SPIRE ICC

User Requirements Document
for the
DPU OBS

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1.1   Purpose & Scope

This document defines those requirements put on the ICC by the need to have OnBoard Software (OBS) for operating and controlling the instrument and for collecting housekeeping (HK), scientific and event data for transmission back to the ground. 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
CDMS   Command and Data Management System
DB   DataBase
DPU   Digital Processing Unit
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
IFSI	Istituto di Fisica dello Spazio Interplanetario
ILT	Instrument Level Test
IST	Integrated System Test
OBS	On Board Software
PV	Performance Verification
SC	SpaceCraft
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   The FIRST DPU/ICU OBS User Requirements Document
RD-2   SPIRE ICC URD Scope Document
RD-3   FGSDD FIRST Ground Segment System Design Description
               (FIRST/FSC/DOC/0146)
RD-4   The FIRST Operations Scenarios Document
RD-5   FCSS URD
RD-6   FIRST-FSC Actor list
RD-7   The Packet Structure Interface Control Document (PS ICD)

1.4   Overview

The Digital Processing Unit (DPU) On Board Software (OBS) provides the capabilities for
handling all uplinked commands from the ground and forwarding them to the instrument
or instrument sub-systems for immediate execution. It is responsible for receiving all
science and housekeeping data generated by the instrument and then passing it to the
S/C for downlink via the on-board solid state memory. It also monitors the status and
health of the instrument and runs processes which respond to anomalous events by
taking appropriate action. Anomalies which could endanger the health of the instrument
will lead the OBS to put the instrument into a safe mode.

The OBS is designed to handle commands and data in terms of packets: in practice this
means that it will encode and decode packets using the standards defined in the Packet
Structure ICD. The satellite Command and Data Management System (CDMS) will pass
command packets to the OBS for execution and will expect to receive housekeeping (HK),
science and event packets for eventual transmission back to the ground.

IFSI in Frascati, Italy are providing the OBS for all three instruments on FIRST.

2   Underlined: User Characteristics

The users of the OBS 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 develop, test and provide the functions needed in the OBS for communicating with the instrument and its sub-systems. He/she will also decide when the instrument functions need to be updated in the OBS.

2.2   **Calibration Scientist** will analyze data from observations and recommend improvements in the on-board instrument functions.

2.3   **Configuration Controller** will keep track of the various OBS images and their status.

3   Requirements

This section describes the actual requirements made on the ICC by the need to have OBS.

3.1   Instrument Information

3.1.1 Provision Of OBS Information

It shall be possible to provide to IFSI all the instrument information needed for the OBS development in a TBD format.

OBS information includes all operating mode definitions, HK and science parameter definitions, TC mnemonics, translation of TC's, etc.
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1. **Source**   [SDS]
2. **Importance/Priority**   [High]
3. **Risk**   [High]
4. **Phase**   [ILT/Operations]

3.1.2 Configuration Control

It shall be possible to keep all the OBS memory images under configuration control.

The OBS images need 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 OBS

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

The ICC must test and validate the OBS functions to ensure that the execution of one function does not leave the instrument in a vulnerable state or whereby the next instrument command or function cannot be executed.

To perform this task the OBS implementation at the ICC will need to support several OBS images.

3.2 Installation

3.2.1 Installation

It shall be possible to install the OBS image after delivery from IFSI.

Resources will be available locally to receive and install the new OBS image. It is expected that this task will be performed by the On Board Software Management (OBSM) component of SCOS-2000. It will compare the new image with the one already installed, generate patches and then upload them via a series of TC's.

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

3.3 Provision of OBS Maintenance Facility (OBSMF)

The ICC shall have inhouse facilities to modify the OBS, recompile it and generate new memory images for subsequent installation.

This resource is required for all phases of the mission. It is envisaged that during ILT substantial OBS updates will take place, whereas during IST, SCP and operations phases the updates will consist of relatively small tweeks.

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

3.4 Problem reporting

It shall be possible to send OBS problem reports.

The ICC would need to communicate with IFSI to ensure that all problems encountered are effectively reported.

5. **Source**   [SDS]
6. **Importance/Priority**   [Medium]
7. **Risk**   [Medium]
8. **Phase**   [ILT/Operations]