

Minutes of Meeting

Date: 19/04/02

Herschel

Doc.-No.: HP-2-ASPI-MN-1346

Meeting place:	RAL	Chairman:	G. Crone
Date/Time:	19/04/02	Secretary:	H. Faas
Agenda dated:	J. Bruston Email, 17/04/02	Close of Meeting:	19/04/02

Subject: SPIRE IID-B Convergence Mtg.

Participants: ESA
 J. Bruston, G. Crone
 RAL
 E. Sawyer, B. Swinyard, K. King, J. Delderfield, M. Griffin,
 C. Brockley-Blatt
 ASPI
 B. Collaudin, G. Lund
 ASED
 H. Faas

Additional Distribution: Alcatel - J. J. Jullien
 - P. Rideau
 - P. Carzini
 Astrium - C. Haelzel
 W. Rühke

Page: 1 of 3 Page(s)

Brief-Minutes (except following sheets)

Summary of Results of Sheets 2 till

Annex 4 deleted / not used.

Reference	Results	Remarks
	<p>Introduction J. Bruston opened the meeting.</p> <p>The objectives of the meeting are:</p> <ul style="list-style-type: none"> • Achieve agreement on the IID-B, Issue 2.2, which is fully in line with the status of the project at the IIBDR • (Not discussed are agreed change requests) <p>Astrium stated that the cut-off date for IID-B updates is 30 April 2002. Changes introduced after this date can be part of the Herschel PDR baseline. After the QPR major instrument changes have been identified by Alcatel. Those are proposed to be introduced by Industry for PDR.</p> <p>ESA clarified that the edition of IID-B Issue 2.1 is the task of Alcatel. The corresponding DCN (SCI-PT-0010707, 06/02/02) has been signed by ESA and Alcatel and therefore the Issue 2.1 is considered as approved.</p> <p>Agreement on the list of updates, verification of open sources Available Input:</p> <ol style="list-style-type: none"> 1. List of proposed changes RAL (Annex 1) 2. Alcatel List of proposed changes (Annex 2) 3. ECR#009, Version 5 (Annex 3) (updated during the meeting) <p>Annex 4 not used</p> <ol style="list-style-type: none"> 4. Harness Interface Mtg. MOM, HP-2-ASED-MN-112 5. Additional input provided by RAL (captured in Annex 1) 6. Industry comments to IID-B, Issue 2.0 (Annex 5) <p>Annex 4 not used.</p> <p>List of proposed (New) changes from RAL: See annotated version Annex 1.</p> <p>Section 5.8 Update: A RAL TN (SPIRE-RAL-NOT-0001242) has been provided which will be reviewed by Astrium. The update of Section 5.8 will be updated subsequently to Issue 2.2.</p> <p>Section 5.9.1 Update: It was agreed that SPIRE put a description of the reduced Thermal Model (to be issued in Summer 2002) in the IID-B, subsequently released to Issue 2.2</p>	<p>AI#1: SPIRE to put a description of the reduced Thermal Model (to be issued in Summer 2002) in the IID-B, subsequently released to Issue 2.2</p> <p>AI#2: Section 5.9.6.1</p>

Reference	Results	Remarks
	<p>Section 5.9.6.1 RAL will provide updates of the Tables by 22/04/02. If update is available it will be included in Issue 2.2.</p> <p>Section 5.10 Update: If an harness agreement is reached (ref HP-2-ASED-0112) and if all harness information is available to Astrium before 30/04/02 the new harness baseline can be taken onboard for the PDR.</p> <p>Section 5.10.4.3 Update (connectors for Spire launch lock status switches) : It was agreed that SPIRE will issue an Change Request. It should be processed after the IID-B update.</p> <p>Alcatel list of proposed changes (Annex 2) ECR-005, section 5.7.5.3 Update according to agreements reached on 13/02/02 (i.e. 50mK). Spire stated that 50mK may not be accurate enough.</p> <p>Alcatel stated that the cut-off date for any updated IF drawings is Monday, 22/04/02. Any drawings received after that date will not be part of the IID-B update.</p> <p>ASPI Change Item 17 to 20 have been deleted. Change Item 27, 28, 29 to be deleted for IID-B update.</p> <p>HR-SP-RAL-ECR-009 Version 4: ESA presented a new version 4 of the SPIRE ECR at the meeting. It was agreed that the ECR is updated to include the current baseline thermal requirements (IID-B, Issue 1). Updates of the text were performed online and are covered by the Version 5.</p> <p>The updated ECR-009, Version 5 is attached as Annex 3 and is agreed.</p> <p>The relevant actions to come to a conclusion have been placed in the Thermal IF Meeting (ref. HP-2-ASED-0107).</p> <p>Additional input provided by SPIRE The changes to be added to IID-B, Issue 2.2 are</p>	<p>RAL will provide updates of the Tables by 22/04/02.</p> <p>AI#3: Annex 1, Section 5.10.4.3 Update: It was agreed that SPIRE will issue an Change Request. It should be processed after the IID-B update.</p>

