



# **SCUBA-2 FTS Project Office**

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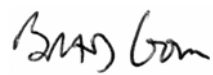
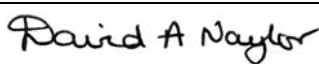

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**Document Title: FTS-2 Test Strategy**

**Document Number: SC2/FTS/TST/001**

**Issue: Version 2.0**

**Date: 7 November 2006**

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## Change Record

Issue	Date	Section(s) Affected	Description of Change / Change Request Reference / Remarks
0.1	10/05/05	All	First draft
1.0	20/06/05	All	PDR release
2.0	7/11/06	All	CDR version, minor updates

# Introduction

This document presents the SCUBA-2 Fourier Transform Spectrometer (FTS-2) Test Strategy, which outlines the testing plan designed to ensure that the FTS-2 development process meets all of the requirements set out in the FTS-2 Functional and Performance Requirements document (SC2/FTS/SRE/001). The Test Strategy will be followed by a Test Plan as the instrument design progresses (see SC2/FTS/TST/002).

## 1. Test Strategy

The FTS-2 instrument development will follow the same process implemented for SCUBA-2, i.e. its development has an analytical phase, followed by the Preliminary Design Review. The design phase is capped with producing prototype versions of certain critical elements system and culminates with the Critical Design Review. The complete prototype build and evaluation phase and the summit-ready instrument build phase ends with the Acceptance Readiness Review, where the FTS-2 instrument functionality will be evaluated based on test results. Finally, during commissioning, the FTS-2 instrument will be installed on the mechanical structure, integrated with the JCMT OCS and tested in operation on the telescope. The test plan will also include operational tests and occasional calibration activities, which are necessary to ensure the reliable and accurate operation of the FTS.

As an auxiliary instrument, FTS-2 has several aspects which may be tested independently of the SCUBA-2 system. There are also several distinct functional entities within the instrument itself which can be developed and tested somewhat independently, based on the specifications of those entities and the FTS-2 Interface Control Documents (SC2/FTS/SYS/005, SC2/FTS/SYS/007, SC2/FTS/SOF/001, SC2/FTS/SOF/002).

The internal FTS-2 functional entities are:

- Beamsplitters
- Translation stage and controller
- Pickoff mirror assembly
- Optical mounts
- Motorized mirror actuators
- Mechanical framework
- Ambient blackbody load shutter
- RTS Client hardware and software
- FTS-2 DR Pipeline Engine
- FTS-2 OCS interface software

In order to mitigate the risks during integration of these entities and proceed from one development phase to the next, the FTS-2 instrument and subcomponents will be subjected to thorough testing. Exit criteria will be set to determine if the project can proceed with integration or the next development phase. Test results will be shared with

co-developers, peers, the SCUBA-2 development team, JAC and invited experts in the field (review panels) for acknowledgement and acceptance.

The two most important components in the FTS-2 system which affect the instrument performance are the beamsplitters (provided by Cardiff University) and the linear translation stage (provided by Aerotech). Cardiff will supply a test certificate, which indicates the optical and mechanical properties of the beamsplitters. Aerotech provides detailed calibration and test certificates for their translation stages.

Tests of the FTS-2 instrument with a single-pixel bolometer should allow testing of the beamsplitter efficiency and phase, as well as the translation stage performance, before delivery to the telescope.

The table below summarizes the various test activities, their owners and reviewers.

Test	Gating	Owner	Reviewers	Status
<b>Prototype</b>				
Optical mounts	Load handling and alignment tests	U of L	U of L	Done
Translation stage	Calibration, PID tuning	U of L	U of L	Done
Pickoff mirror unit	Positional accuracy	U of L	U of L	Preliminary
Mirror actuators	Positional accuracy	U of L	U of L	Done
DR engine	Processing speed	U of L	U of L, JAC	Done
RTS Client SW	Communication tests	U of L	U of L, JAC	Done
<b>Production</b>				
Beamsplitters	Optical performance tests	Cardiff	U of L	
Framework	Load handling, dimensions, mass	U of L	JAC	
Optical alignment	Laser alignment tests, single pixel focus tests.	U of L	U of L	
Component functionality	Translation stage, pickoff mirror assembly, optical mount, functional tests	U of L	U of L, JAC	
DR software	FTS engine testing in main DR pipeline	U of L	JAC	
Control SW	OCS / RTS interface tests	U of L	JAC	
System performance	Single pixel detector optical tests	U of L	U of L, JAC	
<b>Commissioning</b>				
Functionality	FTS-2 subsystem functional tests	U of L	U of L, JAC	
Performance	Sensitivity tests	U of L	U of L, JAC	
Calibration	Spectral calibration tests	U of L	U of L, JAC	
Alignment	Alignment and imaging tests	U of L	U of L, JAC	
<b>Operation</b>				
Calibration	Periodic instrument calibration tests	JCMT	JAC	
Diagnostics	Monitoring of diagnostic parameter logs	JCMT	JAC	