SPIRE ICC

User Requirements Document
for the
Common Uplink System (CUS)

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Draft 1

Wednesday, 10. January 2001

1.1 Purpose & Scope

This document defines those requirements put on the ICC by the need to be able to send commands to the instrument to carry out scientific, calibration and engineering observations. The Common Uplink System (CUS) is expected to provide the required functionality during all phases: from instrument testing on the ground through to the commissioning and routine phases. The CUS is a component of the First Common Science System (FCSS). A more detailed description is given in Section 1.4.

1.2 Definitions of Terms and Acronyms

Listing of acronyms that are “unusual” to this URD

BB	Building Block
DB	DataBase
CCE	Central Checkout Equipment
EGSE	Electrical Ground Support Equipment
FSC	FIRST Science Centre
FCSS	FIRST Common Science System
FCSSDT	FCSS Development Team
FIRST	Far InfraRed and Submillimetre Telescope

ICC	Instrument Control Centre
ILT	Instrument Level Test
IST	Integrated System Test
OBS	On Board Software
PV	Performance Verification
SCOS	Spacecraft Control Operations System
SPIRE	The Spectral and Photometric Imaging REceiver for FIRST
TC	TeleCommand
URD	User Requirement Document

In addition two web pages are available describing terms applicable to SPIRE
http://www.ssd.rl.ac.uk/spire/consortium/information/FIRSTacronyms.shtm
http://www.ssd.rl.ac.uk/spire/consortium/information/FIRSTdefinitions.asp
which are to be updated.

1.3 Related Documents

1.3.1 Applicable Documents

AD-1	SIRD (FIRST Science Operations Implementation Requirements Document)

1.3.2 Reference Documents

RD-1	FGSDD FIRST Ground Segment System Design Description (FIRST/FSC/DOC/0146)
RD-2	SPIRE ICC URD Scope Document
RD-3	FCSS URD
RD-4	FIRST-FSC Actor list

1.4 Overview

The Common Uplink System (CUS) allows the user to enter details of an observation to be performed (viz. an observation request) by the instrument and translates them into instrument commands which eventually get executed by the instrument. The CUS will use the same mechanism to define observation modes and building blocks (see definitions given below) for all types of observations. It could be an observation request originating from an astronomer, or it could be a calibration or an engineering observation request (e.g. instrument characterisation) from an instrument engineer or a calibration scientist. A scripting language will be used for this purpose.

The CUS component is expected to be identical for all three instruments on FIRST (apart from the actual CUS database of course). It will be developed jointly for the FCSS by the FCSSDT.

Figure 1 shows the four abstraction levels of the CUS (see the FGSDD for further details). At the highest level is the *observation,* which could be a scientific, calibration or an engineering observation. The next level refers to *Building Blocks* (*BB's*), which are essentially a high level description of the *observation* in the user domain (e.g. perform_calibration, perform_scan, etc). The *BB's* themselves are scripted in the same language as an *observation.* The relative time-tagged *TC mnemonics*, occurring at the

third abstraction level, are instrument commands. At the fourth level of abstraction, the TC mnemonics are translated into TC packets. This translation is done using SCOS-2000 by the EGSE-ILT, CCE and the MOC during ILT, IST and operations respectively. These TC packets, which are tagged with absolute times by SCOS-2000, can be executed by the OBS without any further expansion.

The first three levels shown in Figure 1 are in the overall FCSS.

2 User Characteristics

The users of the CUS have been identified with the actor definitions given in the FCSS. These have been described elsewhere but their roles in the context of the CUS are briefly outlined below:

2.1 **Instrument Engineer** will provide the CUS database and generate observation modes.

2.2 **Calibration Scientist** will use the CUS to generate observation requests for calibrating the instrument.

2.3 **Configuration Controller** will keep track of the various CUS databases and their status.

2.4 **Astronomer** will use the CUS indirectly via the Proposal Handling System (PHS) to generate observation requests in astronomically meaningful terms (e.g. given signal-to-noise, integration times, etc).

3 Requirements

This section describes the actual requirements made on the ICC.

3.1 Instrument Information

3.1.1 Provision Of CUS DB Information

It shall be possible to provide to the FCSS all the instrument information needed for the CUS in a TBD format.

Instrument information includes the observing mode definitions, building block definitions and TC mnemonics, translation of TC's, etc.

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1. **Source** [SDS]
2. **Importance/Priority** [High]
3. **Risk** [High]
4. **Phase** [Mid ILT/Operations]

3.1.2 Configuration Control

It shall be possible to keep all the instrument information appropriate for the CUS under configuration control.

The CUS DB needs to be kept under configuration control locally at the ICC as well as at the FSC.

1. **Source** [SDS]
2. **Importance/Priority** [Medium]
3. **Risk** [Medium]
4. **Phase** [Mid ILT/Operations]

3.1.3 Testing of observation modes

It shall be possible to test and check an observation mode to ensure that it does not compromise the safety of the instrument.

An observation mode consists of a series of BB's. The ICC must test and validate these modes in such a way that the execution of one BB does not leave the instrument in a state in which the following BB cannot be executed. This could happen, for example, because either the instrument is not in the right mode to continue observing or it has failed in some way.

To perform this task the CUS implementation at the ICC will need to support several CUS DB's.

3.2 Installation

3.2.1 Installation

It shall be possible to install the CUS after delivery from the FCSS on a local system.

Resources will be available locally to take delivery, install and run the CUS component in the overall FCSS release. The most likely scenario is that the entire FCSS will be delivered to the ICC by the FCSSDT, including the CUS.

1. **Source** [SDS]
2. **Importance/Priority** [High]
3. **Risk** [High]
4. **Phase** [Mid ILT/Operations]

3.3 Problem reporting

It shall be possible to send CUS problem reports.

The ICC would need to communicate with the overall FCSSDT to ensure that all problems encountered are effectively reported. It is expected that this process will be handled seamlessly in the FCSS.

1. **Source** [SDS]
2. **Importance/Priority** [Medium]
3. **Risk** [Medium]

4. **Phase** [Early ILT/Operations]

3.4 Access to the FSC system

It shall be possible to access the FSC CUS system.

The ICC should have full network access to the FSC system to use the CUS implementation in the officially released CUS DB.

Figure 1: The abstraction levels of the CUS