



ENVIRONMENTAL TEST AUTHORIZATION AND SUMMARY (ETAS)

AUTHORIZATION SECTION

PROJECT Herschel		LOG NO. HS0TCA02	
JBSYSTEM/ASSEMBLY TITLE SPIRE THERMAL CONTROL, SN002			DATE ISSUED 11/17/2004
REFERENCE DESIGNATION NUMBER	PART NO. (IF MULTIPLE, ATTACH LIST) 10219660-1	REV.	SERIAL NO. 002
HARDWARE TYPE <input type="checkbox"/> EM QUAL <input checked="" type="checkbox"/> FLIGHT <input type="checkbox"/> FLIGHT SPARE <input type="checkbox"/> OTHER		PRE-ENVIRONMENTAL INSPECTION REPORT NUMBER (ATTACH IR)	
WIRING HARNESS <input type="checkbox"/> EM QUAL <input type="checkbox"/> FLIGHT <input type="checkbox"/> EM <input type="checkbox"/> SE		PART NO.	REV.
TEST DESCRIPTION (CHECK ALL APPLICABLE) <input type="checkbox"/> SINE VIBRATION <input type="checkbox"/> PYROSHOCK <input type="checkbox"/> ACOUSTIC <input type="checkbox"/> EMC <input type="checkbox"/> OTHER _____ <input checked="" type="checkbox"/> RANDOM VIBRATION <input checked="" type="checkbox"/> THERMAL VAC. <input type="checkbox"/> THERMAL ATMOSPHERE		TYPE OF TEST <input type="checkbox"/> QUALIFICATION <input type="checkbox"/> FLIGHT ACCEPTANCE <input checked="" type="checkbox"/> PROTO FLIGHT <input type="checkbox"/> RETEST	
WILL ALL TESTS/LEVELS/DURATIONS REQUIRED BY THE PROJECT DOCUMENTS BE PERFORMED ON THIS UNIT? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) ENTER PROJ. DOC. NO. AND REV. _____			
HAS THE UNIT PASSED ALL PRE-ENVIRONMENTAL FUNCTIONAL TESTS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION _____			
HAVE ALL DESIGN ANALYSES BEEN COMPLETED AND REQUIRED CHANGES BEEN IMPLEMENTED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION _____			
IS THE TEST ARTICLE IDENTICAL TO OTHER FLIGHT UNITS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION This is first flight unit, it is identical to previous qual unit.			
ARE ALL PFRs AGAINST THIS UNIT CLOSED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION _____			
HAVE ALL WAIVERS AND ECRs BEEN APPROVED AND ARE THEY INCORPORATED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION _____			

TEST AUTHORIZED BY

COGNIZANT ENGINEER Mark Weiler	DATE 11-17-04	TECHNICAL MGR./INSTR MRG./PI PREP REP Martin H	DATE 11/18/04	ENVIRONMENTAL REQUIREMENTS ENG. J. Newell	DATE 11-17-04
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SUMMARY SECTION

TEST AGENCY (IF MULTIPLE, ATTACH SUMMARY AND TEST DATES) JPL Building 144	TEST INITIATION DATE 10/14/04	ACCUMULATED OPERATING HOURS PRIOR TO FIRST ENVIRONMENTAL TEST
SERIAL NUMBERS ACTUALLY TESTED 002	TEST TERMINATION DATE 11/18/04	OPERATING HOURS DURING ENVIRONMENTAL EXPOSURE

TEST DESCRIPTION

VIBRATION AXES: X Y Z SINE VIBRATION <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RANDOM VIBRATION <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	ACOUSTIC <input type="checkbox"/>	PYROSHOCK SHOCK AXES: X Y Z <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> SHOCKS/AXIS: _____	<input type="checkbox"/> THERMAL VACUUM PRESSURE: <1E-5 mbar, 290K to 10K ^{12K} _{12K} NO OF CYCLES: 2 ¹²⁻¹³ ₁₃₋₀₇	<input type="checkbox"/> TEMPERATURE ATMOSPHERE NO OF CYCLES: _____	<input type="checkbox"/> OTHER _____
EMC <input type="checkbox"/> ESD	<input type="checkbox"/> COND. SUSC. <input type="checkbox"/> RAD. SUSC.	<input type="checkbox"/> COND. EMIS. <input type="checkbox"/> RAD. EMIS.	<input type="checkbox"/> ISOLATION <input type="checkbox"/> MAGNETICS	TEMP. LEVEL (°c) AND ACCUMULATED DURATION (HRS.) HOT: _____ °c, _____ h COLD: _____ °c, _____ h HOT: _____ °c, _____ h COLD: _____ °c, _____ h	

