

STEREO *IMPACT*

FM2 SWEA/STE-D Thermal Vacuum Retest Report

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Distribution List

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1. Overview

1.1. *Introduction*

The Solar Wind Electron Analyzer and Supra-Thermal Electron Detector (Downstream) (SWEA/STE-D) is the part of the STEREO IMPACT instrument suite. It resides at the end of the IMPACT boom.

This document describes the results of the thermal vacuum retest performed on the FM2 SWEA/STE-D unit. This retest was occasioned by the rework made following the failure of the FM1 SWEA test pulser in observatory thermal balance test (PFR 176). This testing was performed at U.C. Berkeley based on the test procedure called out in reference 1, adjusted as follows (as agreed to by STEREO Project):

- 4 cycles were performed
- A different chamber was used which did not have provision for a cooling strap to STE-D, so the STE-D temperatures were significantly warmer than the qualification levels.

The SWEA/STE-D FM2 unit has satisfactorily completed this thermal vacuum test and passed the associated functional tests with no problems.

1.2. *Applicable Documents*

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

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

1. SWEA and STE-D Revised Test Plan1
2. APL Document APL 7381-9003 Rev A – STEREO Environment Definition, Observatory and Instrument (on APL web site)
3. IMPACT-SWEA-CPT
4. IMPACT-SWEA-FM2-Tvac-Report



Fig 1. FM1 SWEA/STE-D

2. Test Setup

The “SNOUT” thermal vacuum chamber at U.C. Berkeley was used for this thermal vac of the FM2 SWEA/STE-D.

The ETU IDPU was setup outside the chamber as indicated in the test plan (reference 1).

Four 10mCi Ni63 sources were mounted around SWEA on a test fixture to provide a nearly uniform illumination of the SWEA aperture with electrons to stimulate the instrument in and end-to-end test. STE-D also had some view of the Ni63 sources.

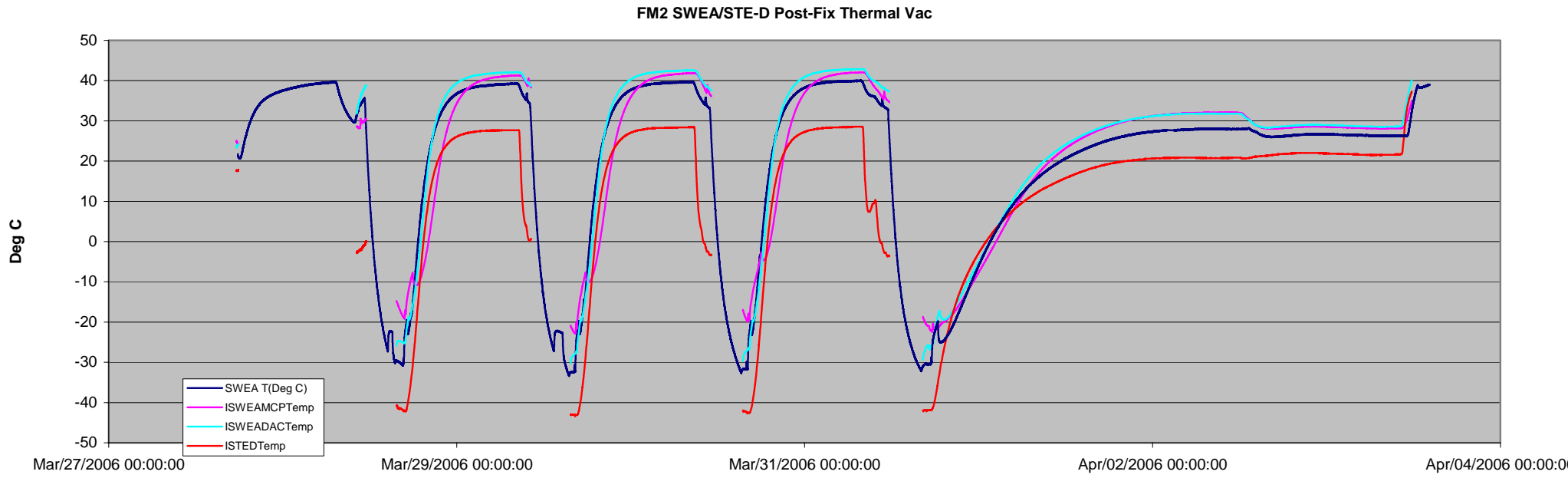
In addition to chamber monitoring TCs (on the baseplate, and shroud), a number of chamber TCs were attached to the exterior of the instrument to monitor the temperature. These instrument-mounted TCs, together with the internal passive PRT sensor attached to the SWEA chassis, were used to determine when temperature soaks were met. We could not mount a TC to the STE-D unit due to surface issues and size, so only the internal sensor was available for that.

