Herschel/SPIRE

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QUALIFICATION MATRIX FOR CQM

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Glossary

All terms are listed in the CIDL.

1 Scope of Document

This document presents the qualification matrix for the CQM structure for SPIRE.

2. Applicable and Reference Documents

All documents are listed in Figure 3.2 of the CIDL.

3. Introduction

The qualification Matrix, shown in table 1 gives the identified Tests, procedures and reports for the applicable requirement of the Spire Structure Specification Document [RD1]. Where there is a document written, the document reference number is given.

3.1 Terms

Here are the terms given in the Qualification Matrix

- ILT_PERF – Performance Test, conducted by RAL
- ILT_THER is the instrument level thermal tests To be specified by RAL Thermal Engineer
- ILT_VIB is the vibration test procedure at either intsrument or unit level
- ILT_EMC is the emc testing, conducted at RAL
- ILT_INTG is the integation procedure for the FPU -

Requirement Name	Description	Value	Model 1	Test ID1	Test ID2	Procedure ID1	Procedure ID2	Test Report ID1	Test Report ID2	NCRs	Compliance
IRD-STRC-R01	Alignment of the instrument w.r.t. the FIRST optical axis	The common structure shall allow the alignment of the instrument and the telescope axis to within +/- 2.6 mm lateral, +/- 3.5 arcmin rotational about any axis.	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pupil Test		SPIRE-RAL-REP-2083 3.4			
IRD-STRC-R02	Attenuation of RF by Common Structure covers	All joints of the external covers shall form EMC tight joints via the use of a stepped interface and a bolt spacing of no more than 30 mm. This is deemed sufficient for EMC tightness and no o-ring type seal is required.	CQM	ILT_EMC	ILT_PERF	SPIRE-RAL-NOT-001681	SPIRE-RAL-NOT-001850 Noise Tests		SPIRE-RAL-REP-2083 2.1.2, 2.2		
IRD-STRC-R03	Items required support from the Common Structure	Photometer and common subsystems, Spectrometer will be mounted on the SOB	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pupil Test		SPIRE-RAL-REP-2083 3.4			
IRD-STRC-R04	Optics and associated sub-system alignment	Specified in RD5 of AD03	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pupil Test		SPIRE-RAL-REP-2083 3.4			
IRD-STRC-R05	Surface finish of the Common Structure cover	The inside and the outside of the box shall have a finish with a low emissivity. At least less than $\varepsilon = 0.2$. Parts may be blackened as part of stray light control.	CQM	ILT_THER							
IRD-STRC-R06	Pumping port	The total effective pumping conductance of the common structure shall be $\geq$7.8 l/s	CQM	ILT_INTG		By Analysis					
IRD-STRC-R07	Thermometry	The structure subsystem shall provide thermistors and associcated wiring to allow temperature monitoring of critical parts	CQM	ILT_THER							
IRD-STRC-R08	Attenuation of radiation from cryostat	Requirement $<2x10^{-5}$	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Dark Noise Loadcurve		SPIRE-RAL-REP-2083 2.1.2,			

Requirement Name	Description	Value	Model 1	Test ID1	Test ID2	Procedure ID1	Procedure ID2	Test Report ID1	Test Report ID2	NCRs	Compliance
	environment							2.2			
IRD-STRC-R09	First natural frequency of the instrument assembly	The structures eigenfrequency shall be above 100 Hz (req.) and preferably above 120 Hz (goal)	CQM	ILT_VIB		SPIRE-RAL-PRC-001956		SPIRE-MSS-REP-002049			
IRD-STRC-R10	Instr. mechanical interface	The I/F will be directly to the HERSCHEL optical bench. The instrument will be in direct thermal contact	CQM	ILT_INTG		FPU integration procedure					
IRD-STRC-R12	Grounding	All parts of the SPIRE structure shall be electrically connected one to another. Resistance to be no more than 0.1 Ω (TBC)	CQM	ILT_INTG		SPIRE-RAL-PRC-001923					
IRD-STRC-R13	Electrical isolation from Herschel	All parts of the SPIRE structure shall be electrically isolated from the HERSCHEL cryostat. Resistance to be greater than TBD Ω	CQM	ILT_INTG		SPIRE-RAL-PRC-001923					
IRD-STRC-R14	Thermal isolation	The conductance from the level 2 to level 1 stage is required to be no more than 6 mW (TBC) assuming level 2 is 9 K and level 1 is 4 K.	CQM	ILT_THER							
IRD-STRC-R19	300-mK bus bar stray light baffle effectiveness.	The aperture in the detector boxes for the 300-mK busbar feed through shall incorporate a stray light baffle. This baffle is to provide at least four reflections for the shortest optical path between the Level 1 environment outside the detector box and the Level 0 environment inside the detector box.	CQM	ILT_EMC	ILT_PERF	SPIRE-RAL-NOT-001681	SPIRE-RAL-NOT-001850 Noise Tests		SPIRE-RAL-REP-2083 2.1.2, 2.2		

