SUBJECT: **SPIRE On Board Software Continuing Management Plan**

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Project Document

SPIRE On Board Software Continuing Management Plan

Ref: **SPIRE-IFS-DOC-001820**
Issue: **1.0**
Date: **23rd September 2003**
Page: 5 of 10

TABLE OF CONTENTS

FIGURES

TABLES

Project Document

SPIRE On Board Software Continuing
Management Plan

Ref: **SPIRE-IFS-DOC-001820**
Issue: **1.0**
Date: **23rd September 2003**
Page: 6 of 10

Glossary

AVM	Avionics Model
CGS	Carlo Gavazzi Space
CQM	Cryogenic Qualification Model
DRCU	Detector Readout and Control Unit
EEPROM	Electrically Erasable Programmable Memory
EGSE	Electrical Ground Support Equipment
EPROM	Electrically programmable Memory
ICD	Interface Control Document
IFSI	Instituto di Fisica dello Spazio Iterplanetario, Rome
OBS	On Board Software
RAL	Rutherford Appleton Laboratory
SPR	Software Problem Report
VM	Virtual Machine

Project Document

SPIRE On Board Software Continuing Management Plan

Ref: **SPIRE-IFS-DOC-001820**
Issue: **1.0**
Date: **23rd September 2003**
Page: 7 of 10

1. INTRODUCTION

The On board Software is that software which is resident in the SPIRE DPU and handles the interfaces with the Spacecraft and instrument DRCU, including command execution, housekeeping and science telemetry collection, housekeeping monitoring and safety functions. The specification of the required OBS functionality is given in AD01 and AD02 augmented with the description of the interfaces given in AD03, AD04 and the operations requirements given in AD05.

The OBS System consists of the following elements:

- **The Boot Software.** This is responsible for starting the DPU and checking the memory, loading the application software into RAM and uploading new application software. This software is located in EPROM and is not updated after delivery.
- **The Application Software** (the OBS)
- **The VM simulator**, required to generate and test VM code to be uplinked and executed by the OBS
- **The OBS Uplink Software**, required to uplink new OBS.

The development, testing, documentation and maintenance of the OBS System is the responsibility of IFSI.

1.1 Scope

The initial delivery of version 1.0 of the OBS took place in April 2003 along with the AVM DPU. During Acceptance Testing several SPRs were raised and a second version (V1.1) was produced, which provided a baseline for the integration testing of the Test facility EGSE and the CQM version of the instrument DRCU electronics. Neither version has been fully acceptance tested at RAL. This document covers the further development of the OBS through further versions:

- Version 1.2, which should resolve the main outstanding SPRs and provide a system for performing the cold verification testing of the CQM instrument. The functionality required for this version is given in section TBD, but does not include autonomy functions.
- Version 1.3 provides the full functionality of the required OBS, including full autonomy actions. This will be provided as part of the AVM delivery to ESA/Industry.
- Version 1.4 is the version for flight and shall include additional functionality n the form of stored VM code and tables necessary to implement SPIRE operational modes. This VM code is unlikely to be available until substantial testing of the instrument has taken place and the likely operational modes have been fully defined.

1.2 Structure of Document

1.3 Documents

1.3.1 Applicable Documents

AD01	SPIRE OBS User Requirements Document	
AD02	SPIRE OBS Autonomy Requirements	
AD03	SPIRE Data ICD	
AD04	Herschel/Planck Packet Structure ICD	
AD05	Herschel/Planck Operations Interface Requirements Document	SCI-PT-RS-07360
AD06	HSO DPU/ICU On Board Software Product Assurance Plan	IFSI/OBS/PL/2000-001

Project Document

SPIRE On Board Software Continuing Management Plan

Ref: **SPIRE-IFS-DOC-001820**
Issue: **1.0**
Date: **23rd September 2003**
Page: 8 of 10

1.3.2 Reference Documents

2. MANAGEMENT

2.1 Organization

IFSI is responsible for the development of the DPU hardware, the software that runs in it and the tools needed for its maintenance and development of VM code that runs within it.