Reference	Results	Remarks
	<p>added to Annex 1 (changes already proposed by RAL). All other changes may be updated in later issues of the IID-B.</p> <ul style="list-style-type: none"> • Thermistor table will be updated (section 5.7.5.1) will be updated subsequently to Issue 2.2 (Spire internal) • Section 5.9.5, Table: JFETs are Off during recycling (to be updated in Issue 2.2) • Section 5.9.6.4.1 new diagram to be added (DPU power input circuit diagram) • Section 5.10.3 Spelling to be corrected (i.e. bonding) • Section 5.10.4.2 Master clock: update last sentence (see Annex 1) • Section 5.11 Data handling to be updated (update available at Alcatel) To be reviewed and updated after release of Issue 2.2 • Section 5.12 On target flag to be updated • Section 5.13.3 to be updated • Section 5.14.3 Frequency Plan to be added <p>The RAL TN is attached as Annex 6. SPIRE does not need “start of scan” or “on-target” flags on board, if they are provided on ground, as required. The content will be not be implemented in Issue 2.2.</p> <p>List of Industry Comments (Annex 5): Ref. ID 236, 238 covered by ECR#009, Version 4 already discussed. ID291 Update: see Annex 1 ID267 The grounding concept part of the IID-B is for information only. ID223 covered. ID246 closed with new CR to be raised ID247 covered. ID285 will be delivered in agreed format. Closed ID286, ID287, ID288, ID289, ID290 Section 7 will be updated after the release of the IID-B, Issue 2.2</p> <p>ID229 closed ID254 closed, Spire will provide the updated tables ID257 already covered, closed ID276 already covered, closed ID241 This issue will be proposed by Alcatel in the IID-A update (redlined copy).</p>	<p>AI#4, RAL: provide Frequency Plan to Alcatel</p>

Reference	Results	Remarks
	<p>Glenn's list Sheet 7 § 5.9.6.3 (LCL current measurement resolution) shall be clarified (Spire is requesting resolution of 8 bits, comment is about accuracy)</p> <p>Sheet 8 §5.13.1 On board software. Different bus addresses for Nominal & redundant units is becoming the base line. HSDPU will have</p> <p>Sheet 9 § 5.15.3 Move first sentence to after header of 5.15.1.</p> <p>Sheet 16 § 5.6.1.1 Microvibration Sensitivity lower limit changed again from 30Hz to 0.03Hz, but</p> <p>Sheet 21 § 5.2 Block diagram version 4.2 to be included in IID-B.</p> <p>Sheet 30 § 5.11.3 "Start of scan" signal timing accuracy will be clarified by Alcatel</p> <p>Conclusion of harness meeting relevant for IID-B. A redline copy of the version 0.9 has been agreed in the Harness meeting and will be implemented by SPIRE in a new CR superseding CR10.</p> <p>Conclusion of the meeting</p> <p>All parties (SPIRE, Alcatel, Astrium, ESA) agree that the proposed changes in the annex 1 "Herschel SPIRE IID-B Update" represent a complete set of updates to proceed to SPIRE IID-B issue 2.2. These will be subject to an ESA CCB and issue of a DCN. Industry comments about SPIRE IID-B version 2.0 (annex 5) have been reviewed and are considered to be covered by the above changes (annex 1)</p> <p>Alcatel will issue version 2.2 of the SPIRE IID-B by End of May for agreement/approval and signature before mid June</p>	<p>AI#5 Alcatel will clarify and confirm the 8 bit resolution is available.</p> <p>AI#7 Alcatel</p> <p>AI#6 Spire will update the CR 10 into a new one, taking into account update of Harness meeting.</p>

