

# **SEPT Thermal Vacuum Re-Test Report Preliminary**

V1.0

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**Doc. No.: STEREO-ETKI-012b**

**December 2004**

**Table of contents**

1	Objectives.....	3
2	Applicable Documents.....	3
3	Reference documents.....	3
4	Acronyms and Abbreviations .....	3
5	Overview .....	4
5.1	Set-up.....	4
5.2	Thermocouples.....	5
5.3	Test sequence .....	6
6	Results.....	6
7	Conclusion.....	7

## 1 Objectives

The purpose of this document is to give a preliminary analysis of the results of the SEPT thermal vacuum re-tests which were carried out at ESA/ESTEC from November 25 through December 1, 2004. An official report (RD1) will be issued later by the facility.

## 2 Applicable Documents

- AD1 SEPT Thermal Vacuum Re-Test Plan, STEREO-ETKI-006b, 24-NOV-2004
- AD2 SEPT Comprehensive Performance Test, STEREO-ETKI-009, January 2004
- AD3 STEREO Environment Definition, Observatory, Component and Instrument Test Requirements Document, Doc. No. 7381-9003
- AD4 STEREO Contamination Control Plan, Doc. No. 7381-9006
- AD5 IMPACT Environmental Test Plan, Version D 2003-Dec-30
- AD6 IMPACT Contamination Control Plan, Version A 2003-May-14

## 3 Reference documents

- RD1 SEPT TV Test Facility Data Report, to be released
- RD2 SEPT TV Test Facility Data Report from first TV test campaign: STEREO SEPT TV Cycling Test of FM1 and FM2, TOS-MCV/2004/2970/In/BL

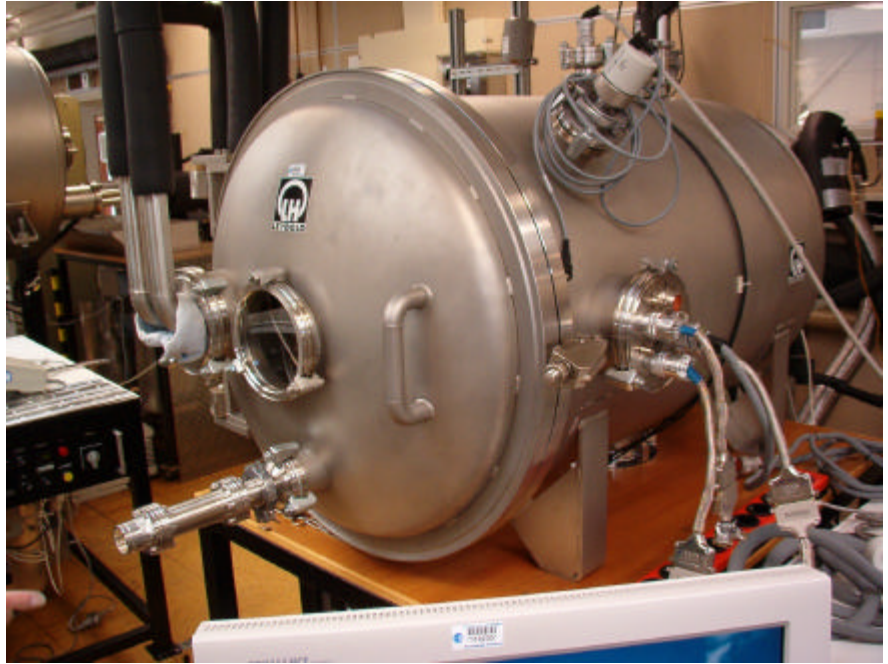
## 4 Acronyms and Abbreviations

CPT	Comprehensive Performance Test
EGSE	Electrical Ground Support Equipment
FM1, FM2	Flight Model 1, 2
LIVAF	Little Vacuum Facility, ESTEC Test Centre
PIPS	Passivated Ion-implanted Planar Silicon detector
SEPT-E	Solar Electron and Proton Telescope – Ecliptic
SEPT-NS	Solar Electron and Proton Telescope – North/South
SSD	Solid State Detector
TC	Thermocouple
TRR	Test Readiness Review
TV	Thermal Vacuum

