary signal ground (BOOM-J4 pin 2) (>1Mohm)

__________Ohms

c) SWEA Heater power to chassis isolation. Measure resistance between SWEA Heater primary power return (BOOM-J1 pin 13) to SWEA chassis ground (>1Mohm):

__________Ohms

d) SWEA Heater power to secondary isolation. Measure resistance between SWEA Heater primary power return (BOOM-J1 pin 13) to secondary signal ground (BOOM-J4 pin 2) (>1Mohm):

__________Ohms

e) Boom Deployment Heater power to chassis isolation. Measure resistance between Boom Deployment Heater primary power return (BOOM-J1 pin 12) to Boom chassis ground (>1Mohm):

__________Ohms

f) Boom Deployment Heater power to secondary isolation. Measure resistance between Boom Deployment Heater primary power return (BOOM-J1 pin 12) to secondary signal ground (BOOM-J4 pin 2) (>1Mohm):

__________Ohms

TC Initials:__________

3.1.9. BOOM Chassis Bonding (**UCB**)

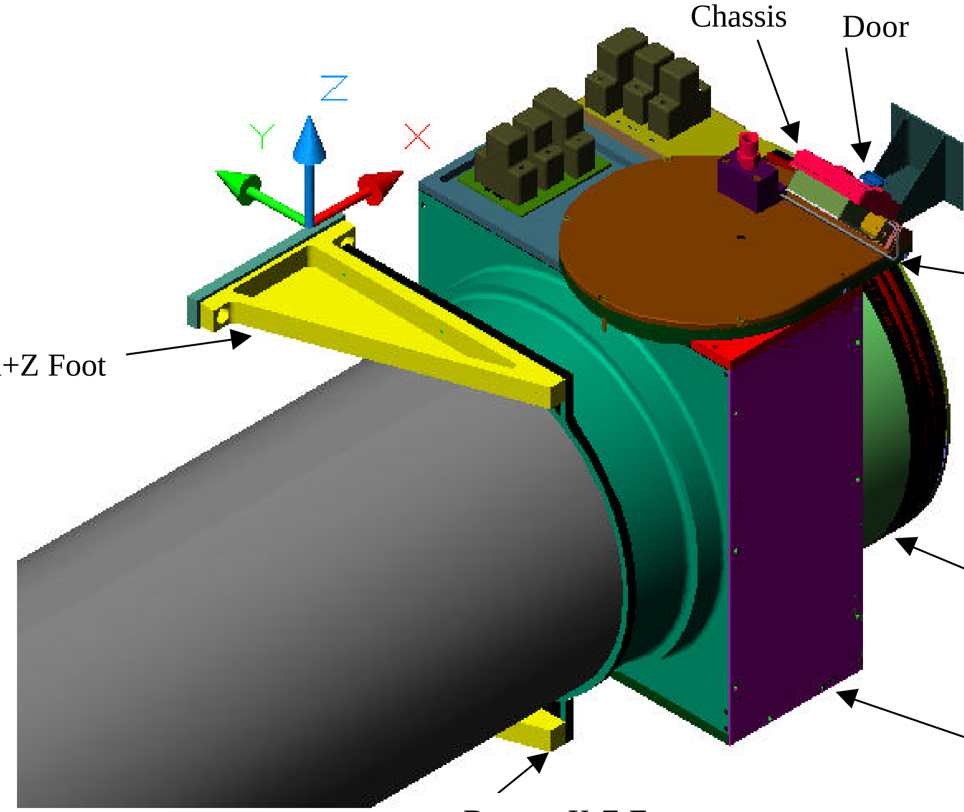


Figure 3.1.9 – Boom Assembly

a) Boom +X+Z Foot to Boom Box –X face (<2.5milliOhm) ________mOhm
b) Boom +X-Z Foot to Boom Box –X face (<2.5milliOhm) ________mOhm
c) Boom Box –X face to Boom Box +Y face (<2.5milliOhm)________mOhm
d) Boom Box –X face to Boom Box +Z face (<2.5milliOhm)________mOhm
e) Boom Box –X face to Boom Box -Y face (<2.5milliOhm)________mOhm
f) Boom Box –X face to Boom Box -Z face (<2.5milliOhm)________mOhm
g) Boom Box –Y face to Boom Box +X face (<2.5milliOhm)________mOhm
h) Boom Box +X face to Boom Spool Side (<2.5milliOhm) ________mOhm
i) Boom Spool Side to Boom Spool End (<2.5milliOhm) ________mOhm
j) Boom Box +Z face to STE-U Preamp (<2.5milliOhm) ________mOhm
k) STE-U Preamp to STE-U Chassis (<2.5milliOhm) ________mOhm
l) STE-U Preamp to STE-U Sun Shade (<2.5milliOhm) ________mOhm
m) STE-U Chassis to STE-U Door (<2.5milliOhm) ________mOhm

