

SPIRE Instrument Hardware Design Review (IHDR) Review Preparation Plan and Draft Agenda

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1. Introduction

The SPIRE Instrument Hardware Design Review (IHDR) will be held at RAL on July 9 and 10. This is a formal review in front of an ESA-appointed Review Board, and is an important milestone in the instrument development. This note outlines the scope and format of the review, and the Project Team's plan for IBDR preparation. It is based on the requirements for the IHDRs in general as defined by ESA, and additional considerations based on the particular needs and current status of SPIRE.

2. IBDR objectives

The Herschel/Planck instrument IHDRs are notionally scheduled for the time that the instrument level test programmes are about to start and first test results of the first instruments' subsystem and unit models are available. Important objectives of the IHDR are to confirm the AVM and CQM AIT programmes at instrument and system level and to confirm the development approach for the instrument FM programme.

2.1 ESA-defined objectives

The objectives of the Herschel/Planck IHDRs as defined by ESA are:

- (i) assessment of the instrument AVM/CQM programme status
- (ii) definition of the acceptance criteria of the AVM/CQM models for spacecraft system level
- (iii) acceptance and freeze of the on-board software (Architectural Design Document)
- (iv) review of the ground facilities (h/w and s/w) required to support the ILTs

Particular emphasis will be given to the OBSW development status and required maturity.

2.2 Additional SPIRE objectives

The SPIRE IHDR will occur during the SPIRE STM/CQM programme, which is a very busy period for the Project Team. The review shall therefore be based on existing documentation to the maximum extent possible. In addition to the ESA objectives as outlined above, the review will also focus on the instrument status with particular attention on the following:

- (i) subsystem technical status, with emphasis on test reports;
- (ii) STM test results to date;
- (iii) spacecraft interfaces, especially FPU thermal interfaces;
- (iv) instrument AIV plan and schedule;
- (v) configuration status.

2.3 Constraints

This review will take place in the middle of a very active time for the project team, with the STM/CQM AIV programme under way at RAL. The Project Team's priority will be to carry out that programme as effectively as possible, so it will be important to minimise the amount of additional work required for the review. The review preparation will therefore need to be prioritised to ensure that it concentrates on the key issues and does not detract from AIV work in progress.

The review documentation package will be sent out one month before the review meeting (deadline 9 June). This means that most of the documents must actually be produced in near final form by the end of

May. The documentation will therefore reflect the status of the project at that time. Any relevant updates will be made during the review meeting.

3. Review format

The review will consist of two parts:

- (i) review of the documentation package;
- (ii) a review meeting involving presentations, discussion, Review Board meeting, and feedback

During the review of the documentation, a list of points to be clarified and discussed will be generated by the Review Board and forwarded to the instrument team before the review meeting.

ESA require that the documentation and presentations make clear the following:

- (A) status of the hardware and software development and performance, including test results and analyses;
- (B) progress made since IBDR (March 2002), including the status of implementation of recommendations;
- (C) critical areas;
- (D) plans for proceeding and resolving problems.

In order to meet these objectives, two full days will be required for the review meeting.

4. Review Board composition

The IBDR Review Board will consist of

- Gerry Crone ESA Payload Manager (Chairman)
- Göran Pilbratt ESA Project Scientist
- Carsten Scharmberg ESA SPIRE Instrument System Engineer (Secretary)
- ESA-appointed members covering the following areas:
 - Product Assurance
 - AIV/Ground Support Equipment
 - Electrical/Thermal-Cryo/Mechanical
 - Data Management /On-board software
 - TBD
- Industry representative
- Representatives of national funding agencies
 - PPARC (Ray Carvell)
 - CNES (Yvan Blanc or alternate)
 - NASA (TBD)
- One or two independent experts to be nominated by SPIRE

By mutual agreement between SPIRE and ESA, other parties may be invited to the review as observers.

4.1 Guidelines for presentations

We can assume that the Review Board and the audience will be familiar with the instrument system and subsystem designs as presented at a number of previous reviews and described in the documentation package. The emphasis will be on using the presentations to emphasise key issues and assist the Review Board in concentrating on the important aspects mentioned above.