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Reference	Results	Remarks
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Meeting: HP-ASPI-1346
 Title Spire IID-B convergence meeting
 Date: 19/04/02

Action Item List

Herschel

No.:	Description:	Due Date	Originator Comp./Pers.	Actionee Comp./Pers.	Source	Completion
AI#1	AI#1: SPIRE to put a description of the reduced Thermal Model (to be issued in Summer 2002) in the IID-B, subsequently released to Issue 2.2	July 2002	ASPI/BC	SPIRE / JD		
AI#2	Section 5.9.6.1 RAL will provide updates of the Tables by 22/04/02. It shall include all items, identified in the IID-A, Section 5.9.5.6.	22/04/02	ASPI/BC	SPIRE / JD		
AI#3	Annex 1, Section 5.10.4.3 Update: It was agreed that SPIRE will issue an Change Request, concerning the EGSE connector. It should be processed after the IID-B update.	19/04/02	ESA/GC	SPIRE / JD		
AI#4	RAL to provide Frequency Plan to Alcatel	22/04/02	ASPI/BC	SPIRE / JD		
AI#5	AI#5 Alcatel will clarify and confirm the 8 bit resolution is available.	23/4/02	SPIRE	Alcatel GL		
AI#6	AI#6 Spire will update the CR 10 into a new one, taking into account update of Harness meeting.	24/04/02	ASPI BC	SPIRE / JD		
AI#7	"Start of scan" signal timing accuracy will be clarified by Alcatel	26/4/02		Alcatel GL		

HP-ASPI-MN-1346 - Annex 1 / Herschel SPIRE IID-B updates

Description

- This document lists the updates needed for the document SCI-PT-IIDB/SPIRE-02124.
- These updates are intended so that the SPIRE IID-B reflects the interface requirements of the instrument AS BEING DESIGNED and FABRICATED at the date of issue above.
- Further proposed changes to the design, implying a change in the interface requirements, shall be addressed after completion of the document update, via Change Requests.
- This list will also be used to identify points that need further discussion before formalization of the IID-B update.

Procedure

- Industry shall identify the updates that are according to their system design (✓), not in accordance (✗) or not applicable (NA).
- It is not demanded to provide any assessment or implication at this time.
- The update items that are found not to be in accordance (hence representing a discrepancy between the instrument and the S/C designs), shall be identified as such, and circulated to all parties.
- All parties are expected to prepare proposals for solving the discrepancies
- A convergence meeting shall be held to address all discrepancies and close them in real time.

Procedure summary and time line

1. SPIRE establishes the “updates list” and provides to ESA: April 1
2. ESA processes a “sanity check” and forwards to industry: April 2
3. Industry circulates and checks out the list, forwards to ESA: April 10
4. ESA forwards to instrument: April 11
5. ESA/industry/instrument convergence meeting is held at ESTEC: April 16/17

Limitation and further activity

The list below shall not comprise changes to requirements that are NOT part of the current design. These will be addressed subsequently to the update via the interface meetings and the Change Request process.

Herschel SPIRE IID-B updates

Version	To go from 2.1 to 2.2
Date of issue	17/4/2002
Prepared by	John Delderfield + additions during convergence meeting 19/04/02
Approved by	

List of updates

Note: Full size configuration drawings are placed in Annex and referred to in the body of the document, ~~together with a smaller version~~. Only a small drawing to permit the reader to appreciate what is being defined is included in the body of the IID-B. Please attach annex.