TC Initials:__________

3.1.10. SWEA/STE-D Chassis Bonding (**UCB**)

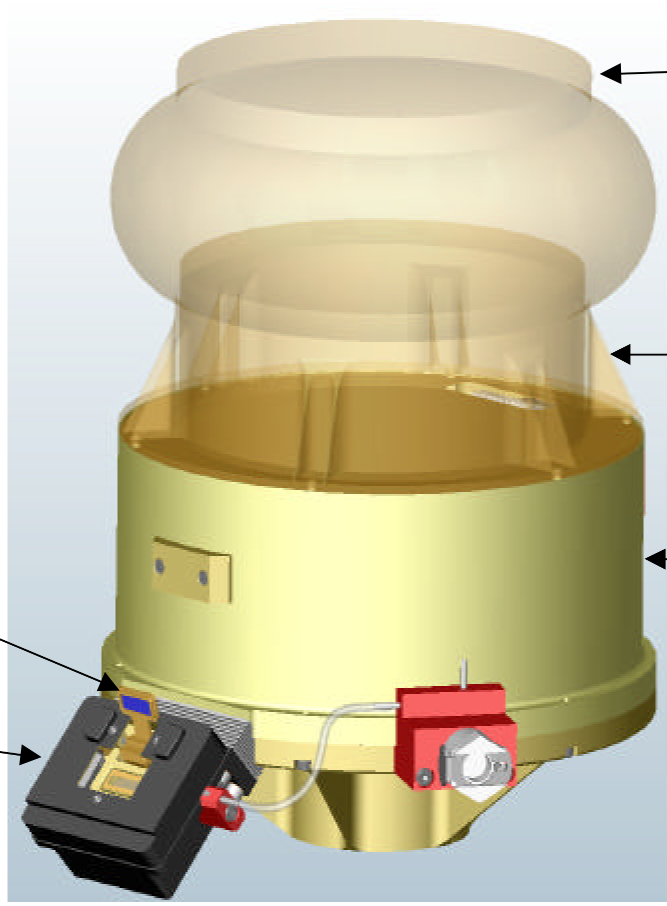


Figure 3.1.10 SWEA/STE-D

a) SWEA top to SWEA analyzer chassis (<2.5milliOhm) ________mOhm
b) SWEA analyzer chassis to SWEA pedestal (<2.5milliOhm) ________mOhm
c) SWEA pedestal to SWEA boom attachment (<2.5milliOhm) ________mOhm
d) SWEA pedestal to STE-D chassis (<2.5milliOhm) ________mOhm
e) STE-D chassis to STE-D Door (<2.5milliOhm) ________mOhm

TC Initials:__________

3.1.11. PLASTIC Power Isolation (**UNH**)

a) Primary power to chassis isolation. Measure resistance between primary power return (PLA-J1 pin 7) to PLASTIC chassis ground (>1Mohm):

__________Ohm

b) Primary power to secondary isolation. Measure the resistance between primary power return (PLA-J1 pin 7) and secondary signal ground (PLA-J4 pin 2) (>1Mohm)

__________Ohm

c) PLASTIC Heater power to chassis isolation. Measure resistance between PLASTIC Heater primary power return (PLA-J3 pin 10) to PLASTIC chassis ground (>1Mohm):

__________Ohm

d) PLASTIC Heater power to secondary isolation. Measure resistance between PLASTIC Heater primary power return (PLA-J3 pin 10) to secondary signal ground (PLA-J4 pin 2) (>1Mohm):

__________Ohm

TC Initials:__________

3.1.12. PLASTIC Chassis Bonding (**UNH**)

TBD-UNH-013

3.1.13. Bonding between Subassemblies and Facility Table

a) IDPU to Table (<2.5milliOhm) ___________mOhm
b) BOOM –X (SWEA) end foot to Table (<2.5milliOhm) ___________mOhm
c) BOOM +X (STE-U) end foot to Table (<2.5milliOhm) ___________mOhm
d) SEP Central to Table (<2.5milliOhm) ___________mOhm
e) SIT to Table (<2.5milliOhm) ___________mOhm
f) SEPT-E to Table (<2.5milliOhm) ___________mOhm
g) SEPT-NS to Table (<2.5milliOhm) ___________mOhm
h) PLASTIC to Table (<2.5milliOhm) ___________mOhm
i) If an intermediate mounting plate is used, bonding from that plate to Table (<2.5milliOhms) ___________mOhm
j) Power Single Point Ground to Table (<2.5milliOhm) ___________mOhm

TC Initials:__________

3.2. *Transients*

Turn-on and Turn-off transients shall be measured on each power service (excluding passive heater circuits) as described in reference 2, sections 4.11 and 5.13. This test will be performed at the subsystem level (where each subsystem shall consist of all equipment sharing the same power converter). This test shall be performed prior to going to the EMC facility.

The power switch GSE includes a mercury wetted-relay for bounceless switching. UCB can provide help to Caltech and UNH in performing this test.

Take snaps of the oscilloscope traces taken during these measurements and append to the as-run proc or test report.

Some of these tests may be added to the CE07 tests at the EMC facility if they cannot be done before then.

