

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 On Board 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
CCS	Central Checkout System (For IST)
EGSE	Electrical Ground Support Equipment
HSC	Herschel Science Centre
HCSS	Herschel Common Science System
HCSSDT	HCSS Development Team (ESA + ICC's)
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
S/C	SpaceCraft
SCOS	Spacecraft Control Operations System
SPIRE	The Spectral and Photometric Imaging REceiver for Herschel
TC	TeleCommand
TFCS	Test Facility Control System (for ILT)
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 (Herschel Science Operations Implementation Requirements Document)

1.3.2 Reference Documents

RD-1	The Herschel DPU/ICU OBS User Requirements Document
RD-2	SPIRE ICC URD Scope Document
RD-3	HGSDD Herschel Ground Segment Design Description (FIRST/FSC/DOC/0146)
RD-4	The Herschel Operations Scenarios Document
RD-5	HCSS URD
RD-6	Herschel-HSC Actor list
RD-7	The Packet Structure Interface Control Document (PS ICD)
RD-8	ICC Interface Requirements Document (TBW)

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's 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 Herschel. During all phases of the mission the DPU OBS maintenance will be performed by the ICC using its OBS Maintenance Facility (OBSMF).

2 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 OBS Maintainer

The OBS Maintainer maintains the OBS and develops and tests the new functions needed in the OBS.

2.2 Instrument Engineer

The Instrument Engineer will investigate problems with the instrument functions, determine how they need to be updated or if new functions need to be added. Detailed specifications will need to be provided to the OBS Maintainer for code updates.

2.3 Calibration Scientist

The Calibration Scientist will analyse data from observations and recommend improvements in the on-board instrument functions.

2.4 Configuration Controller

The Configuration Controller at the ICC will keep track of the various OBS images and their respective status.

3 Requirements

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

3.1 Provision Of OBS Information

UR-OBS-100: 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.

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

3.2 Provision of OBS Maintenance Facility (OBSMF)

UR-OBS-110: The ICC shall have in house facilities to maintain and 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 changes.

1. **Source** [SIRD requirements: ICCF-155, ICCO-020]
2. **Importance/Priority** [High]
3. **Risk** [High]
4. **Phase** [ILT/Operations]

3.2.1 Testing of OBS

UR-OBS-120: 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 All the testing activity should happen in the context of the OBSMF.

1. **Source** [SIRD requirement: ICCF-160]
2. **Importance/Priority** [High]
3. **Risk** [High]
4. **Phase** [ILT/Operations]

3.2.2 Configuration Control

UR-OBS-130: It shall be possible to keep all the OBS memory images under configuration control at the ICC.

The OBS images need to be kept under configuration control locally at the ICC as well as at the HSC.

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

- 3. **Risk** [Medium]
- 4. **Phase** [Mid ILT/Operations]

3.3 Installation

UR-OBS-140: It shall be possible to install the OBS image from the OBSMF.

Resources will be available locally to receive and install the new OBS image from the OBSMF. It is expected that this task will be performed by the On Board Software Management (OBSM) component of SCOS-2000. During operations the MOC will use SCOS-2000 to compare the new image (supplied by the ICC via the HSC) with the one already installed, generate patches and then upload them via a series of TC's. (What happens during ILT and IST? It is not clear whether memory patching with SCOS-2000 is possible with the current release, i.e. 2.0)

- 1. **Source** [SIRD requirement: ICCF-160]
- 2. **Importance/Priority** [High]
- 3. **Risk** [High]
- 4. **Phase** [ILT/Operations]

3.4 Problem reporting and resolving

UR-OBS-150: It shall be possible to communicate OBS problem reports and achieve satisfactory solutions.

The Instrument Engineers within the ICC would need to communicate with the OBS maintainer (i.e. IFSI) to ensure that all problems encountered are effectively reported and resolved.

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