

1. INTRODUCTION

In the original response to the ESA Announcement of Opportunity for SPIRE we described an ICC made up of 3 Centres:

- (i) *an Operations Centre located at the Rutherford Appleton Laboratory in the UK. This will be the sole point of contact for communication with the rest of the ground segment (MOC, FSC and other ICCs). Operations Centre staff will include people seconded from the various SPIRE institutes.*
- (ii) *two Data Processing and Science Analysis Software (DAPSAS) Centres, one at Imperial College (ICSTM) in London and one at SAp, Saclay.*

In broad terms the Operations Centre would be responsible for monitoring instrument operations and for interactions with the Herschel Ground Segment and the DAPSAS Centres would be responsible for the provision of scientific processing software and the planning and verification of observations, though it was envisaged that staff from all three centres would participate in all of these activities with possible relocation as necessary.

Since the start of the Development Phase a single team, the ICC Definition Team (ICCDT), consisting of personnel from all three Centres (and elsewhere) has been working to carry out the initial task of defining the ICC in terms of Use Cases and a set of work packages. This work is now nearing completion and we have to plan for the completion of the work packages over the years up to launch. This note proposes a new organisation of the ICC to enable this next stage to begin.

This note only addresses the ICC activities up to the end of the Launch and Commissioning phases of the Mission. It is expected that the ICC will continue after this with essentially the same Teams in place to provide continuity of expertise into and through the Operations Phase.

1.1 ICC Organisation

In reviewing the work packages arising from the design process it has become clear that many of them require a broad range of expertise to be implemented, so broad that this expertise is unlikely to be fully available at any one Centre. Also in many cases it is not practical to arrange them into independent subject areas that could be assigned to a single Centre (for example, data processing modules are, in many cases, used in the processing of more than one observing mode and there would need to be close cooperation between Centres to avoid duplication of work). In addition, a significant amount of resources are available from institutes not associated directly with any Centre (for example from Italy) and these need to be incorporated into the overall ICC effort.

This note proposes an organisation for the ICC that concentrates on providing teams with experience and expertise in the main subject areas of the ICC work, rather than dividing the work geographically between Centres. Each team will:

- be distributed between cooperating institutes to include all necessary expertise
- meet regularly (including by teleconference and videoconference) to assess progress and continue development in their respective areas of work.

- Be led by a single team leader with significant expertise in the Team areas of responsibility and who will be responsible for delivery of the teams objectives.

Experience (with the HCSS development) shows that continuous interaction between people working on a topic is necessary to produce a coherent system and that this generates a good spirit of cooperation between members rather than encouraging competition between groups. Given the relatively small number of personnel involved it is likely that they will, in many cases, be involved in more than one Team and this will provide transfer of knowledge across the Teams (though any formal transfer will be made by documentation)

Each team will report on progress to the ICC Development Manager, who will provide day-to-day management of the ICC development, supported by an ICC Management Group (consisting of the Centre managers and Co-Is from contributing institutes) who will meet regularly (approximately monthly), usually by teleconference to:

- Agree the terms of reference and tasks of the ICC Teams
- Agree an allocation of resources to each Team
- Monitor the ICC progress against the schedule and propose changes, as necessary to keep the development on time.

The ICC, as a whole, will be reviewed periodically by the Project Team, as happens on the hardware development side.

An organisation chart showing the place of these teams in the SPIRE project is shown in the figure attached and the responsibilities of each team are clearly set out below.

1.2 ICC Teams

1.2.1 Observations Team

This team is responsible for defining and verifying the astronomical observing modes of the instrument. Its tasks are:

- Definition of the observing modes of SPIRE in terms of the available instrument operations and input parameters provided by observers
- Definition of the requirements on the Time Estimator for each observing mode
- Provision of a Science Verification Plan
- Specification of ground tests necessary to verify the Observing Modes (including tests to validate different operational modes and tests to validate data processing software)
- Specification of the Commissioning Phase and PV Phase observations to be made to verify the Observing modes
- Provision of test scripts for observing mode checkout (done as part of the Test Team)
- Analysis of test results to verify the correct processing of observations to the standard data products
- Specification of algorithms for IA data processing modules used for reduction of scientific observations data (including Serendipity and parallel modes)
- Provision of initial data processing procedures ('pipeline') for reduction of scientific observations data (including key programmes)
- Specification of data processing procedures ('pipeline') for Quality Control reduction of scientific observations data