3.2.1. IDPU Transients (**UCB**)

The MAG Heater and IDPU Power service shall be tested separately. IDPU power is on connector IDPU-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. MAG Heater power in also on IDPU-J1, pins 5 and 6, with return on pins 13 and 14 (these points are broken out on the power switch GSE). **Be sure MAG and STE-U are connected to the IDPU for this test**. Measurements to be taken:

a) IDPU Power Turn-on current transient (nominal current = 220mA):

<10A in first 10us________A
<2.5A for first 200ms________A
<244mA at 200ms________A

b) IDPU Power Turn-off voltage transient:

Between -2 and +56V________V
<5V after 2 seconds________V

c) MAG Heater Power Turn-on current transient (nominal current = 35mA):

<10A in first 10us________A
<2.5A for first 200ms________A
<39mA at 200ms________A

d) MAG Heater Power Turn-off voltage transient:

Between -2 and +56V________V
<5V after 2 seconds________V

TC Initials:__________

3.2.2. SEP Transients (**CIT**)

SEP power is on connector IDPU-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11 (these points are broken out on the power switch GSE). SIT , SEPT-E, and SEPT-NS shall be connected to SEP Central for this test. Measurements to be taken:

a) SEP Power Turn-on current transient (nominal current = 310mA):

<10A in first 10us________A

<2.5A for first 200ms________A

<341mA at 200ms________A

b) SEP Power Turn-off voltage transient:

Between -2 and +56V________V

<5V after 2 seconds________V

TC Initials:__________

3.2.3. SWEA/STE-D Transients (**UCB**)

SWEA/STE-D power is on connector BOOM-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11 (these points are broken out on the power switch GSE). Measurements to be taken:

a) SWEA/STE-D Power Turn-on current transient (nominal current = 110mA):

<10A in first 10us________A
<2.5A for first 200ms________A
<121mA at 200ms________A

b) SWEA/STE-D Power Turn-off voltage transient:

Between -2 and +56V________V
<5V after 2 seconds________V

TC Initials:__________

3.2.4. PLASTIC Transients (UNH)

PLASTIC power is on connector PLA-J1 (A 9-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 7 and 8 (these points are broken out on the power switch GSE). Measurements to be taken:

c) PLASTIC Power Turn-on current transient (nominal current = 420mA (TBV-UNH-014):

<10A in first 10us________A
<2.5A for first 200ms________A
<462mA at 200ms________A

d) PLASTIC Power Turn-off voltage transient:

Between -2 and +56V________V
<5V after 2 seconds________V

TC Initials:__________

3.3. *CE01, CE03, CE07*

This test must be performed on each power service using the specification in reference 2 sections 4.1, 4.2 and 4.4 for each power service. The test setup is shown in reference 2 figure 5.4. and 5.6. UCB can supply the 1m harness (with breakout) and the bench power supply called out in that figure. The facility will supply the rest of the test equipment.

CE01/CE03 and CE07 Current measurements shall be taken without anything connected to the power lines (i.e. without the connections required for the CE07 voltage measurements in place). “Spectrum” measurements are CE01/CE03, while Current and Voltage measurements are CE07. Measurements to be documented in facility report.

Measurements are to be made with the entire suite harnessed together, all services powered on, and the suite functioning in its “Noisy” mode (other than high voltages as indicated in section 2.1). Spacecraft simulator GSE including actuator, thermal, and data GSE shall also be connected, and the data GSE shall be active.

Note that only narrow-band measurements are required. “True Differential Mode” tests are only needed if the differential mode tests on power or return exceed the specification in reference 2 figure 1&2.

If significant exceedances are measured relative to the requirement in reference 2 section 4.1 and 4.2, some diagnostic testing may be performed involving powering off some subsystems and/or demating some connectors followed by re-test.

Snaps of spectrum analyzer or scope screens are to be taken of each measurement and appended to this as-run test proc

3.3.1. IDPU CE

IDPU power is on connector IDPU-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. MAG Heater power in also on IDPU-J1, pins 5 and 6, with return on pins 13 and 14. Measurements to be taken:

3.3.1.1 IDPU Power Service Current Measurements

a) Differential Mode Spectrum, Power ________
b) Differential Mode Current, Power line, <200mA p-p ________
c) Differential Mode Spectrum, Return ________
d) Differential Mode Current, Return line, <200mA p-p ________
e) True Differential Spectrum, if needed ________
f) Common Mode Spectrum, Power and Return ________
g) Common Mode Current, Power and Return, <50mA p-p ________
h) Differential Mode Spectrum, MAG Heater ________
i) Differential Mode current, MAG Power line, <200mA p-p ________
j) Differential Mode Spectrum, MAG Heater Return ________
k) Differential Mode current, MAG Return line, <200mA p-p ________
l) True Differential Spectrum, MAG Heater, if needed ________

m) Common Mode Spectrum, MAG Heater and Return ________
n) Common Mode current, MAG Heater and Return, <50mA p-p ________

TC Initials:__________

3.3.1.2 IDPU Power Service Voltage Measurements

a) Differential voltage, Power to Return, <700mV p-p ________
b) Common mode voltage, Power to Chassis, <500mV p-p ________
c) Common mode voltage, Return to Chassis, <500mV p-p ________
d) Differential voltage, MAG Power to MAG Return, <700mV p ________
e) Common mode voltage, MAG Power to Chassis, <500mV p-p ________
f) Common mode voltage, MAG Return to Chassis, <500mV p-p ________