WERE THERE ANY PFRs GENERATED DURING ENVIRONMENTAL TESTS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST)	LIST PFR NOS. / BRIEF EXPLANATION
ARE THE POST ENVIRONMENTAL DAMAGE INSPECTIONS COMPLETE? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF YES, ATTACH A COPY OF THE INSPECTION REPORTS. IF NO, ATTACH EXPLANATION)	LIST PFR NOS. / BRIEF EXPLANATION
WERE ALL PLANNED TESTS/LEVELS/DURATIONS ACHIEVED? <input type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST)	LIST PFR NOS. / BRIEF EXPLANATION

TESTS HAVE NOT BEEN SUCCESSFULLY COMPLETED. SEE THE ATTACHED SUMMARY FOR ACTIONS THAT NEED TO BE TAKEN.

COGNIZANT ENGINEER	DATE	TECHNICAL MGR./INSTR MRG./PI PREP REP	DATE	ENVIRONMENTAL REQUIREMENTS ENG.	DATE
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HARDWARE HAS SUCCESSFULLY COMPLETED THE ENVIRONMENTAL TESTS LISTED ON THIS FORM OR REMAINING ACTIONS HAVE BEEN TAKEN, INCLUDING RETEST.

COGNIZANT ENGINEER Mark Weiler	DATE 12-16-04	TECHNICAL MGR./INSTR MRG./PI PREP REP Martin H	DATE 12/17/04	ENVIRONMENTAL REQUIREMENTS ENG. J. Newell	DATE 12-16-04
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ENVIRONMENTAL TEST AUTHORIZATION AND SUMMARY (ETAS)

OTHER AUTHORIZATION PROVISIONS AND EXPLANATIONS

This ETAS is for qualification testing of the First Flight Model (flight unit 1, which is SN002) of the SPIRE thermal control assembly (TCA). The test consists of 2 cryogenic thermal cycles (including DC electrical continuity tests) and a z-axis cold shake test.

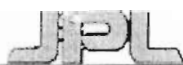
The thermal cycle test will be done with the TCA unit mounted inside the SPIRE cold alignment facility, which has previously been used for thermal cycle tests on the SPIRE BDA's. This test is a set of 2 cycles before vibration. The unit contains only passive electrical components (heaters and resistance thermometers), which will be DC continuity and isolation tested warm and cold during every cycle.

The 3-axis cold vibration test will be performed with the hardware at <100 K with the TCA unit mounted inside the SPIRE cold vibration facility. The hardware has such a low mass (<50 grams) and will be vibrated cold, so no accelerometers or force transducers will be used during the primary tests. The vibration levels will be as specified in the Herschel-Plank Environmental Requirements document, proto-flight levels, applied for 2 minutes.



**ENVIRONMENTAL TEST AUTHORIZATION AND SUMMARY (ETAS)
ENVIRONMENTAL TEST SUMMARY**

HARDWARE	S/N	ETAS	TEST ENVIRONMENT LEVELS & DURATION	DATE TEST PERFORMED	TEST AGENCY	PASS/ FAIL	COMMENTS
SPIRE Thermal Control Assembly (10217660-1)	001 002	HSOTCA01 02	<p>Thermal Cycle: 2 Thermal cycles from 290K to <math>\leq 100K</math>, at a pressure of <math>< 1E-5</math> mbar.</p> <p>Vibration: (see IOM 352D-JPF-0447 Rev A. "Vibration Test Plan form Herschel Flight Thermal Control Assembly" for details) LONGITUDINAL (Z-axis) ONLY 10 minute Random Vibe 20 Hz 0.007 g²/Hz 20-100 Hz +5 dB/Oct 100 Hz 0.1 g²/Hz 100-110 Hz +43.8dB/Oct 110 - 200 Hz 0.4 g²/Hz 200 - 210 Hz -42.8 dB/Oct 210-400 Hz 0.2 g²/Hz 400-2000 Hz -12 dB/Oct 2000 Hz 0.0003 g²/Hz</p> <p align="center">Grms 10.45</p>				



