STEREO IMPACT

PROBLEM REPORT
PR-1002
STE-U FM1 Assembly
2004-04-12

PR Numbers: 1xxx=UCB, 2xxx=Caltech/JPL, 3xxx=UMd, 4xxx=GSFC/SEP, 5xxx=GSFC/Mag, 6xxx=CESR, 7xxx=Keil, 8xxx=ESTEC, 9xxx=MPAe

Assembly : IMPACT Boom	**SubAssembly :** STE-U
Component/Part Number:	**Serial Number:** FM1
Originator: David Curtis	**Organization:** U.C.Berkeley
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Failure Occurred During (Check one √)

√ Functional test | Qualification test | S/C Integration | Launch operations

Environment when failure occurred:

√ Ambient | Vibration | Shock | Acoustic
Thermal | Vacuum | Thermal-Vacuum | EMI/EMC

Problem Description

During first power-on of the FM1 STE-U assembly 2 of the 4 detector segments were non-functional. In addition, the door status read-back indicated both open and closed states active.

Analyses Performed to Determine Cause

The detector, preamp, and door had been tested previously. The only operation that had been performed since those test were assembly of the detector and preamp into the chassis and wiring them up together.

1. Close inspection of the bonds in question under a microscope reveals that not only was the first bond wire broken where the wire meets the joint, but that the second bad segment bond wire was deformed such that it makes contact with the detector surface at a second location (grounded shield segment).
2. The door open status read-back signal was shorted to the door closed status read-back signal at the connector block. There is insufficient clearance between conductors in that block and where the solder lug for the cover open signal passes by.

Corrective Action/ Resolution

Rework | √ Repair | Use As Is | Scrap

1. a. Replaced the damaged detector board (S/N#002) with a flight spare (S/N#004).
   b. A protective GSE cover was added to the assembly procedure of the flight units and will be used for all subsequent builds.
   c. The S/N#002 detector board was returned to the bonding house and the two failed bond wires were removed and replaced. Each segment had multiple contact pads, so fresh pads were bonded to the detector. The reworked detector board was retested and meets the performance requirements and is considered a candidate for use in one of the STE flight units.
2. Installation of kapton tape over the conductor on the block fixed the problem.

Resolution: Rework completed. Preliminary tests indicate that the instrument is working fine. All 4 channels are functional and the door is working nominally.

Date Action Taken: 2004-4-22 **Retest Results**: Success

Corrective Action Required/Performed on other Units √ Serial Number(s): STE-U FM2, STE-D FM1 & FM2, spare all have kapton tape added to avoid shorting.

Closure Approvals

Subsystem Lead: _____ Date:_____
IMPACT Project Manager: _____ Date _____
IMPACT QA: _____ Date:_____
NASA IMPACT Instrument Manager: _____ Date:_____

Preliminary Inspection Results, 2004-4-12 – 13:

1. One of the detector bond wire has been broken at the detector bond point. There is wire bonded to the detector surface still visible, indicating a break at the knee of the bond joint. The bond wires had been tested mechanically by the manufacturer, and electrically by UCB prior to assembly. The bond wires are exposed during the installation of the detector into the box to damage from accidental contact by the installer. No such contact was noted at the time (three people were present), but no other opportunity for damage existed.
2. The other failed detector segment is still under investigation. Its bond wire is intact, and the characteristic of the failure is different under electrical diagnosis (detector segment seems to have a low impedance to ground). More data to be obtained after detector board is removed.
3. The door open status read-back signal was shorted to the door closed status read-back signal at the connector block. There is insufficient clearance between conductors in that block and where the solder lug for the cover open signal passes by. Installation of kapton tape over the conductor on the block fixed the problem.

Post-disassembly inspection results, 2004-4-15:

Close inspection of the bonds in question under a microscope reveals that not only was the first bond wire broken where the wire meets the joint, but that the second bad segment bond wire was deformed such that it makes contact with the detector surface at a second location (grounded shield segment). Both bonds are fairly close together, and were likely broken in the same event. The other bond wires look un-touched.