TC Initials:__________

3.3.1.3 IDPU Harness Common Mode Current Measurements

a) Common Mode Spectrum, Power harness (IDPU-J1) ________
b) Common Mode Current, Power harness (IDPU-J1), <50mA p-p ________
c) Common Mode Spectrum, 1553 harness (IDPU-J2a,b) ________
d) Common Mode Current, 1553 harness (IDPU-J2a,b), <50mA p-p________
e) Common Mode Spectrum, PLASTIC harness (IDPU-J3) ________
f) Common Mode Current, PLASTIC harness (IDPU-J3), <50mA p-p ________
g) Common Mode Spectrum, SEP harness (IDPU-J4) ________
h) Common Mode Current, SEP harness (IDPU-J4), <50mA p-p ________
i) Common Mode Spectrum, SWEA harness (IDPU-J5) ________
j) Common Mode Current, SWEA harness (IDPU-J5), <50mA p-p ________
k) Common Mode Spectrum, MAG harness (IDPU-J6) ________
l) Common Mode Current, MAG harness (IDPU-J6), <50mA p-p ________
m) Common Mode Spectrum, STE-U harness (IDPU-J7) ________
n) Common Mode Current, STE-U harness (IDPU-J7), <50mA p-p ________

TC Initials:__________

3.3.2. SEP CE

SEP power is on connector SEP-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. SEP heater power in on SEP-J1 pins 5 and 6 with returns on pins 13 and 14. Measurements to be taken:

3.3.2.1 SEP Power Service Current Measurements

a) Differential Mode Spectrum, Power ________
b) Differential Mode Current, Power line, <200mA p-p ________
c) Differential Mode Spectrum, Return ________
d) Differential Mode Current, Return line, <200mA p-p ________
e) True Differential Spectrum, if needed ________
f) Common Mode Spectrum, Power and Return ________
g) Common Mode Current, Power and Return, <50mA p-p ________
h) Common Mode Spectrum, SEP Survival heater and Return ________
i) Common Mode Current, SEP Survival heater and Return, <50mA p-p ________

TC Initials:__________

3.3.2.2 SEP Power Service Voltage Measurements

a) Differential voltage, Power to Return, <700mV p-p ________
b) Common mode voltage, Power to Chassis, <500mV p-p ________
c) Common mode voltage, Return to Chassis, <500mV p-p ________

TC Initials:__________

3.3.2.3 SEP Harness Common Mode Current Measurements

a) Common Mode Spectrum, Power harness (SEP-J1) ________
b) Common Mode Current, Power harness (SEP-J1), <50mA p-p ________
c) Common Mode Spectrum, Thermal harness (SEP-J2) ________
d) Common Mode Current, Thermal harness (SEP-J2), <50mA p-p ________
e) Common Mode Spectrum, SIT harness (SEP-J5) ________
f) Common Mode Current, SIT harness (SEP-J5), <50mA p-p ________
g) Common Mode Spectrum, SEPT-E harness (SEP-J7) ________
h) Common Mode Current, SEPT-E harness (SEP-J7), <50mA p-p ________
i) Common Mode Spectrum, SEPT-NS harness (SEP-J9) ________
j) Common Mode Current, SEPT-NS harness (SEP-J9), <50mA p-p________
k) Common Mode Spectrum, SIT Actuator harness (SIT-J3) ________
l) Common Mode Current, SIT Actuator harness (SIT-J3), <50mA p-p ________
m) Common Mode Spectrum, SEPT-E Actuator harness (SEPT-E J3)________
n) Common Mode Current, SEPT-E Actuator harness (SEPT-E J3), <50mA p-p ________

o) Common Mode Spectrum, SEPT-NS Actuator harness (SEPT-NS J3) __________

p) Common Mode Current, SEPT-NS Actuator harness (SEPT-NS J3), <50mA p-p __________

TC Initials:__________

3.3.3. SWEA/STE-D CE

SWEA/STE-D power is on connector BOOM-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. SWEA heater power in on BOOM-J1 pins 5 and 6 with returns on pins 13 and 14. Boom Actuator heater on BOOM-J1 pins 4 and 7 and return on pins 12 and 15. Measurements to be taken:

3.3.3.1 SWEA/STE-D Power Service Current Measurements

a) Differential Mode Spectrum, Power ________
b) Differential Mode Current, Power line, <200mA p-p ________
c) Differential Mode Spectrum, Return ________
d) Differential Mode Current, Return line, <200mA p-p ________
e) True Differential Spectrum, if needed ________
f) Common Mode Spectrum, Power and Return ________
g) Common Mode Current, Power and Return, <50mA p-p ________
h) Common Mode Spectrum, SWEA Heater and Return ________
i) Common Mode Current, SWEA heater and Return, <50mA p-p ________
j) Common Mode Spectrum, Deployment Heater and Return ________
k) Common Mode Current, Deployment Heater and Return, <50mA p-p ________

TC Initials:__________

3.3.3.2 SWEA/STE-D Power Service Voltage Measurements

a) Differential voltage, Power to Return, <700mV p-p ________
b) Common mode voltage, Power to Chassis, <500mV p-p ________
c) Common mode voltage, Return to Chassis, <500mV p-p ________

TC Initials:__________

3.3.3.3 SWEA/STE-D Harness Common Mode Current Measurements

a) Common Mode Spectrum, Power harness (BOOM-J1) ________
b) Common Mode Current, Power harness (BOOM-J1), <50mA p-p________
c) Common Mode Spectrum, Thermal harness (BOOM-J2) ________
d) Common Mode Current, Thermal harness (BOOM-J2), <50mA p-p ________
e) Common Mode Spectrum, Actuator harness (BOOM-J3) ________
f) Common Mode Current, Actuator harness (BOOM-J3), <50mA p-p ________