Presentations by the Project team will focus on

- updates to the instrument system design and major interfaces;
- the Instrument Development Plan and Schedule;
- PA and configuration control;

- the current status of the STM/CQM programme.

Presentations will also be given on the status of the **subsystems** - the key issues are to be explicitly addressed in these presentations by adopting a format which includes the following headings:

- (A) Compliance with requirements (IRD) and budgets
- (B) Subsystem qualification status
- (C) Results of performance tests and modeling
- (D) Development plan and delivery schedule (esp. CQM and PFM)
- (E) PA and configuration status
- (F) Problems and plans for resolving them

There is no need to describe the design, except to highlight any key updates or changes.

1. All presentations should take at least 5 minutes less than the allotted time to allow for questions and change-over.
2. All presentations are to be in Powerpoint or PDF form, and must be made available to Eric Sawyer before the review meeting for installation on one machine.
3. The review meeting shall also be chaired by the Review Board chairman. The session chairs shall be responsible for ensuring that speakers keep within the allotted time.

A standard viewgraph template will be provided for presenters to use.

5. List of documents to be issued for the review

The table below lists the documents that will be provided for the review. Of particular importance for the subsystems will be available test reports on prototype or flight-standard hardware.

- P1: Top priority, essential for the review, not produced as yet.
 P2: Second priority - not to be forgotten and ready by mid. January
 P3: Third priority for now (already exists, inessential, or requirements as yet unclear)

All configured docs to be reviewed and approved by relevant PT members before reissue.

No. and Priority	Document	Responsible	Current Status	Plan
Top-level requirements documents				
1 3	Scientific Requirements Document	Matt	No update needed	
2 2	Instrument Requirements Document	Bruce	Routine update via ECR needed.	To be done by April 30
3 1	Calibration Requirements Document	Bruce	To be issued - some work needed beforehand.	To be done by April 30
Instrument Design Description and Development Plan				
4 3	SPIRE Design Description Document	Doug (+ Bruce and Matt)	Needs to be updated	Needs a week or so from Doug + some updates from Bruce and Matt To be done by April 30.
5 1	Instrument Development Plan	Ken/Eric	To be updated. Will be in the same format as for the IBDR.	A version to be ready by 15 May
6 3	EMC control plan	Doug	Update needed to include grounding scheme change and modelling/test plans	Doug to produce descoped version by April 30
7 3	Microphonics control plan	Doug	Working version to be	Version for

			produced for review	discussion 15 May. Finalise by end May
IID-B and related documents				
8 3	IID-B	John D.	Under Alcatel control - we'll provide status report and list of important items/issues from our point of view.	
9 1	Thermal Model document	AnSo	To be updated.	Review status by April 30; produce new configured version by May 30
10 1	FPU Mechanical Model	Berend	Status - check with Berend.	Eric to discuss the status/format with Berend.
11 1	Harness Definition Document	Doug	Issue 1.1 now out. 1.2 will be produced for the review. Minor updates.	ECRs will be produced routinely. New version to be ready by May 30
12 3	Stray light model document	Tony R.	No update needed. Internal SPIRE description is still correct but not the external parts - make clear to RB.	
13 1	Budgets spreadsheets	John	To be updated - routinely.	Review status May 30.
OBS				
14 1	OBS URD	Sergio	Issue 1.1 requires an update - IFSI have an action to do that.	Bruce and Ken to liase with Sergio. To be finalised by Apr. 30
15 1	OBS Architectural Design	Riccardo	Exists in draft. Needs a lot of work.	New version needed for April 30. Ken to liase with IFSI on this.
16 3	Operating Modes Document	Bruce, Matt, Sunil	Minor updates needed. Parallel mode needs to be sorted out. Telemetry rates need to be reviewed and updated using Ken's input.	Update and review by April 30
17 1	Operating the Instrument Document	Sunil	In draft form and needs updating. More detail on low-level ops. Based on latest command list.	Sunil to produce new version by April 30.
18 2	SPIRE Data ICD	Ken	Was issued for DPU acceptance tests. But needs further update based on CEA ICD.	Normal work. Latest version will be provided for the review.
AIV Plan				
19 1	Warm Electronics integration plan	Ken and Eric	Needs updating.	Ken to specify
20 1	FPU integration plan	Berend	FPU will have been integrated. MSSSL responsibility - check with Berend.	Review draft by April 30. Eric to discuss with Chris.
21 1	Alignment Plan and Alignment Procedures	Kjetil	Will have been carried out. No update needed. Will be refined as procedures done.	Review available documentation April 30.
22 1	Instrument-Level Test Plan	Dave Smith	STM: to be reviewed CQM: Perf test plan exists	Review April 30. Scope to be