Instrument Rework results, 2004-4-23:

Rework completed per items 1,2,3 in corrective action section above. Preliminary tests indicate instrument working fine. All 4 channels functional, door working nominally.

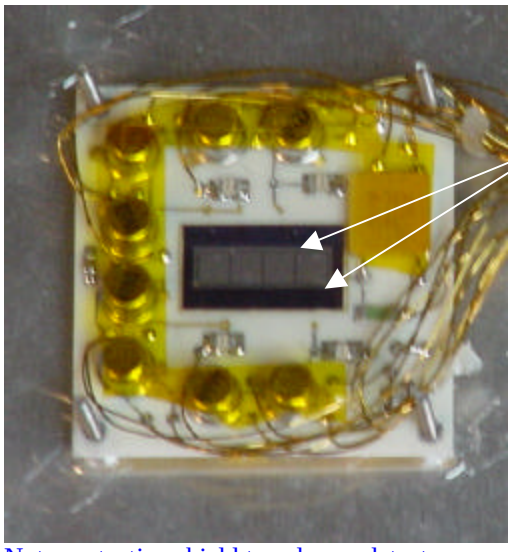
Detector board rework results, 2004-4-23:

Detector board was returned to the bonding house. All bond wires were inspected. The two failed bond wires were removed and replaced. Each segment has multiple contact pads, so fresh pads were bonded to on the detector. There was plenty of room on the board side for the new wire. See attached photos before and after the new bond wires were added. The reworked board is in the queue for performance testing and possible use on one of the other 3 STE flight units.

Detector board retest results, 2004-5-30:

The reworked detector board was retested and meets the performance requirements. It is considered a candidate for use in one of the STE flight units.

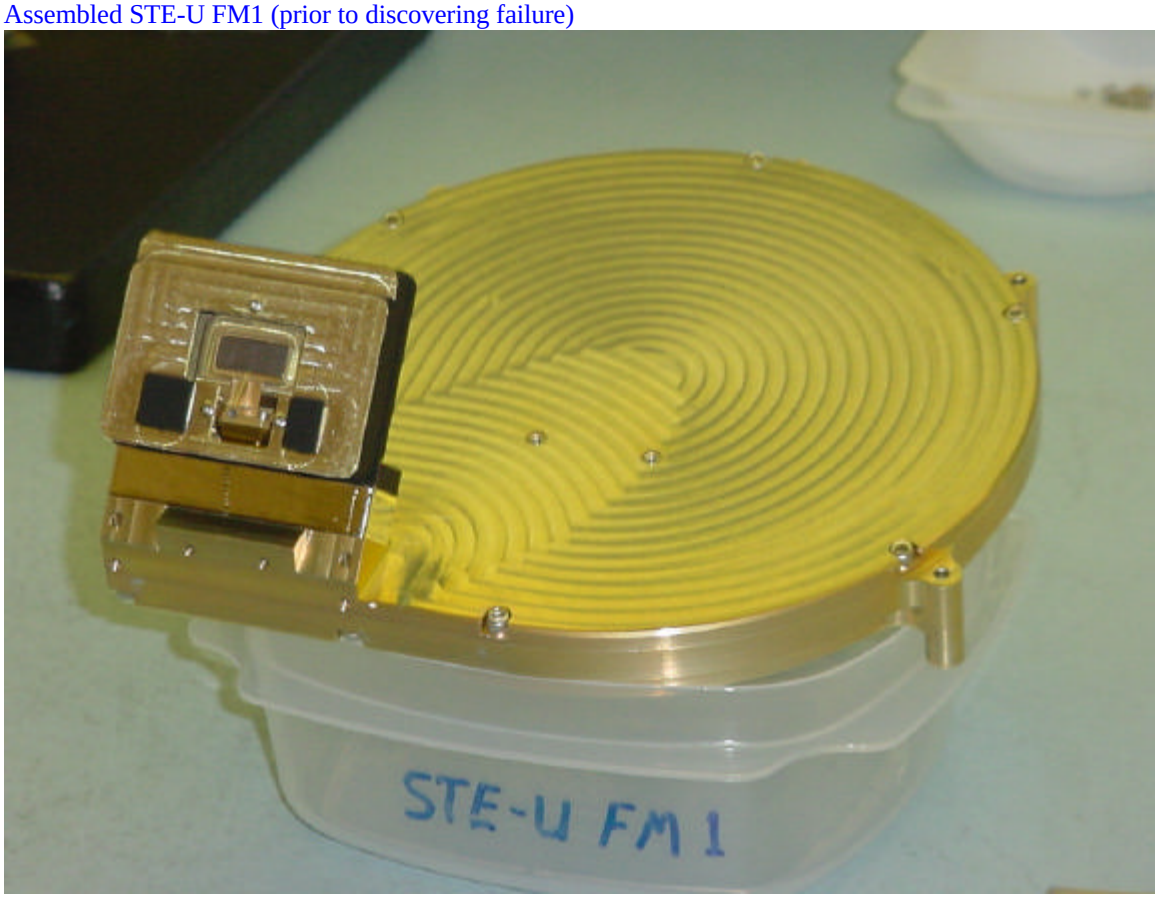
Failed STE detector.