TC Initials:__________

3.3.4. PLASTIC CE

PLASTIC power is on connector PLA-J1 (A 9-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 7 and 8. Measurements to be taken:

3.3.4.1 PLASTIC Power Service Current Measurements

a) Differential Mode Spectrum, Power _________
b) Differential Mode Current, Power line, <200mA p-p _________
c) Differential Mode Spectrum, Return _________
d) Differential Mode Current, Return line, <200mA p-p _________
e) True Differential Spectrum, if needed _________
f) Common Mode Spectrum, Power and Return _________
g) Common Mode Current, Power and Return, <50mA p-p _________

TC Initials:__________

3.3.4.2 PLASTIC Power Service Voltage Measurements

a) Differential voltage, Power to Return, <700mV p-p _________
b) Common mode voltage, Power to Chassis, <500mV p-p _________
c) Common mode voltage, Return to Chassis, <500mV p-p _________

TC Initials:__________

3.3.4.3 PLASTIC Harness Common Mode Current Measurements

a) Common Mode Spectrum, Power harness (PLASTIC-J1) _________
b) Common Mode Current, Power harness (PLASTIC-J1), <50mA p-p _________
c) Common Mode Spectrum, Thermal harness (PLASTIC-J2) _________
d) Common Mode Current, Thermal harness (PLASTIC-J2), <50mA p-p _________
e) Common Mode Spectrum, Heater harness (PLASTIC-J3) _________
f) Common Mode Current, Heater harness (PLASTIC-J3), <50mA p-p _________

TC Initials:__________

3.4. *CS01, CS02, CS06*

This test must be performed on each power service using the specification in reference 2 sections 4.5 (Low Frequency), 4.6 (High Frequency) and 4.7 (Spikes). The test setup is shown in reference 2 figure 5.7, 5.8, and 5.9. UCB can supply the 1m harness (with breakout) and the bench power supply called out in that figure (TBR-facility-015). The facility will supply the rest of the test equipment.

SEP, PLASTIC, and BOOM heater circuits should be stimulated in parallel with the corresponding primary power circuits for CS01 and CS02, but shall not be tested for CS06. The MAG heater circuit shall be tested as a primary power service since it is not a simple passive heater circuit.

Measurements are to be made with the entire suite harnessed together, all services powered on, and the suite functioning in its "Quiet" mode (other than high voltages as indicated in section 2.1). Spacecraft simulator GSE including actuator, thermal, and data GSE shall also be connected, and the data GSE shall be active.

All 3 CS tests shall be performed on each primary power service as listed below.

Pauses in the frequency sweep for CS01 and CS02 shall be 2 minutes in duration, (1 minute is the longest telemetry cycle). The system will be setup at the start of the sweep and operate continuously through the sweep without further commanding. During the run a record shall be kept of the frequency setting vs time (at least at the pauses) to allow post-processing of the data. The relative timing of the instrument GSE and the clock used to time the sweep shall be determined, and synchronized if possible.

A list of telemetry points to be monitored and the threshold levels for determining noise are listed below. If significant exceedances are found in the instrument telemetry, the level of sensitivity at that frequency shall be determined. In the event of an exceedance the instrument team will evaluate to determine if it constitutes a failure (will not meet performance requirements) or degradation.

Following the CS tests an instrument LPT test shall be run to verify the instruments survives the tests without degradation.

3.4.1. IDPU CS

IDPU power is on connector IDPU-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11.
Record the background min/max for each of the quantities below prior to the start of the test. During the run record the frequencies where the value significantly exceeds that range (more than 2x the normal variation). After the run data shall be processed (plotted) to look for exceedances that may have been missed during the run.

3.4.1.1 IDPU Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	**Background**		**Exceedances**
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
IMAGHeater			
IMAGTemp			
ISTEUCur			
ISTEUTemp			
ISTEUDACTemp			
ISTEUVCCA			
ISTEU5VD			
ISTEU12V			

3.4.1.2 MAG Field

Monitor RMS field values (displayed on the GSE) to look for increases (>2x normal variations). Set the MAG telemetry sample rate to 32Hz for this test (at 4Hz 60Hz noise is seen as a slow beat which can mask other noise sources).

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
MAG X RMS			
MAG Y RMS			
MAG Z RMS			

3.4.1.3 STE-U Monitor Rates

Looks for any significant increase in the 24 monitor rates. Any change > 2x the normal variations (more than 5 counts/second for rates that are normally zero) may be significant.

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
LLD0			
LLD1			
LLD2			
LLD3			
ULD0			
ULD1			
ULD2			
ULD3			
RST0			
RST1			
RST2			
RST3			

TC Initials:__________

3.4.2. MAG Heater CS

MAG Heater power in on IDPU-J1, pins 5 and 6, with return on pins 13 and 14.

Record the background min/max for each of the quantities below prior to the start of the test. During the run record the frequencies where the value significantly exceeds that range (more than 2x the normal variation). After the run data shall be processed (plotted) to look for exceedances that may have been missed during the run.