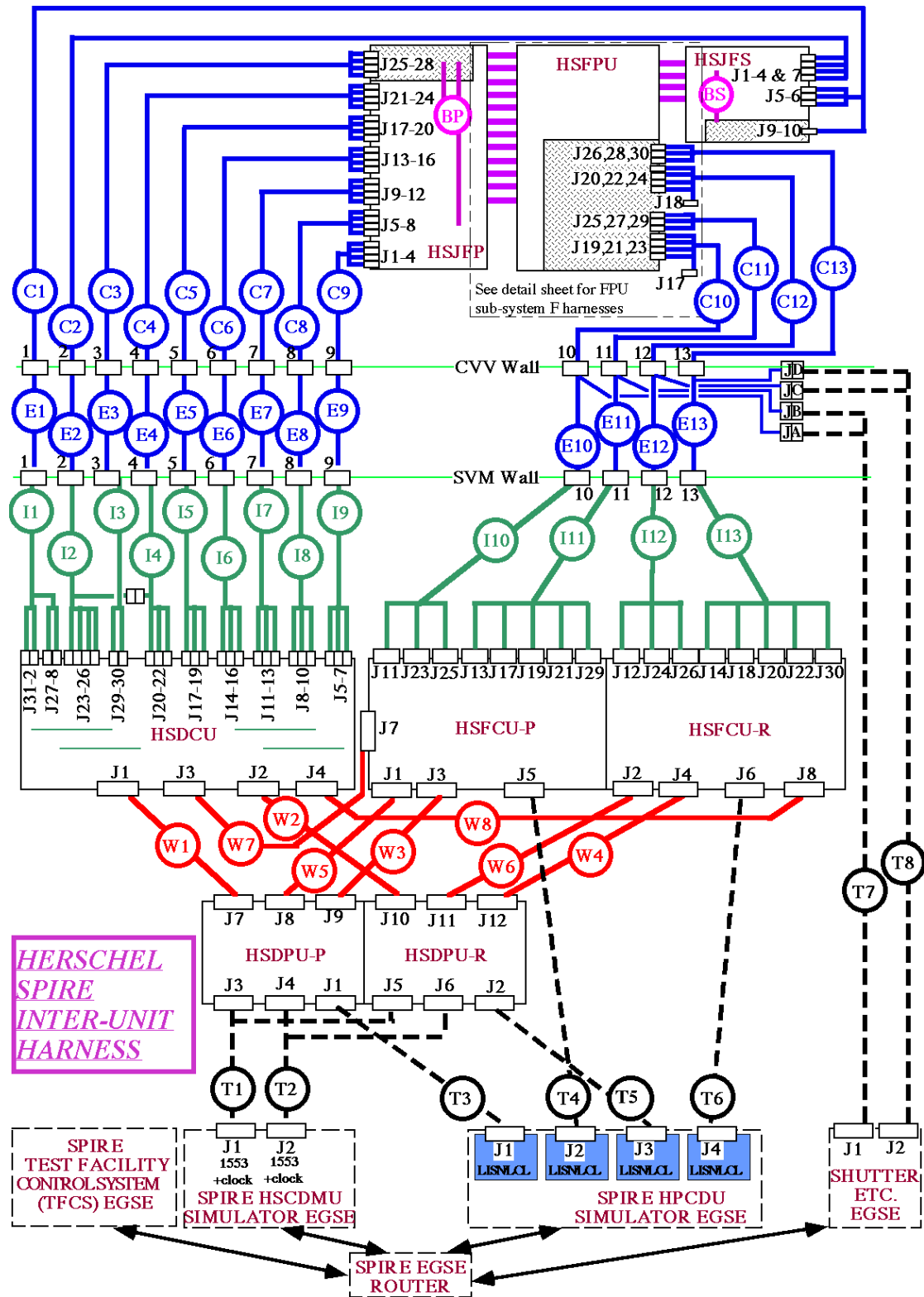
Paragraph	Update	ESA	ASPI	ALENIA	ASED
2.2	RD2, correct number PRG to PRJ Add RD4, Herschel Spire Harness Definition SPIRE-RAL-PRJ-000608 Add RD5, Spire Data ICD, SPIRE RAL-PRJ-001078 Add RD6, Spire Operating Modes, SPIRE-RAL-PRJ-000320 Add RD7, Herschel Alignment Plan, Annex to IID-A Add RD8, Spire Thermal Configuration Control Document SPIRE-RAL-PRJ-000560				
4.1	Insert figure 4.1 that follows to give overall view				
4.4	Bring into line with section 5.1				
4.6 and 4.7	Add "for latest information, refer to RD6."				
5.1 end	Expand to 4 harness categories as in Figure 5.2.1				
Fig 5.3-1	Insert up-to-date version which I hope to table at Harness Mtg.				
Fig 5.3-2	Insert updated version if available				
5.3.1	Bit of a red-herring. Remove last sentence put in in error in 2,1				
5.3.1.1	Change tbd to "0.8 metre as a goal, see section 5.4.4" since actually achieved this				
5.3.2	Change (ADtbd) to RD7				
5.4.1	Remove detailed drawing sheets and just put in one of two HSFPD isometric views. The detailed ones go in annex.				
5.4.4	Replace by "drawing in appropriate section of IID-A"				
5.4.4.1	Add DPU isometric view.				
Fig 5.4.7	Insert new HSDCU isometric view.				
Fig 5.4.8	Insert new HSFCU isometric view				

