

SPIRE

SUBJECT: SPIRE STM Performance Test **Plan**

PREPARED BY: T. L. Lim

DOCUMENT No: SPIRE-RAL-NOT-001122

ISSUE: Draft **0.1**

Date: 31st January 2002

APPROVED BY: B. M. Swinyard

Date:

D. L. Smith

SPIRE

Project Document

SPIRE STM Performance Test Plan

Ref: SPIRE-RAL-NOT-001122

Issue: Draft 0.1

Date: 31st January
2002

Page: 3 of 11

Distribution

B. M. Swinyard
D. L. Smith
S. D. Sidher

RAL
RAL
RAL

SPIRE

Project Document

SPIRE STM Performance Test Plan

Ref: SPIRE-RAL-NOT-001122

Issue: Draft 0.1

Date: 31st January
2002

Page: 4 of 11

Change Record

ISSUE

0.1

DATE

31 January 2002

TABLE OF CONTENTS

1	SCOPE	7
1.1	APPLICABLE DOCUMENTS.....	7
1.2	REFERENCE DOCUMENTS.....	7
2	INTRODUCTION.....	7
3	STM PERFORMANCE TESTS OUTLINE	8
3.1	ILT-PERF-OST - IMAGE QUALITY STAR TEST	8
3.2	ILT-PERF-OHT - IMAGE QUALITY HARTMANN TEST.....	8
3.3	ILT-PERF-OTH - INSTRUMENT THROUGHPUT.....	8
3.4	ILT-PERF-OHC - COMPATIBILITY WITH THE HERSCHEL TELESCOPE	9
3.5	ILT-PERF-OFR - VARIATION IN THE FOCAL RATIO	9
3.6	ILT-PERF-TAD – AMPLIFIER THERMAL DISSIPATION.....	9
3.7	ILT-PERF-TL1 – MAXIMUM THERMAL LOAD ON LEVEL 1	10
4	CROSS MATRIX BETWEEN TESTS AND INSTRUMENT AND CALIBRATION REQUIREMENTS	11

FIGURES

Figure 1:	Test Document Tree.....	8
-----------	-------------------------	---

TABLES

SPIRE

Project Document

SPIRE STM Performance Test Plan

Ref: SPIRE-RAL-NOT-001122

Issue: Draft 0.1

Date: 31st January
2002

Page: 6 of 11

Glossary

1. SCOPE

This document expands on the part of the SPIRE STM test plan (AD3) relating to performance requirements of the instrument. It also expands on the AIV plan (AD2) which identifies those instrument requirements which are performance related and for which the STM must be compliant. A set of tests is outlined and a cross reference table is given which shows which instrument performance requirements are met by each test. The details of how each test will meet the requirements specified here will be given in the individual test procedures.

1.1 Applicable Documents

AD1	SPIRE Instrument Requirements	B. M. Swinyard	SPIRE-RAL-PRJ-000034
AD2	SPIRE Instrument AIV Plan	B.M. Swinyard	SPIRE-RAL-PRJ-000410
AD3	SPIRE STM Instrument Level Test Plan	D. L. Smith	SPIRE-RAL-DOC-001049

1.2 Reference Documents

RD1	SPIRE Calibration Requirements	B. M. Swinyard	SPIRE-RAL-PRJ-001064	
RD2	SPIRE Optical Alignment Verification Plan	A. Origne	SPIRE-LAM-PRJ-000445	10 April 2001
RD3	Thermal Test Plan	S. Heys	TBW	
RD4	SPIRE Instrument Qualification Requirements	B. M. Swinyard	SPIRE-RAL-PRJ-000592	

2. INTRODUCTION

The STM model will show that the SPIRE design is structurally and thermally compliant with requirements. As there will not be a detector array in the STM most SPIRE performance requirements can not be evaluated on the STM model but the model will allow some optical and thermal performance to be evaluated. Section 10 of the AIV plan (AD2) shows which instrument requirements are met by performance testing. The AIV plan is then used as a baseline for the test campaigns of each model and a high level description showing the AIV for each model is given in the test plans for each model (see figure 1). The performance tests are then expanded into the performance test plans for each instrument model, which are further expanded into the individual test procedures. Section 3 contains a lists of performance tests which will be done on the STM, the tests listed here will be in common with either alignment verification (described in RD2) or thermal verification (described in RD3). Section 4 of this document shows the cross matrix between the STM activity given in AD3, the performance tests on the STM listed in this document and both the instrument requirements and calibration requirements on the STM evaluated by the tests.