3.4.2.1 IDPU Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	Background		Exceedances
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	Background		Exceedances
	Min	Max	
IMAGHeater			
IMAGTemp			
ISTEUCur			
ISTEUTemp			
ISTEUDACTemp			
ISTEUVCCA			
ISTEU5VD			
ISTEU12V			

3.4.2.2 MAG Field

Monitor RMS field values (displayed on the GSE) to look for increases (>2x normal variations). Set the MAG telemetry sample rate to 32Hz for this test (at 4Hz 60Hz noise is seen as a slow beat which can mask other noise sources).

Telemetry Point	Background		Exceedances
	Min	Max	
MAG X RMS			
MAG Y RMS			
MAG Z RMS			

TC Initials:__________

3.4.3. SEP CS

SEP power is on connector SEP-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. SEP heater power in on SEP-J1 pins 5 and 6 with returns on pins 13 and 14.

Record the background min/max for each of the quantities below prior to the start of the test. During the run record the frequencies where the value significantly exceeds that range (more than 2x the normal variation). After the run data shall be processed (plotted) to look for exceedances that may have been missed during the run.

3.4.3.1 SEP Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	**Background**		**Exceedances**
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
TBD-CIT-016			

c) SEPT Analogs:
Note: raw units are given, valid @ 20 °C under GN2 purge, + sign denotes channels which may increase when purge is interrupted.

Telemetry Point	**Min**	**Max**	**Exceedances**
SEPTNS_CS0	57	59	
SEPTNS_CS1	53	55+	
SEPTNS_CS2	59	60	
SEPTNS_CS3	48	49	
SEPTNS_GR0	54	55	
SEPTNS_GR1	51	52	
SEPTNS_GR2	54	55	
SEPTNS_GR3	42	44	
SEPTE_CS0	79	81	
SEPTE_CS1	73	75	
SEPTE_CS2	66	68	
SEPTE_CS3	66	68	
SEPTE_GR0	75	78	
SEPTE_GR1	69	71+	
SEPTE_GR2	69	71+	
SEPTE_GR3	56	59	

3.4.3.2 HET Monitor Rates

Telemetry Point	**Background**	**Exceedances**
H1i High Gain	0-1000	
H1o High Gain	0-1000	
H2 High Gain	0-1000	
H3 Hi Gain	0-1000	
H4 Hi Gain	0-1000	
H5 Hi Gain	0-1000	
H6 Hi Gain	0-1000	
H1i Low Gain	0-50	
H1o Low Gain	0-50	
H2 Low Gain	0-50	
H3 Low Gain	0-50	
H4 Low Gain	0-50	
H5 Low Gain	0-50	
H6 Low Gain	0-50	
Trigger	0-5000	
Coincidence	0-1000	

3.4.3.3 LET Monitor Rates

TBD-CIT-018

3.4.3.4 SIT Monitor Rates

TBD-CIT-019

3.4.3.5 SEPT Monitor Rates

The SEPT counters (after decompression) should not exceed the background rate by more than a factor of 2. Singles are not compressed.

Telemetry Point		**Background**	**Exceedances**
SEPT-NS PDFE0	32 counters	1000	
SEPT-NS PDFE1	32 counters	1000	
SEPT-NS PDFE2	32 counters	1000	
SEPT-NS PDFE3	32 counters	1000	
SEPT-NS Singles	8 counters	1000	
SEPT-E PDFE0	32 counters	1000	
SEPT-E PDFE1	32 counters	1000	
SEPT-E PDFE2	32 counters	1000	
SEPT-E PDFE3	32 counters	1000	
SEPT-E Singles	8 counters	1000	

TC Initials:__________

3.4.4. SWEA/STE-D CS

SWEA/STE-D power is on connector BOOM-J1 (A 15-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 10 and 11. SWEA heater power in on BOOM-J1 pins 5 and 6 with returns on pins 13 and 14. Boom Actuator heater on BOOM-J1 pins 4 and 7 and return on pins 12 and 15.

Record the background min/max for each of the quantities below prior to the start of the test. During the run record the frequencies where the value significantly exceeds that range (more than 2x the normal variation). After the run data shall be processed (plotted) to look for exceedances that may have been missed during the run.

3.4.4.1 SWEA Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	**Background**		**Exceedances**
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
ISWEAMCP			
ISWEANR5V			
ISWEAV0			
ISWEAGND			
ISWEASTEDCur			
ISWEAMCPTemp			
ISTEDTemp			
ISWEADACTemp			
ISWEASTEDVCCA			
ISWEASTED5VD			
ISWEASTE12V			

3.4.4.2 SWEA Count Rates

The SWEA counters should normally be zero, resulting in a zero (or small) value for the first moment.

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
SWEA Density Moment			

3.4.4.3 STE-D Monitor Rates

Looks for any significant increase in the 24 monitor rates. Any change > 2x the normal variations may be significant.

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
LLD0			
LLD1			
LLD2			
LLD3			
ULD0			
ULD1			
ULD2			
ULD3			
RST0			
RST1			
RST2			
RST3			

TC Initials:__________

3.4.5. PLASTIC CS

PLASTIC power is on connector PLA-J1 (A 9-pin standard density D male connector), with 28V on pins 2 and 3 and return on pins 7 and 8.