5.5	<p>Update table as follows to IBDR based values:</p> <table border="1" data-bbox="506 276 1482 691"> <thead> <tr> <th>Project Code</th> <th>Instrument Unit</th> <th>Nominal Mass</th> <th>Allocated Mass</th> </tr> </thead> <tbody> <tr> <td>HSFPU</td> <td>HS Focal Plane Unit</td> <td>45.5Kg</td> <td>46.3Kg</td> </tr> <tr> <td>HSJFP</td> <td>HS JFET Rack-Photometer</td> <td>3Kg</td> <td>3.3Kg</td> </tr> <tr> <td>HSJFS</td> <td>HS JFET Rack-Spectrometer</td> <td>1.2Kg</td> <td>1.4Kg</td> </tr> <tr> <td colspan="2" style="text-align: center;">Total Mass for units on HOB</td> <td>49.7Kg</td> <td>51Kg</td> </tr> <tr> <td>HSDPU</td> <td>HS Digital Processing Unit</td> <td>7Kg</td> <td>7Kg</td> </tr> <tr> <td>HSFCU</td> <td>HS FPU Control Unit</td> <td>14.28</td> <td>15</td> </tr> <tr> <td>HSDCU</td> <td>HS Detector Control Unit</td> <td>15.41</td> <td>15.5</td> </tr> <tr> <td>HSW1-8</td> <td>HS Warm Inter-unit Harness</td> <td>1.5Kg</td> <td>1.5Kg</td> </tr> <tr> <td colspan="2" style="text-align: center;">Total Mass for units on SVM</td> <td>38.19Kg</td> <td>39Kg</td> </tr> <tr> <td colspan="2" style="text-align: center;">Spire TOTAL MASS</td> <td></td> <td>90Kg</td> </tr> </tbody> </table> <p>Nominal mass is estimated mass without margin</p>	Project Code	Instrument Unit	Nominal Mass	Allocated Mass	HSFPU	HS Focal Plane Unit	45.5Kg	46.3Kg	HSJFP	HS JFET Rack-Photometer	3Kg	3.3Kg	HSJFS	HS JFET Rack-Spectrometer	1.2Kg	1.4Kg	Total Mass for units on HOB		49.7Kg	51Kg	HSDPU	HS Digital Processing Unit	7Kg	7Kg	HSFCU	HS FPU Control Unit	14.28	15	HSDCU	HS Detector Control Unit	15.41	15.5	HSW1-8	HS Warm Inter-unit Harness	1.5Kg	1.5Kg	Total Mass for units on SVM		38.19Kg	39Kg	Spire TOTAL MASS			90Kg				
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5.6	Put back in reference to clarify non-mechanical I/F straight after main 5.6 heading: “Note: Electrical and thermal characteristics conferred by these mechanical interfaces are covered in the appropriate sections, not here”																																																
5.6.1	move third paragraph which is just one part of the electrical grounding situation into 5.10.2																																																
5.6.3	Remove text “6 or 8”																																																
5.7.3	Change all Non-operating max to 60, which assumes only CVV is baked out, an approach clearly taken by HiFi and PACs																																																
5.7.3	In last paragraph of section, change “will use the SVM as a thermal I/F, without formal isolation, to” to “will be thermally joined over their base mounting I/Fs to the panel skins which will”																																																
5.8	Add “the cryostat has to be compatible with the SPIRE beam”																																																
5.8.1	Change (tbd) to 1.																																																