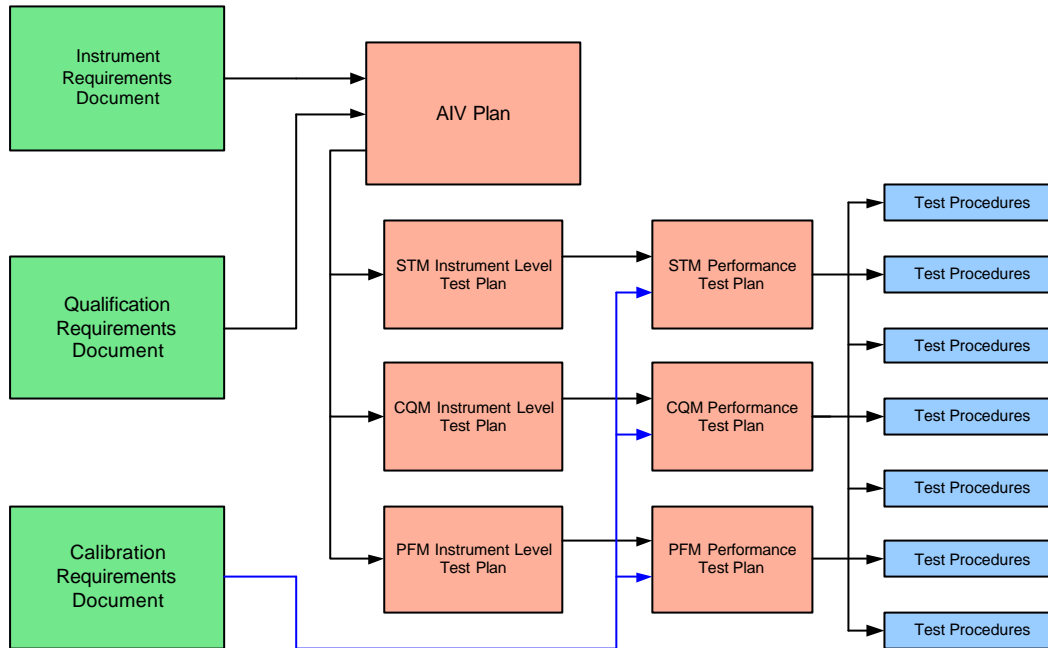


Figure 1: Test Document Tree

3. STM PERFORMANCE TESTS OUTLINE

3.1 ILT-PERF-OST - Image Quality Star Test

Aim:

Investigate the image quality, determine the Strehl ratio for both the photometer and spectrometer at 250 um, check for distortion and anamorphism.

Method:

Described in RD2 section 4.6

Analysis:

TBW

3.2 ILT-PERF-OHT - Image Quality Hartmann Test

Aim:

Investigate the image quality, determine the Strehl ratio for both the photometer and spectrometer at 250 um, check for distortion and anamorphism.

Method:

Described in RD2 section 4.6

Analysis:

TBW

3.3 ILT-PERF-OTH - Instrument Throughput

Aim:

Determine the instrument throughput by measuring the area of the beam (A) at one of the conjugate planes (focal plane or pupil plane) and angular extent of the beam (O) at the other.

Method:

The pupil quality verification (RD2 section 4.5) might give us the beam area at the pupil, or we might need a separate test.

It is not clear how the PSF will be measured at STM level, will information about this come from the Hartmann test (RD2 section 4.6)?

Analysis:

The throughput is AO and this can be checked against the requirement.

Comments/Open Issues

The spectrometer requirement IRD-OPTS-R06 is a theoretical throughput, how do we test this?

3.4 ILT-PERF-OHC - Compatibility with the Herschel Telescope

Aim:

To check that the optical design of the photometer fore-optics is compatible with the Herschel telescope.

Method:

TBW

Analysis:

TBW

Comments/Open Issues:

It is not clear from the alignment plan how this will be done.

3.5 ILT-PERF-OFR - Variation in the Focal Ratio

Aim:

To determine the focal ratio at any point in the FOV and confirm it is within 20% of that of the on-axis point.

Method:

TBW

Analysis:

TBW

Comments/Open Issues:

It is not clear from the alignment plan how this will be done.

3.6 ILT-PERF-TAD – Amplifier Thermal Dissipation

Aim:

To confirm the dissipation of JFET amplifiers shall be heat sunk to the level 2 cryostat stage. The dissipation shall be within the specification given in 'SPIRE Systems Budgets'

Method:

TBW

Analysis:

TBW

Comments/Open Issues:

Awaiting thermal test plan.

3.7 ILT-PERF-TL1 – Maximum Thermal Load on Level 1

Aim:

The SMEC requirement says: Check the maximum thermal load onto level 1 during cold operation – mechanism and cold position measurement system.

This needs expanding!

Method:

TBW

Analysis:

TBW

Comments/Open Issues:

Awaiting thermal test plan

4. CROSS MATRIX BETWEEN TESTS AND INSTRUMENT AND CALIBRATION REQUIREMENTS

STM Test Step	Test	Identifier	Sub Inst	Instrument Requirement(s)	Calibration Requirement
STM-1-6	Image Quality Star Test	ILT-PERF-OST	Both	IRD-OPTP-R06, IRD-OPTP-R06 IRD-OPTP-R03, IRD-OPTS-R03, IRD-OPTP-R04, IRD-OPTS-R04	None
STM-1-6	Image Quality Hartmann Test	ILT-PERF-OHT	Both	IRD-OPTP-R06, IRD-OPTP-R06 IRD-OPTP-R03, IRD-OPTS-R03, IRD-OPTP-R04, IRD-OPTS-R04	None
STM-1-6	Instrument Throughput	ILT-PERF-OTH	Both	IRD-OPTP-R05 IRD-OPTS-R05	CRD-PAR-6
STM-1-6	Compatibility with Herschel Telescope	ILT-PERF-OHC	Both	IRD-OPTP-R00	None
STM-1-6	Variation in Focal Ratio	ILT-PERF-OFR	Both	IRD-OPTP-R02, IRD-OPTS-R02	None
STM-4-10 STM-6-10	Amplifier Thermal Dissipation	ILT-PERF-TAD	Both	IRD-FTB-R05	None
STM-4-10 STM-6-10	Maximum Thermal Load on Level 1	ILT-PERF-TL1	Both	IRD-SMEC-R11	None