Record the background min/max for each of the quantities below prior to the start of the test. During the run record the frequencies where the value significantly exceeds that range (more than 2x the normal variation). After the run data shall be processed (plotted) to look for exceedances that may have been missed during the run.

3.4.5.1 PLASTIC Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	**Background**		**Exceedances**
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
LVC_-12V			
LVC_-5V			
LVC_+2.5VB			
LVC_+12V			
LVC_+2.5VA			
LVC_+5V			
ADC_AVDD(DAC)			
ADC_DVDD (DAC)			
CAL_VREF (DAC)			
LVC_+2.5V_B_IMON			
LVC_+12V_IMON			
LVC_-12V_IMON			
LVC_+5V_IMON			
LVC_-5V_IMON			

LVC_+2.5VA_IMON			
ADC_LU_FLAG			
PLUG_ID			
STATUS_DAC			
TAC0_TSP			
SB1_TSP			
SB0_TSP			
TOF_HV1_TSP			
TOF_HV0_TSP			
S_C_1_TSP			
S_C_0_TSP			
LVC1_TSP			
LVC0_TSP			
ADC1_VREF			
ADC0_VREF			

3.4.5.2 PLASTIC Rates

TBD-UNH-021

TC Initials:___________

3.5. *RE01, RE02*

This test must be performed using the specification in reference 2 sections 4.8, and 4.9. The test setup is shown in reference 2 figures 5.10. and 5.11.

Facility background measurements should be taken prior to the arrival of the instrument, and again with the instrument and GSE in place but the instrument powered off.

Measurements are to be made with the entire suite harnessed together, all services powered on, and the suite functioning in its “Noisy” mode (other than high voltages as indicated in section 2.1). Spacecraft simulator GSE including actuator, thermal, and data GSE shall also be connected, and the data GSE shall be active.

If significant exceedances are measured relative to the requirement in reference 2 section 4.8 and 4.9, some diagnostic testing may be performed involving powering off some subsystems and/or demating some connectors followed by re-test.

Snaps of spectrum analyzer plots shall be taken and appended to this as-run test proc or the test report.

3.5.1. RE01

During RE01 measurements, each exposed face of each separate box shall be scanned. For the boom, scan each end of the boom (SWEA/STE-D/MAG at one end and STE-U, harness spool, and connectors at the other), plus a representative point in the middle of the boom. Also scan each of the intra-instrument harnesses. Note locations and frequencies of any exceedance below (spectra to be provided in facility report).

Table 3.5.1 RE01 Exceedances

Instrument & Location	Frequencies and Amplitudes

TC Initials:__________

3.5.2. RE02

The two required orientations shall be achieved by first scanning one face, then rotating all the instruments by 90 degrees and repeating. Small boxes shall be rotated separately about the vertical axis. At least one orientation should include the connector face. The boom cannot be rotated. Instead the antennas shall be oriented first to point 45 degrees from the direction perpendicular to the bench to the left, and then 45 degrees to the right. Multiple antenna locations shall be used as required to ensure that the full instrument is covered by the antenna pattern.

Note that RE02 measurements shall be taken down to 2KHz.

Table 3.5.2 RE02 Exceedances

Antenna Location	Frequencies and Amplitudes

TC Initials:__________

3.5.3. RS03

This test must be performed using the specification in reference 2 sections 4.10. The test setup is shown in reference 2 figure 5.12. UCB can supply the 1m harness (with breakout) and the bench power supply called out in that figure. The facility will supply the rest of the test equipment.

Measurements are to be made with the entire suite harnessed together, all services powered on, and the suite functioning in its “Quiet” mode (other than high voltages as indicated in section 2.1). Spacecraft simulator GSE including actuator, thermal, and data GSE shall also be connected, and the data GSE shall be active.

The two required orientations shall be achieved by first scanning one face, then rotating all the instruments by 90 degrees and repeating (see note in RE02 about these rotations and antenna patterns)

Pauses in the frequency sweep shall be 2 minutes in duration, (1 minute is the longest telemetry cycle). The system will be setup at the start of the sweep and operate continuously through the sweep without further commanding. During the run a record shall be kept of the frequency setting vs time (at least at the pauses) to allow post-processing of the data. The relative timing of the instrument GSE and the clock used to time the sweep shall be determined and synchronized if possible.

A list of telemetry points to be monitored and the threshold levels for determining noise are listed below. If significant exceedances are found in the instrument telemetry, the level of sensitivity at that frequency shall be determined. In the event of an exceedance the instrument team will evaluate to determine if it constitutes a failure (will not meet performance requirements) or degradation. Note that sensitivity to frequencies in the 8.4-8.5GHz band is more serious since that is what we will see on orbit; the rest is primarily ground test sensitivity.

Following the RS test an instrument LPT test shall be run to verify the instruments survives the tests without degradation.

3.5.4. IDPU Housekeeping

a) Any limit violation as logged by the Command & Telemetry GSE (before the test list any out of limit conditions)

Telemetry Point	**Background**		**Exceedances**
	Min	Max	

b) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
IMAGHeater			
IMAGTemp			
ISTEUCur			
ISTEUTemp			
ISTEUDACTemp			
ISTEUVCCA			
ISTEU5VD			
ISTEU12V			

3.5.5. MAG Field

Monitor RMS field values (displayed on the GSE) to look for increases (>2x normal variations). Set the MAG telemetry sample rate to 32Hz for this test (at 4Hz 60Hz noise is seen as a slow beat which can mask other noise sources).