IFSI have delegated the development of the Boot Software, residing in EPROM in the DPU, to CGS. IFSI take the role of customer to CGS, specifying the requirements, monitoring the development, and acceptance testing the delivered code. The appropriate information provided by CGS should form part of the OBS delivery package

2.2 Development

All software shall be developed under the following regimes (see AD06):

2.2.1 Configuration Control (see RD01)

A system shall be put in place to manage Software Problem Reports. All problems will be reported here, along with the current status, an analysis of the problem and the proposed solution. When resolved, the solution, and the version(s) of the module(s) in which the solution has been implemented shall be included. The status of SPRs shall be provided with each delivery.

2.2.2 Version Management

CVS will be used to manage software development. Each module shall contain a header that identifies the module (relating to the architectural design), the current version number and author, and the date of each change and the SPR to which it relates. The Software Delivery Note shall include the list of modules and their versions included in each delivery

2.2.3 Testing

Before acceptance of an updated module into the new version, it shall undergo regression testing – consisting of all tests previously carried out on the module to ensure that any update has not affected previously accepted functionality. The report of this testing shall be provided with the delivery of the OBS.

Before delivery of a new version of the software it shall undergo system testing – to ensure that the set of modules for delivery operate together, and acceptance testing to verify the compliance of the software with requirements. The test reports shall be provided with the delivered OBS version

3. MAINTENANCE

IFSI is responsible for the maintenance of the OBS System to the end of the mission (~2010). To this end they will maintain both hardware and software systems capable of editing and recompiling any of the OBS software during this period. This will include continuing configuration control and version management systems.

In addition, all the necessary documentation to allow this – programmers guides, procedures, software manual shall be maintained in a form that would allow new personnel to be trained to update the software in the event that he original developers are no longer available.

In the event that this is not possible, all of the above, software and documentation, shall be delivered to RAL and the appropriate training provided.

4. DELIVERABLES

4.1 Boot Software

This is delivered with each model of the DPU. Each delivery shall be accompanied by a Boot Software Data Package, including as a minimum, a test report and verification matrix, plus any updated documentation.

4.2 Application software.

There shall be two further deliveries of the OBS. Each delivery will consist of:

1. A Software Delivery Note specifying the modules included in the delivery (and their version numbers) the SPRs corrected in this version, the extra functionality included in this version and any additional information about the status of the software found during testing (e.g. missing/ non functionality)
2. A list of SPRs and their status
3. The On Board Software in a form suitable to be stored into the DPU EEPROM
4. The software, procedures and installation guide required to store the OBS into the DPU EEPROM
5. The full OBS source code, fully documented in English. (As we are treating this development as a 'small project' we consider the fully documented source code, along with a sufficiently detailed architectural design, to cover the requirements of the Detailed Design documentation, provided each module in the source code is identifiable in the architectural design)
6. A Software User Manual
7. A acceptance Test Plan and Test Report
8. A Verification Matrix indicating for each OBS requirement, the verification status and test result
9. Test reports from regression/system testing
10. Updated design documentation:

4.2.1 Version 1.2

This version shall:
- correct all high priority outstanding SPRs on version 1.1
- conform to the Data ICD version TBD (updated as a result of test with the DRCU electronics)

4.2.2 Version 1.3

This version shall:
- correct all outstanding SPRs on version 1.2
- conform to the Data ICD version TBD (it is envisaged that the Data ICD may change after testing with an actual instrument model has taken place).
- Include all autonomy requirements

4.2.3 Version 1.4

This version shall:
- Include additional VM code stored in the OBS to implement SPIRE operational modes

4.3 VM Simulator

No new deliveries of this software are planned at present. An acceptance test will be carried out.

4.4 Uplink Software

No new deliveries of this software are planned at present

5. PLANNING

5.1 Milestones

Date	Milestone	From	To
27/10/03	Delivery of OBS version 1.2	IFSI	RAL
01/11/03	Delivery of Autonomy Requirements Document	RAL	IFSI
12/12/03	Delivery of OBS version 1.3	IFSI	RAL
01/09/04	Delivery of VM Tables	RAL	IFSI
01/11/04	Delivery of OBS version 1.4	IFSI	RAL

5.2 Schedule

TBD