

# ACIS Verification Summary Report

**Specification:** ACIS Contract End Item Specification

**Requirement Number/Title:** 3.2.5.3 Thermal (VRSD 3.2.5.3-1)

**Requirement Statement:** The SI shall be designed to meet the thermal requirements to be encountered in the mission, including safe mode survival temperatures. These extremes consist of two types:

- (a) steady state -- "hot and cold case"
- (b) on-orbit thermal transient

The thermal environments are identified in paragraphs 3.3.1.1.1 and 3.3.2 of the Observatory to Science Instrument ICD.

**Verification Method:** Analysis and Test

**Procedure Number:** 36-01306, Rev.'s B and C

## Configuration:

Rev. B documents ACIS TV Test #1. Rev. C documents ACIS TV Test #2.

**Cycle Time:** TV Test #1 : 3 weeks. TV Test #2: 6 days

## Verification Discussion/Results:

The flight ACIS Instrument (except for the Telescope and Sun Shades and external calibration source) was successfully operated during more than 8 cycles at hot and cold protoflight conditions, as defined in paragraphs 3.3.1.1.1 and 3.3.2 of the Observatory to Science Instrument ICD (CM07A). During TV Test #1, the DEA, DPA, PSMC, Warm and Cold Radiators were subjected to 8 thermal cycles with the EU DH and a "flight-like" Focal Plane (FP). During TV Test #2, the flight DH and FP were operated for 6 days, in excess of the time required for 8 cycles of hot and cold soaks (8 cycles x 4 hrs. x 2 temp.'s = 64 hrs. = 2.7 days). The ACIS was operated during steady-state and transient temperature conditions.

The flight FP was cooled to -116.6C during the hot soak in TV Test #2. Because of improved heat-sinking on-orbit, the ACIS thermal model predicts that the FP will cool to -120C on-orbit with 1.15W of heater margin. During cold soak in TV Test #2, the FP was cooled to -120C.

The DH door and Vent Valve Assembly functions were demonstrated several times during both tests. Successful operation of bakeout mode was demonstrated at hot and cold conditions during TV Test #1. Two bakeout modes were performed in TV Test #2. The high-conductance vent valve failed to close in TV Test #2 and was replaced by a spare part after the Test. A copy of the Long Form Functional Test performed during TV Test #2 is provided in Attachment A.

## ACIS Verification Summary Report

Specification:	ACIS Contract End Item Specification
Requirement Number/Title:	3.2.5.3 Thermal (VRSD 3.2.5.3-1)

## Verification Discussion/Results: (Continued)

One cold survival soak was accomplished during TV Test #1, cooling DEA, DPA, PSMC, Support Structure, Warm Radiator and the EU DH to their cold survival temperatures. The flight DH and a "flight-like" FP were cooled to survival temperatures per LMA Procedure ACIS-110-77-01 on 5/27/96. The cold radiator was cooled to -131C during TV Test #1. It did not cool to its predicted survival temperature (<-136C) because the LN2 shroud at the LL is not as cold as deep space (-190C vs. -273C).

Safe-mode conditions for the ACIS are defined as low-power with trim heater setpoints enabled. Those conditions were demonstrated during Tests #1 and #2 when DEA, DPA and PSMC were operated in low power conditions. The flight trim/survival heaters on Support Structure, PSMC, and DH were powered by external power supplies during both tests. Setpoints for those heaters are located in the S/C BTU box, which will control the heaters during the ISIM TV Test at Ball in the fall of 1997.

## ATTACHMENTS

- A. Long Form Functional Test log sheets from TV Test #2
- B. As-run log sheets from TV Test #1
- C. TQCM log sheets from TV Test #1
- D. As-run log sheets from TV Test #2
- E. TQCM log sheets, TV Test #2

*Ellen M Sen*      5/27/97  
 ACIS Cognizant Engineer      Date