Requirement Name	Description	Value	Model 1	Test ID1	Test ID2	Procedure ID1	Procedure ID2	Test Report ID1	Test Report ID2	NCRs	Compliance
IRD-STRP-R01	Items supporting	The photometer detector box shall support the level 0 optics, dichroics, filter, detectors, and thermal strap for detectors	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pupil Test		SPIRE-RAL-REP-2083 3.4			
IRD-STRP-R02	Optics and filters alignment	See RD5 of AD03	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Optical Cross Talk Test PSF Test Pupil Test		SPIRE-RAL-REP-2083 3.1, 3.3, 3.4			
IRD-STRP-R03	Array module alignment	See RD5 of AD03	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pixel Centre		SPIRE-RAL-REP-2083 3.2			
IRD-STRP-R04	Surface finish	The outside of the box shall have a finish with a low emissivity. At least ε = 0.2. The inside shall have a low reflective finish on all non-optical surfaces..	CQM	ILT_THER							
IRD-STRP-R05	Pumping port	The total effective pumping conductance of the detector box shall be $\geq$ 5.6 l/s	CQM	ILT_INTG		By Analysis					
IRD-STRP-R06	Attenuation of radiation from common structure environment	Requirement: $5x10^{-7}$ with a goal of $5x10^{-8}$	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Loadcurve Laser Straylight Test Pupil Test		SPIRE-RAL-REP-2083 2.2, 3.6, 3.4			
IRD-STRP-R07	First natural frequency	The first eigenfrequency of the photometer detector box on its mounts shall be greater than 200 Hz, with a goal of 300 Hz	CQM	ILT_VIB		SPIRE-RAL-PRC-001956		SPIRE-MSS-REP-002049			
IRD-STRP-R09	Thermal isolation	Request one budget for both detector boxes. The conductance from the common structure to the detector boxes shall be $\leq$ 2.0 mW with boundary 2-4 K. (TBC)	CQM	ILT_THER							
IRD-STRS-R01	Items supporting	The photometer detector box shall support the level 0 optics, filter, detectors, and thermal strap for	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pupil Test		SPIRE-RAL-REP-2083 3.4			

Requirement Name	Description	Value	Model 1	Test ID1	Test ID2	Procedure ID1	Procedure ID2	Test Report ID1	Test Report ID2	NCRs	Compliance
		detectors									
IRD-STRS-R02	Optics and filters alignment	See RD5 of AD03	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Optical Cross Talk Test PSF Test Pupil Test		SPIRE-RAL-REP-2083 3.1, 3.3, 3.4			
IRD-STRS-R03	Array module alignment	See RD5 of AD03	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Pixel Centre		SPIRE-RAL-REP-2083 3.2			
IRD-STRS-R04	Surface finish	The outside of the box shall have a finish with a low emissivity. At least ε = 0.2. The inside shall have a low reflective finish on all non-optical surfaces..	CQM	ILT_THER							
IRD-STRS-R05	Pumping port	The total effective pumping conductance of the detector box shall be $\geq$ 5.6 l/s	CQM	ILT_INTG		By Analysis					
IRD-STRS-R06	Attenuation of radiation from 4-K environment	Requirement: $5x10^{-7}$ with a goal of $5x10^{-8}$	CQM	ILT_PERF		SPIRE-RAL-NOT-1850 Loadcurve		SPIRE-RAL-REP-2083 2.2			
IRD-STRS-R07	First natural frequency	The first eigenfrequency of the spectrometer detector box on its mounts shall be greater than 200 Hz, with a goal of 300 Hz	CQM	ILT_VIB		SPIRE-RAL-PRC-001956		SPIRE-MSS-REP-002049			
IRD-STRS-R09	Thermal isolation	Request one budget for both detector boxes. The conductance from the common structure to the detector boxes shall be $\leq$ 2.0 mW with boundary 2-4 K. (TBC)	CQM	ILT_THER							
STRAP-Req. –04	Accommodation	The 300-mK Strap system is to be supported entirely from the Level-0 Photometer and Spectrometer Detector Boxes.	CQM	ILT_INTG		SPIRE-RAL-PRC-001923					
STRAP-Req.–05	Mass	285g									

Requirement Name	Description	Value	Model 1	Test ID1	Test ID2	Procedure ID1	Procedure ID2	Test Report ID1	Test Report ID2	NCRs	Compliance
STRAP-Req.-06	First mode of vibration	>300Hz, goal > 400Hz									
STRAP-Req. –07	Qualification level random vibration loads.	$0.5g^2$/Hz between 100Hz and 400Hz. 6dB/octave roll-off below and above this.									
STRAP-Req.–08	Qualification level Sine vibration loads	40g between 5Hz and 110Hz									