Note protective shield taped over detector

Detector installed in box

Assembled STE-U FM1 (prior to discovering failure)



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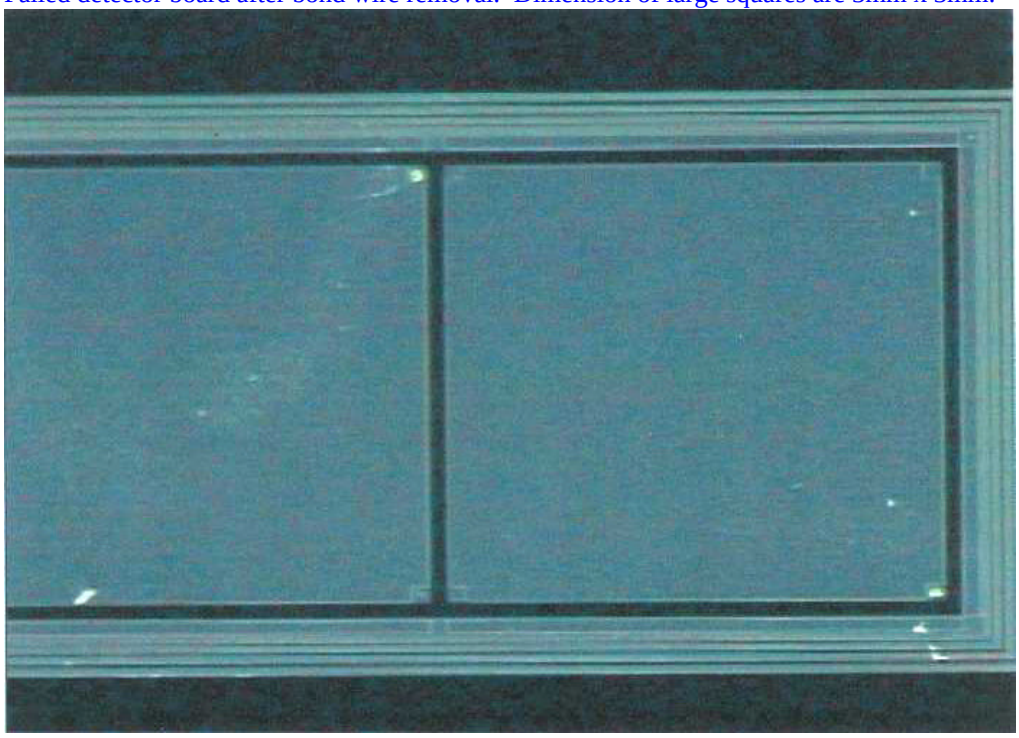
Failed detector board after bond wire removal. Dimension of large squares are 3mm x 3mm.



Repaired detector board