## 5 Overview

### 5.1 Set-up

The TV chamber is located at ESA/ESTEC (Netherlands) and is shown in Fig. 1:



**Figure 1: Little Vacuum Facility (LIVAF)**

The test setup is carried out according to the test plan (see AD1): four units are mounted side by side on a thermal plate (see Figure 2).

The Ultem bushings below the lugs are replaced by aluminium washers (1 mm thick) to provide good thermal contact to the cold plate and sufficient clearance for the operational and survival heaters on the bottom plate of the E-Box. The Ultem bushings above the lugs are retained. The SEPT-NS units are mounted without brackets.

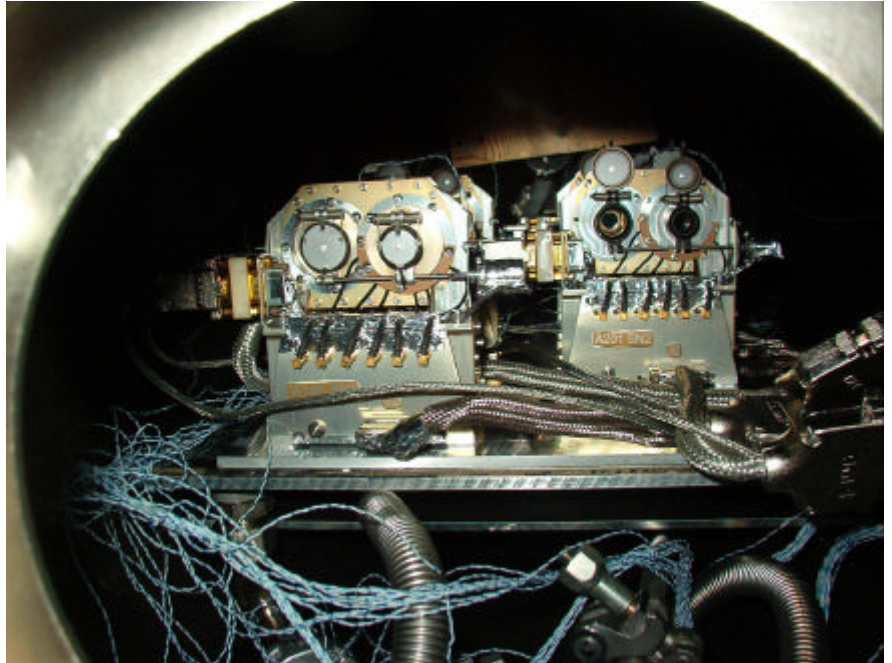


Figure 2: Configuration of the four SEPT units in vacuum, photographed through chamber window (left: SEPT-E FM1 front view, right: SEPT-NS FM1 front view, both FM2 units in second row behind)

## 5.2 Thermocouples

The test facility provided 12 thermocouples (see also Figure 3):

TC No.	Task	Location
1	Critical temperature	FM1 SEPT-E sensor, rear side, detector housing
2	Reference temperature	FM1 SEPT-E Ebox, rear side, close to mounting lug
3	Critical temperature	FM1 SEPT-NS sensor, rear side, detector housing
4	Reference temperature	FM1 SEPT-NS Ebox, rear side, close to mounting lug
5	Critical temperature	FM2 SEPT-E sensor, rear side, detector housing
6	Reference temperature	FM2 SEPT-E Ebox, rear side, close to mounting lug
7	Critical temperature	FM2 SEPT-NS sensor, rear side, detector housing
8	Reference temperature	FM2 SEPT-NS Ebox, rear side, close to mounting lug
9	Control temperature	Cold plate (averaged with TC 10)
10	Control temperature	Cold plate (averaged with TC 9)
11	Shroud	LIVAF chamber shroud door
12	Shroud	LIVAF chamber shroud cylinder

