

STEREO CONFIGURATION CHANGE REQUEST

For Office Use Only	TITLE: Request to waive the Harness Shielding Requirement on the IMPACT Harness.	CLASS:	NUMBER:		
		I			
		II	DATE: 3-10-2004		
CONFIGURED ITEM: IMPACT Instrument		ORIGINATOR:			PRIORITY:
STS Number:	Payload: STEREO	Name:	Dave Curtis		<input checked="" type="checkbox"/> Routine
Component :	Experiment: IMPACT	Organization:	U.C. Berkeley		<input type="checkbox"/> Urgent
Component Part #:	Serial #:	Phone:	510-642-5998		<input type="checkbox"/> Emergency
		Email:	dwc@ssl.berkeley.edu		
TYPE OF REQUEST:		RESPONSIBLE ORGANIZATION/INDIVIDUAL:		IMPACTS: (If yes, attach additional pages)	
<input type="checkbox"/>	Configuration				
<input type="checkbox"/>	Deviation	#			
<input checked="" type="checkbox"/>	Waiver	#			
<input type="checkbox"/>	Other:				
REASONS FOR CHANGE:				RETEST REQUIRED:	
<input type="checkbox"/>	Improvement	<input type="checkbox"/> Test/Payload Failure	<input type="checkbox"/>	New Document:	
<input type="checkbox"/>	Reliability	<input type="checkbox"/> Specification Requirements	<input checked="" type="checkbox"/>	Other:	
				<input checked="" type="checkbox"/>	No
				<input type="checkbox"/>	Yes
<p>PROPOSED CHANGE (Attach additional pages as required)</p> <p>The following IMPACT harnesses include segments outside the STEREO spacecraft bus, and so potentially susceptible to discharges as described in the EMC requirements - Section 3.2.6.10.2, "STEREO EMC Control Plan and STEREO EMI Performance Requirements", 7381-9030 Rev B. We feel the signals on these harnesses are sufficiently robust that they do not require the 20 mils aluminum equivalent shielding called out in the requirements, as justified by each of the designers noted below. Note there are no floating conductors in or near these harnesses, so only the small discharges from insulators in the harness need to be considered.</p>					

RATIONALE (Attach additional pages as required)

IDPU to PLASTIC Harness

This harness contains 3 digital signals carried is RG178 coaxes with a common silver-clad fiber braid over-shield. This over-shield will be exposed on the part of the harness that is exposed. The signals are driven and received by National 54AC14 gates which are ESD protected to category B of Mil-Std-883C, test method 3015, class 2; guaranteed to be immune to 2000V discharge from a 100pF capacitor through 1500 ohms (far in excess of what can be expected from insulation discharge).

IDPU to SEP Harness

Same as 1.

IDPU to Boom (SWEA) Harness

Same as 1.

IDPU to Boom (MAG) Harness

The MAG sensor cable is composed of four coaxial conductors and a two twisted pairs. All conductors are terminated by low impedance, high capacitance loads, the MINIMUM being 0.015 uF. Using the maximum penetrating charged particle flux levels derived from the "Handbook of Geophysics and the Space Environment" (fourth edition, published by the US Air Force - ADA 167000) , the maximum voltage that can be developed across these cables during a charging event is < 6volts with a time constant of ~30 nS. Each coaxial external conductor already provides more than adequate shielding and adding 20 mils of Al would accomplish nothing. These voltages are non-damaging to any of the MAG circuits. The twisted pairs are terminated by 80 ohm resistors in parallel with 0.1 uF capacitors and the expected voltage rise during a maximum charging event is negligible.

IDPU to Boom (STE-U) Harness

- There are no unconnected wires.
- Preamp output -> shaper input
Both the driver and the input are connected to Analog devices AD8005s. Analog Devices says these parts have a 2000V Level 1 ESD rating, so this should meet the requirements.
- MAX987 comparators (door switches)
Drives the cable through 100 ohm resistors, with 0.01 uF capacitors on the cable. This capacitor will limit the voltage to less than 0.3V, so it should not be a problem.
- LT1353 (thermometer conditioner)
Drives the cable, with an HS-508A on the other end. I will add a 1000 pF capacitor in parallel with this output, limiting the voltage to 2.7v max, within the part specifications for both ends.
- Power supplies
Filter capacitors will reduce the discharge voltage to acceptable levels.

Boom Harness

This harness carries signals up the IMPACT boom to SWEA/STE-D and MAG. For most of its length the stacer provides 20mil Aluminum equivalent, while for the remainder a copper braid provides better than 20 mils Aluminum equivalent with better than 95% coverage. It is not clear if this requires a waiver (depending on if a 95% braid meets the requirement). The signals in this harness consist of a combination of 3 and 4 above, plus spacecraft power and temperature services (which APL says are ESD protected to a level higher than the insulator discharges indicated in the EMC spec).

SEP to SIT, SEPT-NS, and SEPT-E Harnesses

Most of the signals in these harnesses are connected to ESD-protected circuits to exceed the 900V insulator discharge arc model. One digital part with no manufacturer data and one FET are possible concerns, but will be protected with capacitors and/or zeners. In addition there is spacecraft survival heater power and temperature sensor signals in these harnesses (which APL says are ESD protected to a level higher than the insulator discharges indicated in the EMC spec).

SEPT detector cables (from e-box to detectors)

- 12 coax cables
- type: MIL-C-17/93 RG 178TF
- exposed length: 90 mm each
- outer jacket: FEP
- additional Viton shrink sleeve, length 29 mm each
- shielding braid: SPC AWG38
The shielding braid is grounded to box structure at both ends of the 90 mm long cables. This is considered good shielding of the center lead and no extra shielding by 20 mils aluminum is required.
- The PDFE is ESD protected:
Up to 8 kV human body model according to Mil Std 883c method 3015.5 pin combination up to 1 kV human body model according to Mil Std 883c method 3015.7 as stated in the PDFE data sheet. Alcatel Microelectronics ESD design rules are implemented. Decoupling capacitor before PDFE, manufacturer Kemet does not specify precise breakdown voltage, but notes give values of 1000 V

DOCUMENTS/DRAWINGS AFFECTED (Document No./Title/Section) :

Section 3.2.6.10.2, "STEREO EMC Control Plan and STEREO EMI Performance Requirements", 7381-9030 Rev B.

AFFECTED (Check all that apply):

FLIGHT SYSTEMS:

- Avionics
- Experiment
- Structures and Mechanical

- Electrical and Cables
- Software/Firmware
- Other:

GROUND SYSTEMS:

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- Other:

REQUIRED APPROVAL DATE: _____

REQUIRED JUSTIFICATION:

STEREO CONFIGURATION CHANGE REQUEST

For Office Use Only	TITLE:		CLASS:		NUMBER:	
			I		DATE:	
			II			
CONTRACT/AGREEMENT NUMBER EFFECTIVITY:						
STEREO NAS5-97271		√	IMPACT S-13635Y		PLASTIC NAS5-00132	SECCHI S-13631Y
DOCUMENTS/DRAWINGS TO BE REVISED:						
Document/Drawing Number:		Document/Drawing Title:		Section(s) No.	EO No.:	Date Completed:
PROCESSING APPROVAL:						
CCB						
Out of Board						
Emergency		Systems Engineer			Date	
CCB APPROVAL:						
CCB ACTION DATE:		CCB ACTION ITEMS/CONDITIONS:				
Approved Denied Withdrawn Hold						
CLOSEOUT COMMENTS:					DATE OF CLOSEOUT:	
					CMO	