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
MAG X RMS			
MAG Y RMS			
MAG Z RMS			

3.5.6. STE-U Monitor Rates

Looks for any significant increase in the 24 monitor rates. Any change > 2x the normal variations (more than 5 counts/second for rates that are normally zero) may be significant.

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
LLD0			
LLD1			
LLD2			
LLD3			
ULD0			
ULD1			
ULD2			
ULD3			

RST0			
RST1			
RST2			
RST3			

3.5.7. STE-D Monitor Rates

Looks for any significant increase in the 24 monitor rates. Any change > 2x the normal variations may be significant.

Telemetry Point	Background		Exceedances
	Min	Max	
LLD0			
LLD1			
LLD2			
LLD3			
ULD0			
ULD1			
ULD2			
ULD3			
RST0			
RST1			
RST2			
RST3			

3.5.8. SWEA Housekeeping

Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	Background		Exceedances
	Min	Max	
ISWEAMCP			
ISWEANR5V			
ISWEAV0			
ISWEAGND			
ISWEASTEDCur			
ISWEAMCPTemp			
ISTEDTemp			
ISWEADACTemp			
ISWEASTEDVCCA			
ISWEASTED5VD			
ISWEASTE12V			

3.5.9. SWEA Count Rates

The SWEA counters should normally be zero, resulting in a zero (or small) value for the first moment.

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
SWEA Density Moment			

3.5.10. SEP Housekeeping

a) Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	**Background**		**Exceedances**
	Min	Max	
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b) SEPT Analogs:
Note: raw units are given, valid @ 20 °C under GN2 purge, + sign denotes channels which may increase when purge is interrupted.

Telemetry Point	**Min**	**Max**	**Exceedances**
SEPTNS_CS0	57	59	
SEPTNS_CS1	53	55+	
SEPTNS_CS2	59	60	
SEPTNS_CS3	48	49	
SEPTNS_GR0	54	55	
SEPTNS_GR1	51	52	
SEPTNS_GR2	54	55	
SEPTNS_GR3	42	44	
SEPTE_CS0	79	81	
SEPTE_CS1	73	75	
SEPTE_CS2	66	68	
SEPTE_CS3	66	68	
SEPTE_GR0	75	78	
SEPTE_GR1	69	71+	

SEPTE_GR2	69	71+	
SEPTE_GR3	56	59	

3.5.11. HET Monitor Rates

Telemetry Point	Background	Exceedances
H1i High Gain	0-1000	
H1o High Gain	0-1000	
H2 High Gain	0-1000	
H3 Hi Gain	0-1000	
H4 Hi Gain	0-1000	
H5 Hi Gain	0-1000	
H6 Hi Gain	0-1000	
H1i Low Gain	0-50	
H1o Low Gain	0-50	
H2 Low Gain	0-50	
H3 Low Gain	0-50	
H4 Low Gain	0-50	
H5 Low Gain	0-50	
H6 Low Gain	0-50	
Trigger	0-5000	
Coincidence	0-1000	

3.5.12. LET Monitor Rates

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3.5.13. SIT Monitor Rates

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3.5.14. SEPT Monitor Rates

The SEPT counters (after decompression) should not exceed the background rate by more than a factor of 2. Singles are not compressed.

Telemetry Point		Background	Exceedances
SEPT-NS PDFE0	32 counters	1000	
SEPT-NS PDFE1	32 counters	1000	
SEPT-NS PDFE2	32 counters	1000	
SEPT-NS PDFE3	32 counters	1000	
SEPT-NS Singles	8 counters	1000	
SEPT-E PDFE0	32 counters	1000	
SEPT-E PDFE1	32 counters	1000	
SEPT-E PDFE2	32 counters	1000	
SEPT-E PDFE3	32 counters	1000	

SEPT-E Singles	8 counters	1000	

3.5.15. PLASTIC Housekeeping

Analog housekeeping shall be monitored for induced noise that may be within limits, but >2x above the usual background variation (or 10% if no significant background variation). Points to be monitored include:

Telemetry Point	Background		Exceedances
	Min	Max	
LVC_-12V			
LVC_-5V			
LVC_+2.5VB			
LVC_+12V			
LVC_+2.5VA			
LVC_+5V			
ADC_AVDD(DAC)			
ADC_DVDD (DAC)			
CAL_VREF (DAC)			
LVC_+2.5V_B_IMON			
LVC_+12V_IMON			
LVC_-12V_IMON			
LVC_+5V_IMON			
LVC_-5V_IMON			
LVC_+2.5VA_IMON			
ADC_LU_FLAG			
PLUG_ID			
STATUS_DAC			
TAC0_TSP			
SB1_TSP			
SB0_TSP			
TOF_HV1_TSP			
TOF_HV0_TSP			
S_C_1_TSP			
S_C_0_TSP			
LVC1_TSP			
LVC0_TSP			
ADC1_VREF			
ADC0_VREF			

3.5.16. PLASTIC Rates

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TC Initials:__________