			but not detailed procedures yet.	discussed with Bruce
23	1	Manufacturing Flow Charts	Eric	Review April 30.
GSE				
24	3	GSE Overview	Ken/Bruce	No update needed on IBDR version
PA				
25	2	SPIRE PA Plan	Eric Clark	Has never been approved by ESA. ESA (PO) comments to be taken into account. New version to be available by April 30.
26	2	SW PA Plan		Included in PA plan
27	1	FMECA	Bruce	Update needed. Harnesses to be included. Review status April 15.
28	1	Configuration Management Plan		No update needed. Same as IHDR. OK
29	2	Cleanliness Control Plan	Bruce	No update needed? Review status April 15
30	1	Configured Items Data List	Eric Clark	Exists for the STM/CQM and is under config control (not "frozen"). Not in ESA's preferred format but does contain needed information. Will not be reformatted. Will be reviewed and updated for IHDR by May 1.
31	1	Critical Items List	Eric Clark	To be updated using format ESA have suggested. Matt to produce draft by April 30. Finalise by May 15
32	2	Safety submission/analysis	Eric Clark	Submission has been produced and submitted. Analysis needs to be completed (main issue is sorption cooler integrity) Will be available 1 May.
33	1	Worst Case Analysis		DRCU: Limited version in DRCU review documentation. DPU status? Eric to investigate DPU status. Review status April 30.
34	2	Part Stress Analysis and derating analysis		Contained in Warm Electronics PA plans. Also needed for SPIRE-provided harnesses. Review status on April 30.
35	1	FDIR	Bruce	To be written before H/W-S/W interaction analysis. Bruce and Ken have started. First draft by April 15. Finalise by May 15.
36	1	HW/SW interaction analysis	Ken and Bruce	To be written based on format agreed with Jan. Significant work needed. First draft by April 30. Finalise by May 30
37a-e	2	a EEE Parts list, b PAD sheets c DML d DPL e DMPL	Eric Clark	PAD sheets: IFSI, CEA to be contacted for latest information. Review and finalise April 30.
38	1	Verification Control Document	Eric S./Bruce	"Verification Plan" was issued for IBDR. May need update. Document scope to be defined. Bruce and Eric to discuss. Review plan April 15.
39	3	Test Procedures		Will be provided as annexes to AIV plan or VCD for tests already done, esp. environmental tests. Bruce, Eric and Eric to define the hierarchy. Review April 15.
40	1	NCR and RFW status lists	Eric Clark	Snapshot to be provided OK
For each subsystem				

41	2	All DDR Document sets with any updates made since the DDR	Eric	Each subsystem to provide updated versions (if appropriate) of their DDR document sets. Eric Sawyer will contact subsystem managers on this.	Review status fortnightly. Finalise by April 30.
42	1	All DDR Review Board Reports (several need to be formally issued)	Eric/Bruce/Doug		Eric and Bruce to review status wrt reports and RIDS (by 24 March).
43	3	List of available STM EIDPs and Acceptance Review Minutes as available.	Eric Clark		
44	1	Technical reports to demonstrate subsystem design compliance and maturity.	Bruce/Eric	Subsystems to provide all relevant reports. PT to review and select relevant docs for review package.	Review available reports end April.