3. Test History

This test started on 2006-March-27, following workmanship vibration testing. Following a ~8 hour bake at non-op hot (+40C), the system was transitioned to operational hot case. Baseplate was sent to +35C, and the shroud was sent cold (-50C) to cool STE-D. The hot case CPT was performed with STE-D at ~0C and the reset of SWEA at ~+40C. SWEA High voltage was powered on and a nominal distribution from the Ni63 sources was observed. STE_D also saw the Ni63 source when the door was opened. This CPT was repeated at each plateau with nominal results in each case. The instrument was then transitioned cold, with SWEA reaching -30C and STE-D reaching -40C. The survival heater was exercised (On at ~ -30C off at ~ -20C), the instrument was cold-started, and the CPT performed. The remaining 3 cycles were completed in the same way.

4. Temperature Profile

SWEA PRT is the spacecraft-monitored temperature sensor attached to the SWEA pedestal (internal). ISWEAMCPTemp is telemetry from a thermistor on the MCP board in the SWEA unit. ISWEADACTemp is telemetry from a thermistor on the DAC board in the SWEA pedestal. ISTEDTemp is telemetry from a PRT in the STE-D unit.



5. Trending

5.1. *Trending Data Explanation*

The trending data on the following pages is extracted from the trending file for the FM2 STE-D and SWEA plus LVPS. It is composed of values measured during the CPT, either directly, or from a post-processing fitting function which evaluates the data collected.

- The Door Open and Door Close columns show two times; from application of power to the time when the door comes off the first switch (starts moving), and the time from the application of power to the time when the door reaches the destination switch.
- Threshold values are DAC levels, corresponding to ~100eV per step. Requirement is <5keV.
- The test pulser fit data measures the electronic performance. Of particular interest is the FWHM, which measures the electronic noise in the system. Other values can be used to look for thermal drift and other trends in energy gain and offset.
- The “door source” fit data measures the calibration source on the STE door, and so is a end-to-end measurement (albeit using mostly photons rather than electrons). Again the FWHM is of interest (requirement < 2keV). In a few cases the short integration door source test was skipped due to time limitations; the long integration test is a better test for most purposes.

- SWEA trends show the primary current (data logger) and secondary voltages (instrument housekeeping). High Voltage supply monitors are also trended.

5.3. SWEA, LVPS Trending Data

SWEA FM2 Performance Trend (incl SWEA/STE-D LVPS)

Date	File	Test	SWEA Temp	ISWEAM CPTemp	ISWEADA CTemp	Bus Voltage	Primary Current	2.5V	5VD	5VA	12VA	ISWEAST EDCur	ISWEAVU @ DAC=128				Open Door?	MCP On?	
													5V	al	fl1	fl2			
Mar 23 2006	B0603231015.tlm	Post Rework CPT		28.7	32.3	28	143	2.51	4.98	5.07	11.55	10.4	-12.5	6.09	68.37	161.17	98.56	Yes	No
Mar 23 2006	B0603231653.tlm	Post Vib CPT	27.9	28.8	30.1	28	142	2.51	4.98	5.09	11.59	9.4	-12.5	6.08	68.37	161.17	98.56	No	No
Mar 28 2006	B0603280959.tlm	Tvac Hot #1	32	28.3	34.6	28	144	2.51	4.98	4.94	11.61	12	-12.5	6.16	68.37	160.33	98.56	Yes	Yes
Mar 28 2006	B0603281510.tlm	Tvac Cold #1	-29.9	-17.6	-24.8	28	129	2.50	4.98	4.90	11.10	-11	-12.54	5.97	70.06	164.56	102.79	No	Yes
Mar 29 2006	B0603290915.tlm	Tvac Hot #2	35.3	38.8	39.5	28	129	2.51	4.98	5.04	11.74	14.6	-12.49	6.2	67.95	160.33	98.56	No	Yes
Mar 29 2006	B0603291528.tlm	Tvac Cold #2	-32.5	-21.8	-28.6	28	129	2.50	4.98	4.89	11.03	-13.1	-12.54	5.93	70.06	164.56	102.79	No	Yes
Mar 30 2006	B0603300000.tlm	Tvac Hot #3	34.1	37.1	38.5	28	156	2.51	4.98	5.04	11.73	13.3	-12.49	6.2	67.95	160.33	98.56	No	Yes
Mar 30 2006	B0603301514.tlm	Tvac Cold #3	-31.6	-18.4	-27.8	28	129	2.50	4.98	4.87	11.02	-13.3	-12.54	5.94	70.06	164.56	102.79	No	Yes
Mar 31 2006	B0603310000.tlm	Tvac Hot #4	33.9	35.5	38.1	28	155	2.51	4.98	5.03	11.72	13.9	-12.49	6.19	67.95	160.33	98.56	No	Yes
Mar 31 2006	B0603311605.tlm	Tvac Cold #4	-31	-19.7	-27.4	28	131	2.50	4.98	4.88	11.01	-12.2	-12.54	5.93	70.06	164.56	102.79	No	Yes

6. Contamination Data

No TQCM was available, so three witness foils were used instead. The foils were analyzed at SWALES (File HST393) with no significant residue found (the amount of residue was the same for the control foil as for the foils in the chamber).