- Provision of the SPIRE Observers Manual and additional documentation required for informed use of the instrument for scientific observations

1.2.2 Operations Team

This team is responsible for defining and verifying the instrument operational modes and providing the instrument database(s) necessary to implement these modes. It is also responsible for the setup and integration of the ICC for Operations. Its tasks are:

- Definition of instrument operational modes as required for calibration, engineering and scientific observations.
- Provision of MIB, CUS, and other instrument databases necessary to implement the operational modes
- Specification of tests (on ground and during the Commissioning Phase) to verify the correct operation of the instrument in all its operational modes
- Analysis of data from tests to verify the correct operation of the instrument in all its operational modes
- Specification of software and algorithms for software to process instrument data to monitor the continuing health and performance of the instrument.
- Specification of data processing procedures for instrument monitoring during the Operations Phase
- Provision of the Instrument Users Manual
- Provision of an Operations Plan
- Definition of operating procedures (both for within the ICC and for interactions with the rest of the Herschel ground Segment)
- Installation and test of the OBS Maintenance facility. This includes being trained in its use.
- Installation and test of externally provided systems (SCOS2000, MIB editor etc). This includes training of users.
- Definition and execution of the ICC Integration tests and Herschel Ground Segment tests
- Provision of ICC infrastructure (hardware) and installation of software for use by ICC teams for analysis of test data
- Provision of ICC infrastructure (hardware) and installation of software for use by ICC teams during the Operations Phase
- Provision of training for users of ICC Systems
- Provision, verification and delivery of the Instrument Simulator to MOC
- Take delivery of the instrument Cryogenic Test Facility for use during Operations
- Setup and Training of the Operations Team for the Operations Phase
- Training of ICC-external users in ICC software and systems
- Setup and execution of Configuration Control

1.2.3 Software Team

This team is responsible for providing the software identified and specified by the other teams. This includes both software to be provided to the Herschel Ground Segment and software for the ICC. Its tasks are:

- Setup of an infrastructure (hardware and software) for development of software (including version control, configuration control, sandboxes)
- Provision of HCSS software to the Herschel Ground Segment
- Provision of IA, calibration and monitoring software as specified by other ICC groups

- Provision of ICC software infrastructure (HCSS, Access Control, Information Handling, Problem Reporting) for use during development and Operations

1.2.4 Calibration Team

This team is responsible for defining the calibration plan for the instrument and for obtaining the required data. In particular, they will be responsible for specifying and analysing the data from tests carried out on the ground. Its tasks are:

- Definition of the SPIRE Calibration Plan
- Specification of calibration ground tests
- Provision of test scripts for calibration tests (done as part of the Test Team)
- Analysis of data from ground calibration tests held at instrument-level
- Definition of the calibration database
- Population of the calibration database from ground testing and other facilities (subsystem tests, other telescopes, literature)
- Specification of IA data processing modules for calibration data processing
- Definition of calibration processing procedures

Note: the ICC does not provide all the resources for this activity – this team will contain personnel from the instrument hardware teams

1.2.5 Test Team

This team is responsible for implementing the instrument tests as defined in the test plan(s), executing these tests and analysis of the data to verify the instrument functionality and performance. Its tasks are:

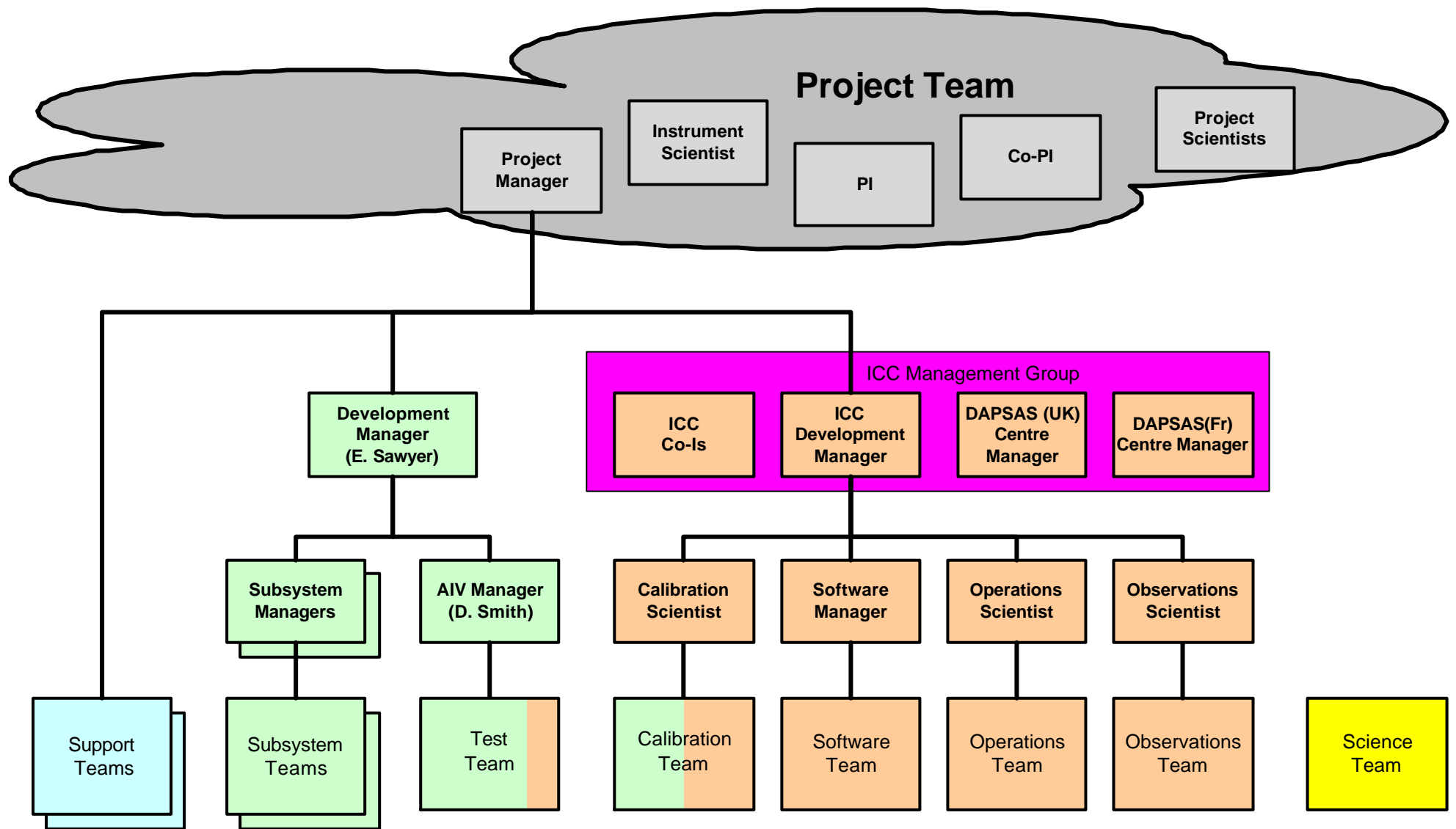
- Management of the ground test programme
- Provision of the Cryogenic Test Facility
- Definition of test procedures and preparation of test scripts and data
- Execution of all instrument tests (ILT, IST and commissioning Phase)
- Analysis of test data to verify functionality and performance (calibration and observing mode verification is carried out by the relevant ICC Teams.
- Provision of Test Reports

Note: The ICC will only provide some resource to this team in order to carry out their calibration and observation verification responsibilities. At this time they fall under the Test Team managerial responsibility

1.2.6 Support Teams

These teams are already in place supporting the hardware development and AIV activities. They will support the ICC teams in their work through:

- Provision of Project Office support
- PA/QA activities
- Computer System Management



SPIRE Organisation during Development