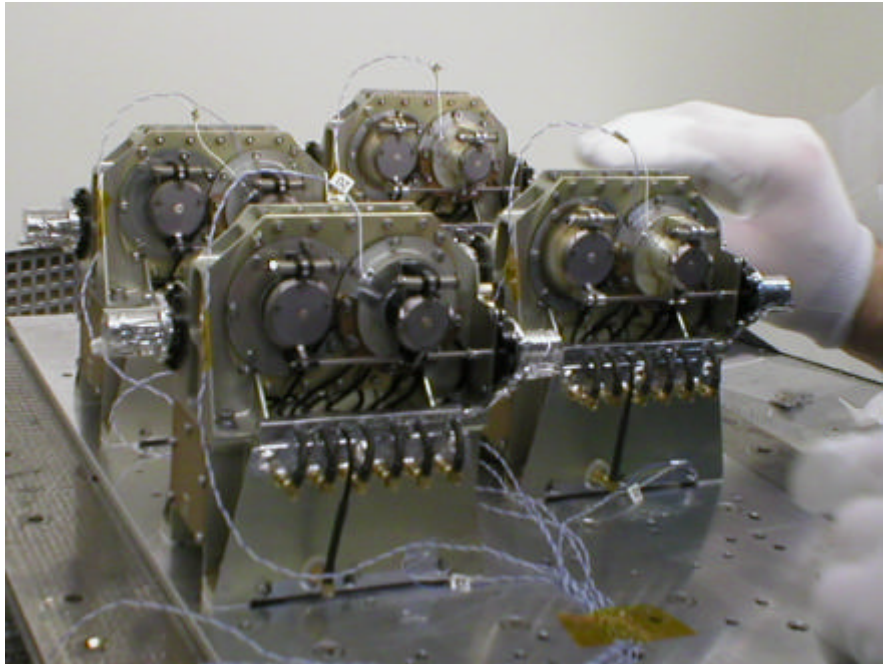


Figure 3: Placement of thermocouples on identical locations of each SEPT unit.

### 5.3 Test sequence

The test sequence was carried out according to the test plan (see AD1), however, with some deviations: Door opening tests were performed in cycle 3 cold soak (2 doors), cycle 4 hot soak (4 doors), and cycle 4 cold soak (2 doors).

## 6 Results

The tests were performed as planned with 7 cycles in the temperature range from  $-40\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$ . All hot and cold dwell temperatures were reached.

All CPTs at hot and cold dwell were successful as were the pre-test and post-test CPTs.

The door opening test for 16 doors were successful (8 doors in hot soak, 8 doors in cold soak). Each pin-puller opened two doors at the same time. The actuator performance was nominal:

Cycle	Door location	Actuation current	Actuation time
3 cold	SEPT-NS FM1 side B	0.8 A	83 ms
3 cold	SEPT-NS FM2 side B	0.8 A	83 ms
4 hot	SEPT-NS FM1 side A	0.8 A	38 ms
4 hot	SEPT-NS FM2 side A	0.8 A	40 ms
4 hot	SEPT-E FM1 side B	0.8 A	37 ms
4 hot	SEPT-E FM2 side B	0.8 A	37 ms
4 cold	SEPT-E FM1 side A	0.8 A	79 ms
4 cold	SEPT-E FM2 side A	0.8 A	77 ms

## 7 Conclusion

The four SEPT units were tested according to AD1. The SEPT detectors, door mechanisms, and electronics boxes performed flawlessly. The three failure cases encountered during the first qualification campaign in February through April 2004 did not show up again proving that the corrective actions taken to prevent these failures were successful. The re-qualification which was made necessary after the rework was performed to the full levels.