ENVIRONMENTAL TEST AUTHORIZATION AND SUMMARY (ETAS)

AUTHORIZATION SECTION

PROJECT Herschel		LOG NO. HS0TCA03	
SUBSYSTEM/ASSEMBLY TITLE SPIRE THERMAL CONTROL, SN003			DATE ISSUED 11/29/2004
REFERENCE DESIGNATION NUMBER 10219660-1	PART NO. (IF MULTIPLE, ATTACH LIST)	REV.	SERIAL NO. 003
HARDWARE TYPE <input type="checkbox"/> EM QUAL <input checked="" type="checkbox"/> FLIGHT <input type="checkbox"/> FLIGHT SPARE <input type="checkbox"/> OTHER	PRE-ENVIRONMENTAL INSPECTION REPORT NUMBER (ATTACH IR)		
WIRING HARNESS <input type="checkbox"/> EM QUAL <input type="checkbox"/> FLIGHT <input type="checkbox"/> EM <input type="checkbox"/> SE	PART NO.	REV.	SERIAL NO.
TEST DESCRIPTION (CHECK ALL APPLICABLE) <input type="checkbox"/> SINE VIBRATION <input type="checkbox"/> PYROSHOCK <input type="checkbox"/> ACOUSTIC <input type="checkbox"/> EMC <input type="checkbox"/> OTHER _____ <input checked="" type="checkbox"/> RANDOM VIBRATION <input checked="" type="checkbox"/> THERMAL VAC. <input type="checkbox"/> THERMAL ATMOSPHERE	TYPE OF TEST <input type="checkbox"/> QUALIFICATION <input type="checkbox"/> FLIGHT ACCEPTANCE <input checked="" type="checkbox"/> PROTO FLIGHT <input type="checkbox"/> RETEST		
WILL ALL TESTS/LEVELS/DURATIONS REQUIRED BY THE PROJECT DOCUMENTS BE PERFORMED ON THIS UNIT? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) ENTER PROJ. DOC. NO. AND REV. _____			
HAS THE UNIT PASSED ALL PRE-ENVIRONMENTAL FUNCTIONAL TESTS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION			
HAVE ALL DESIGN ANALYSES BEEN COMPLETED AND REQUIRED CHANGES BEEN IMPLEMENTED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION			
IS THE TEST ARTICLE IDENTICAL TO OTHER FLIGHT UNITS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION			
ARE ALL PFRs AGAINST THIS UNIT CLOSED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION			
HAVE ALL WAIVERS AND ECRs BEEN APPROVED AND ARE THEY INCORPORATED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST) BRIEF EXPLANATION			

TEST AUTHORIZED BY

COGNIZANT ENGINEER Mark Weibert	DATE 11-29-04	TECHNICAL MGR./INSTR MRG./PI PREP REP Martin	DATE 12/10/04	ENVIRONMENTAL REQUIREMENTS ENG. LJM	DATE 11-29-04
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SUMMARY SECTION

TEST AGENCY (IF MULTIPLE, ATTACH SUMMARY AND TEST DATES) JPL Building 144	TEST INITIATION DATE 11/29/04	ACCUMULATED OPERATING HOURS PRIOR TO FIRST ENVIRONMENTAL TEST
SERIAL NUMBERS ACTUALLY TESTED 003	TEST TERMINATION DATE 12/3/04	OPERATING HOURS DURING ENVIRONMENTAL EXPOSURE