6. Preparation for the review

1. All aspects of the preparation for the review will be managed and coordinated by Eric Sawyer.
2. All documents are to be reviewed internally by the Project Team before finalisation, under Eric Sawyer's direction. The deadline for document distribution to ESA is June 9. To allow for proper internal review, all documents must therefore be ready by May 26 at the latest.
3. Progress on the preview preparation will be rigorously tracked in fortnightly Project Team meetings and regular contact with subsystem managers.
4. Considering the large file sizes that will certainly be included in the documentation package, distribution to the Review Board will be by CD. The documentation shall also be placed on *Livelink*.

7. Draft agenda for the review meeting

The first draft agenda are given below.

**SPIRE Instrument Hardware Design Review (IHDR)
RAL, 9/10 July 2002**

Draft Agenda

Day 1 9 July

Start Time	End Time	Duration (Min.)		
			Introduction	Chair: King
9:30	9:35	5	Welcome and logistics	M. Griffin
9:35	9:50	15	Purpose and organisation of the review	Sawyer
9:50	10:00	10	Review Board perspective	Board Chair
10:00	10:15	15	Coffee	
10:15	10:35	20	Instrument design and performance update	M. Griffin
			SPIRE System Design Update	Chair: Sawyer
10:35	10:50	15	Instrument budgets	D. Griffin
10:50	11:05	15	Status of IID-B and Herschel interfaces	Delderfield
11:05	11:20	15	Grounding scheme and harness design	Delderfield
11:20	11:40	20	FPU FEA model and subsystem vibration levels	Winter
11:40	12:00	20	Thermal design and modelling	Goizel
12:00	12:15	15	EMC Control Plan	D. Griffin
12:15	12:45	30	Questions and clarifications	Swinyard
12:45	13:45	60	Lunch	
13:45	14:15	30	Tour of AIV facility	
			Subsystem Status Reports	Chair: Sawyer
14:15	14:45	30	Detector Arrays and JFETs	Bock
14:45	15:05	20	FPU structure and thermal straps	Winter
15:05	15:20	15	Coffee	
15:20	15:30	10	Mirrors	Pouliquen
15:30	15:50	20	FTS mechanism	Pouliquen
15:50	16:10	20	BSM	Pain
16:10	16:30	20	He-3 cooler	Duband
16:30	16:50	20	Internal calibrators	Hargrave
16:50	17:00	10	Filters	Hargrave
17:00	17:20	20	DRCU	Cara
17:20	17:40	20	DPU	Cerrulli
17:40	18:00	20	On-Board Software	Molinari
18:00	18:30	30	Interim Review Board meeting	
Evening			Relaxing social event	

Day 2 10 July

Start Time	End Time	Duration (Min.)		
			AIV and PA	Chair: Sawyer
9:00	9:30	30	AIV Facility and Ground Calibration	Smith
9:30	9:45	15	EGSE	King
9:45	10:00	15	MGSE and OGSE	Swinyard
10:00	10:15	15	Coffee	
10:15	10:45	30	PA procedures and status	Clark
10:45	11:15	30	FMECA, H/W-S/W analysis and FDIR	Swinyard
11:15	11:45	30	Questions and clarifications	
			Instrument Development Plan	Chair: Griffin
11:45	12:00	15	Qualification and AIV Plan	Swinyard
12:00	12:15	15	Development Plan and Model Philosophy	Sawyer
12:15	12:30	15	STM/CQM progress report	Sawyer
12:30	12:50	20	Shedule (CQM, PFM, FS)	Sawyer
12:50	13:00	10	Project Team staffing and organisation	King
13:00	14:00	60	Lunch	
			Summary and Review Board meeting	Chair: Swinyard
14:00	14:20	20	Critical Items List	Sawyer
14:20	14:35	15	Summary of progress on issues raised at the IBDR	M. Griffin
14:35	15:15	40	Questions and clarifications	
15:15	15:30	15	Coffee	
15:30	16:30	60	Review Board meeting	
16:30	16:45	15	Review Board feedback	
16:45			End of meeting	