5.9.1	<p>Remove table and the text that follows, which is a real mess. Insert the following: “Spire dissipates power inside the cryostat as follows:</p> <table border="1" data-bbox="492 1166 1263 1445"> <thead> <tr> <th>Item</th> <th>Max. in unit/mW</th> <th>Mean in unit/mW</th> <th>Max in harness/mW</th> <th>Mean in harness/mW</th> </tr> </thead> <tbody> <tr> <td>Photometer Cal</td> <td>4</td> <td>0.1</td> <td></td> <td></td> </tr> <tr> <td>Spectrometer Cal</td> <td>5</td> <td>2</td> <td></td> <td></td> </tr> <tr> <td>300mK Cooler*</td> <td>1.42</td> <td>1.22</td> <td></td> <td></td> </tr> <tr> <td>BSM</td> <td>4</td> <td>4ph/1sp</td> <td></td> <td></td> </tr> </tbody> </table>	Item	Max. in unit/mW	Mean in unit/mW	Max in harness/mW	Mean in harness/mW	Photometer Cal	4	0.1			Spectrometer Cal	5	2			300mK Cooler*	1.42	1.22			BSM	4	4ph/1sp																									
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	SMEC	9.5	4.6ph/1.6sp						
	Photometer JFETS	42	42						
	Spectrometer JFETS	14.1	14.1						
	<p>*Recycling is a special case, see section 5.9. “Each item dissipates power per mode as in section 5.9.5.”</p>								
5.9.3	<p>After table delete “These apply to all Modes, and” and capitalise “T” of following “the”. Insert a preceding paragraph. “ These dissipations are essentially independent of observing mode except that the baseline is to only power the spectrometer OR the photometer bolometer systems at any one time, and the figures are based on the higher dissipation photometer operation. When operating as a spectrometer, the reduction in the HSDCU and resulting conditioning loss reduction in HSFCU is TBD”</p>								
5.9.6.1	If update available, update, otherwise add after table “needs to updated”								
5.9.6.2 / 3	Add HS before unit names								
5.9.6.3	Add “Spacecraft’s” before “LCL” on last line								
5.10.1	Change Adxxx to RD4								
5.10.1	Insert drawing of harness configuration from issue 0.9 as attached								
5.10.1	Add harness specification summary tables from issue 0.9, not included explicitly here to keep document handleable								
5.10.2	Remove last paragraph of section								
5.10.4.2	Third paragraph. Change “units” to “HSDPUs”.								
5.10.4.3	Add “will be updated”								
5.9.5	JFET are “OFF” during recycling								
5.9.6.4	LCL fault conditions to be corrected								
5.9.6.4.1	Diagram of power input config. To be inserted (provided by SPIRE)								
5.10.3	Correct spelling “bounding” to “bonding”								
5.10.4.2	Delete beginning of 5 th paragraph until “S/C”								
5.13.3	Delete paragraph 2 and “replace para 3 “- when an ...” by “- when an error or hard limit is detected in the SPIRE S/C housekeeping.”								
5.13.4	Delete TBD and replace with “N.A”								
5.14.3	Add frequency table								
5.10.2	Add “SPIRE grounding is for information only”								
5.13.1	Replace by “There is a single on-board computer in each of the prime and redundant SPIRE HSDPUs. Each HSDPU shall have a different 1553 address. The HSDPUs have the only non- hard-coded on-board								