TEST DESCRIPTION

VIBRATION AXES: X Y Z SINE VIBRATION <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> RANDOM VIBRATION <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>	ACOUSTIC <input type="checkbox"/>	PYROSHOCK SHOCK AXES: X Y Z <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> SHOCKS/AXIS:	<input type="checkbox"/> THERMAL VACUUM PRESSURE: <1E-5 mbar, 290K to 10K <12% NO OF CYCLES: 2	<input type="checkbox"/> TEMPERATURE ATMOSPHERE	<input type="checkbox"/> OTHER
EMC <input type="checkbox"/> ESD	<input type="checkbox"/> COND. SUSC. <input type="checkbox"/> RAD. SUSC.	<input type="checkbox"/> COND. EMIS. <input type="checkbox"/> RAD. EMIS.	<input type="checkbox"/> ISOLATION <input type="checkbox"/> MAGNETICS	TEMP. LEVEL (°c) AND ACCUMULATED DURATION (HRS.) HOT: _____°c, _____h COLD: _____°c, _____h HOT: _____°c, _____h COLD: _____°c, _____h	
WERE THERE ANY PFRs GENERATED DURING ENVIRONMENTAL TESTS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST)			LIST PFR NOS. / BRIEF EXPLANATION		
ARE THE POST ENVIRONMENTAL DAMAGE INSPECTIONS COMPLETE? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF YES, ATTACH A COPY OF THE INSPECTION REPORTS. IF NO, ATTACH EXPLANATION)			LIST PFR NOS. / BRIEF EXPLANATION		
WERE ALL PLANNED TESTS/LEVELS/DURATIONS ACHIEVED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, ATTACH EXCEPTIONS LIST)			LIST PFR NOS. / BRIEF EXPLANATION		

TESTS HAVE NOT BEEN SUCCESSFULLY COMPLETED. SEE THE ATTACHED SUMMARY FOR ACTIONS THAT NEED TO BE TAKEN.

COGNIZANT ENGINEER Mark Weibert	DATE 12-16-04	TECHNICAL MGR./INSTR MRG./PI PREP REP Martin	DATE 12/13/04	ENVIRONMENTAL REQUIREMENTS ENG. LJM	DATE 12-16-04
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HARDWARE HAS SUCCESSFULLY COMPLETED THE ENVIRONMENTAL TESTS LISTED ON THIS FORM OR REMAINING ACTIONS HAVE BEEN TAKEN, INCLUDING RETEST.

OTHER AUTHORIZATION PROVISIONS AND EXPLANATIONS

This ETAS is for Protoflight Level testing of the second Flight Model (flight unit 2, which is SN003) of the SPIRE thermal control assembly (TCA). The test consists of 2 cryogenic thermal cycles (including DC electrical continuity tests) and a z-axis cold PF level shake test.

The thermal cycle test will be done with the TCA unit mounted inside the SPIRE cold alignment facility, which has previously been used for thermal cycle tests on the SPIRE BDA's. This test is a set of 2 cycles before vibration. The unit contains only passive electrical components (heaters and resistance thermometers), which will be DC continuity and isolation tested warm and cold during every cycle.

The 1-axis cold vibration test will be performed with the hardware at <100 K with the TCA unit mounted inside the SPIRE cold vibration facility. The hardware has such a low mass (<50grams) and will be vibrated cold, so no accelerometers or force transducers will be used during the primary tests. The vibration levels will be as specified in the Herschel-Plank Environmental Requirements document, protoflight levels, applied for 1 minute.



**ENVIRONMENTAL TEST AUTHORIZATION AND SUMMARY (ETAS)
ENVIRONMENTAL TEST SUMMARY**

HARDWARE	S/N	ETAS	TEST ENVIRONMENT LEVELS & DURATION	DATE TEST PERFORMED	TEST AGENCY	PASS/ FAIL	COMMENTS
SPIRE Thermal Control Assembly (10217660-1)	003	HSOTCA03	<p>Thermal Cycle: 2 Thermal cycles from 290K to $\leq 10K$, at a $\frac{1}{2}$ hr dwell, at a pressure of $< 1E-5$ mbar.</p> <p>Vibration: (see IOM 352D-JPF-0447 Rev A. "Vibration Test Plan form Herschel Flight Thermal Control Assembly" for details) LONGITUDINAL (Z-axis) ONLY T\sim100K 1 minute Random Vibe 20 Hz 0.007 g²/Hz 20-100 Hz +5 dB/Oct 100 Hz 0.1 g²/Hz 100-110 Hz +43.8dB/Oct 110 - 200 Hz 0.4 g²/Hz 200 - 210 Hz -42.8 dB/Oct 210-400 Hz 0.2 g²/Hz 400-2000 Hz -12 dB/Oct 2000 Hz 0.0003 g²/Hz Grms 10.45</p>				