



# **SCUBA-2 FTS Project Office**

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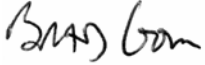
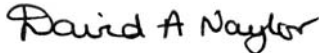

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**Document Title: FTS-2 Commissioning Plan**

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# Change Record

Issue	Date	Section(s) Affected	Description of Change / Change Request Reference / Remarks
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1.0	10/03/06	All	First release version.

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# 1. Introduction

This document describes the installation and commissioning plan for FTS-2, to be undertaken after the commissioning of SCUBA-2. Details of the FTS-2 system can be found in the FTS-2 Operational Concept Definition document ([SC2/FTS/SYS/004](#)). The science case for FTS-2 is presented in [SC2/FTS/SCE/001](#). Mechanical and electrical interfaces between the JCMT and FTS-2 are described in [SC2/FTS/SYS/007](#).

FTS-2 will provide low to medium spectral resolution in both the 450 and 850  $\mu\text{m}$  bands. The baseline plan is to commission two FTS-2 observing modes: a low-resolution SED mode and a high-resolution spectral line mode. These modes will be strictly point-and-shoot; mapping with FTS-2 will require further investigation.

# 2. Participants

The FTS-2 commissioning team will consist of:

- FTS-2 Instrument Scientist (David Naylor)
- FTS-2 Systems Engineer (Brad Gom)
- FTS-2 Software Engineer (Baoshe Zhang) (remote support)

The commissioning process will also require effort from various (TBD) JAC personnel including:

- JAC Instrument Engineer (responsible for SCUBA-2 systems)
- JAC Mechanical Engineer (responsible for FTS-2 mechanical interfaces)
- JAC Electrical Engineer (responsible for FTS-2 electrical interfaces)
- JAC Scientist (responsible for SCUBA-2/FTS-2 observing)
- JAC/CSC Software Engineer (responsible for SCUBA-2/FTS-2 DR and control software)

### 3. Outline of commissioning period

Since it has been agreed that the FTS-2 commissioning will occur well after SCUBA-2 commissioning (currently 6 months), it is assumed that the following conditions will have been met before the FTS-2 commissioning period:

- SCUBA-2 has been commissioned
- At least one of the subarrays used by the FTS in each band will be fully functional.
- The FTS-2 hardware has been shipped to Hilo for inspection.

The following table outlines the main phases in the FTS-2 commissioning campaign. The duration is a rough estimate, and may not represent contiguous blocks of time.

Phase	Description and main goals	Duration	Main staff
Hilo arrival and re-orientation	Check FTS-2 shipment, meet with JAC staff, transport to summit.	4 days	<b>U of L Inst Sci</b> U of L Sys Eng U of L Soft Eng <b>JAC Inst Eng</b>
Summit assembly and integration	Assemble FTS-2 framework, install and align internal optics, and install control electronics.	1 week	<b>U of L Inst Sci</b> U of L Sys Eng U of L Soft Eng <b>JAC Inst Eng</b> JAC Mech Eng JAC Elec Eng
Functional check	Perform basic functionality test of FTS-2 mechanisms, check data acquisition, telescope actions etc	4 days	<b>U of L Inst Sci</b> U of L Sys Eng U of L Soft Eng <b>JAC Inst Eng</b> JAC Mech Eng JAC Soft Eng
On-sky commissioning	Demonstrate basic functionality of all observing modes	1 week	<b>U of L Inst Sci</b> U of L Sys Eng U of L Soft Eng JAC Sci JAC Soft Eng
Astronomical image quality and calibration	Image known sources to demonstrate imaging capabilities, astrometry, noise, calibration etc Carry out acceptance and release to community.	1 week	<b>U of L Inst Sci</b> U of L Sys Eng U of L Soft Eng JAC Sci CSC Soft Eng

## 4. Detailed commissioning task breakdown

This section details the tasks in each phase of the commissioning period. It outlines a requirement or goal and summarises the effort required.

This list is not yet finalized. There may be other minor tasks added to the testing program before the FTS-2 CDR.

### 4.1. Hilo arrival and re-orientation

The FTS-2 instrument will be shipped disassembled. The framework, optics, and mechanisms must be inspected for damage at the JAC before transport to the summit.

Task	Description and main goals	Duration	Main staff involved
Meeting	Convene a meeting to go over and agree schedule for next few weeks	0.5 day	U of L Inst Sci U of L Sys Eng U of L Soft Eng JAC Inst Eng JAC Mech Eng JAC Elec Eng
Unpack	Unpack and check shipment	1 day	U of L Inst Sci U of L Sys Eng
Re-package	Re-package all parts as needed and prepare for transport to summit	0.5 days	U of L Inst Sci U of L Sys Eng
Transport to summit	Transport all equipment to JCMT Lift equipment to gallery for assembly.	1 days	U of L Inst Sci U of L Sys Eng JAC Mech Eng JAC Inst Eng
Summary	(including slack time)	4 days	

#### Required Equipment:

- Suitable truck, hoists, dollies to move the shipping crates in the JAC loading bay / lab and at the summit.

## 4.2. Summit assembly and integration

This instrument is fully assembled with all ancillary equipment and computers on the carousel floor prior to being installed on the N1 framework.

Task	Description and main goals	Duration	Main staff involved
Framework assembly	Assemble FTS-2 framework, install stage and mechanisms, install optics.	2 days	<b>U of L Inst Sci</b> U of L Sys Eng JAC Mech Eng
Mechanism check	Check operation of FTS-2 mechanisms.	1 days	<b>U of L Inst Sci</b> U of L Sys Eng JAC Mech Eng <b>JAC Inst Eng</b>
Internal alignment	Align internal optics	1 day	<b>U of L Inst Sci</b> U of L Sys Eng
Install FTS-2	Lift FTS-2 to N1 framework, install power and communications connections.	1 day	<b>U of L Inst Sci</b> U of L Sys Eng <b>JAC Inst Eng</b> JAC Mech Eng JAC Elec Eng
<b>Summary</b>		<b>5 days</b>	

### Required Equipment:

- Tools for framework assembly
- Connection to RTS client to test functionality of main mechanisms
- Optical alignment tools, jigs, lasers, etc. provided by the U of L.
- Access to JCMT electronic test equipment and clean room as necessary.
- Lifting harness for hoisting instrument.
- Qualified personnel and safety gear to work at N1 framework location.

### 4.3. Functional check

The instrument undergoes an extensive functional check out. The instrument is also integrated into the main JCMT control systems.

Task	Description and main goals	Duration	Main staff involved
System check	Check communication with FTS-2 control system, mechanism operation, etc. Integrate with JCMT control systems	2 days	<b>U of L Inst Sci</b> U of L Sys Eng <b>JAC Inst Eng</b>
System set-up	Demonstrate and optimize start night, calibration, end night, etc	2 days	<b>U of L Inst Sci</b> U of L Sys Eng <b>JAC Sci</b> JAC Soft Eng
<b>Summary</b>		<b>4 days</b>	

#### Required Equipment:

- JCMT control systems

#### 4.4. On-sky commissioning

The initial commissioning period on the sky will concentrate on basic functionality of the observing modes. The duration of each task is in number of nights. There will need to be gaps between the various tasks in order to fully understand the test results, so this phase may be spread over a couple of weeks.

Task	Description and main goals	Duration	Main staff involved
Pointing and focus	Demonstrate that pointing and focusing is possible with FTS-2 in the beam. Determine image offsets and rotation.	2 nights	U of L Inst Sci U of L Sys Eng JAC Sci JAC Soft Eng
Alignment optimization	Optimize alignment of FTS-2 pickoff mirrors	2 nights	U of L Inst Sci U of L Sys Eng JAC Inst Eng JAC Soft Eng JAC Sci
SED mode	Basic commissioning of the low-res SED mode.	2 nights	U of L Inst Sci U of L Sys Eng JAC Inst Eng JAC Soft Eng JAC Sci
Line mode	Basic commissioning of the high-res spectral line mode.	2 nights	U of L Inst Sci U of L Sys Eng JAC Inst Eng JAC Soft Eng JAC Sci
Summary		8 nights	

#### Required Equipment:

- JCMT control and data reduction systems



#### 4.5. Astronomical image quality and calibration

Once the basic observing modes have been commissioned it will then be necessary to determine the spectral sensitivity and calibration issues. Work is also planned here for photometric standards and sky extinction correction. The duration of the tasks is in number of nights.

Task	Description and main goals	Duration	Main staff involved
Calibration standards	Select and observe a series of standards and begin to construct a database. Probably do in parallel with other tasks TBD in this phase.	3 nights	<b>U of L Inst Sci</b> U of L Sys Eng <b>JAC Sci</b> JAC Soft Eng
Contingency		1 night	<b>U of L Inst Sci</b> U of L Sys Eng <b>JAC Sci</b>
Acceptance and release	Demonstrate to JCMT Director that FTS-2 is available for science release.	1 day	<b>U of L Inst Sci</b> <b>JCMT Director</b>
<b>Summary</b>		<b>5 nights</b>	

#### Required Equipment:

- None beyond normal JCMT operation.

## 5. Personnel schedules

TBD