	software used in SPIRE.”				
5.15.3	Move first sentence to after header of section 5.15.1				
5.6.1.1	Change “30Hz” by “0.03 Hz”. In last sentence, add after “Alcatel” “between 30 Hz and 300 Hz”				

Figure 4.1 Spire in Herschel.



Maximum total data rate 130000 bits/sec
 Maximum packet rate 25 packets/sec
 Maximum packet data field size 8144 bits

Note-Overheads on PUS TM packets
 Packet header 48
 Data header 80
 Error control 16

**Maximum Data Rate for Chopping Observatory Functions:
 POF1, POF2, POF3, POF4, POF6, POF7**

DCU Science	Nominal
Number of data channels	292
Bits per channel	16 bits
Frame size	4672 bits
Frames per packet	1
Packet size	4896 bits
Sampling rate	20 frames/sec
Packets per sec	20

MCU Science	Nominal
Number of data channels	10 Chop&Jiggle
Bits per channel	16 bits
Frame size	160 bits
Frames per packet	32
Packet size	5344 bits
Sampling rate	64 frames/sec
Packets per sec	2

SCU Science	Nominal
Number of data channels	0
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	1
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

DPU Science	Nominal
Number of data channels	8 TBC
Bits per channel	16 bits
Frame size	128 bits
Frames per packet	8
Packet size	1248 bits
Sampling rate	4 frames/sec
Packets per sec	0.5

Housekeeping	Nominal
Parameter field length	480 Octets
Frame size	3856 bits
Frames per packet	1
Packet size	4000 bits
Sampling rate	1 frames/sec
Packets per sec	1

% Budget Used		
Total packet rate	23.50	94.0%
Total data rate	113232.00	87.1%

**Maximum Data Rate for Non-Chopping Observatory Functions:
 POF5**

DCU Science	Nominal
Number of data channels	292 TBC
Bits per channel	16 bits
Frame size	4672 bits
Frames per packet	1
Packet size	4896 bits
Sampling rate	24 frames/sec
Packets per sec	24

MCU Science	Nominal
Number of data channels	0 Chop
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	64
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

SCU Science	Nominal
Number of data channels	0
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	1
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

DPU Science	Nominal
Number of data channels	0 TBC
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	8
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

Housekeeping	Nominal
Parameter field length	480 Octets
Frame size	3856 bits
Frames per packet	1
Packet size	4000 bits
Sampling rate	1 frames/sec
Packets per sec	1

% Budget Used		
Total packet rate	25.00	100.0%
Total data rate	121504.00	93.5%

**Maximum Data Rate for Scanning Observatory Functions:
 SOF1, SOF2**

DCU Science	Nominal
Number of data channels	70
Bits per channel	16 bits
Frame size	1120 bits
Frames per packet	4
Packet size	4704 bits
Sampling rate	80 frames/sec
Packets per sec	20

MCU Science	Nominal
Number of data channels	6
Bits per channel	16 bits
Frame size	96 bits
Frames per packet	80
Packet size	7904 bits
Sampling rate	240 frames/sec
Packets per sec	3

SCU Science	Nominal
Number of data channels	0
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	4
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

DPU Science	Nominal
Number of data channels	0
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	4
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

Housekeeping	Nominal
Parameter field length	480 Octets
Frame size	3856 bits
Frames per packet	1
Packet size	4000 bits
Sampling rate	1 frames/sec
Packets per sec	1

% Budget Used		
Total packet rate	24.00	96.0%
Total data rate	121792.00	93.7%

**Maximum Data Rate for Step-and-Look Observatory Functions:
 SOF3, SOF4**

DCU Science	Nominal
Number of data channels	70
Bits per channel	16 bits
Frame size	1120 bits
Frames per packet	4
Packet size	4704 bits
Sampling rate	16 frames/sec
Packets per sec	4

MCU Science	Nominal
Number of data channels	10 Chop
Bits per channel	16 bits
Frame size	160 bits
Frames per packet	32
Packet size	5344 bits
Sampling rate	64 frames/sec
Packets per sec	2

SCU Science	Nominal
Number of data channels	0
Bits per channel	16 bits
Frame size	0 bits
Frames per packet	1
Packet size	224 bits
Sampling rate	0 frames/sec
Packets per sec	0

DPU Science	Nominal
Number of data channels	8 TBC
Bits per channel	16 bits
Frame size	128 bits
Frames per packet	8
Packet size	1248 bits
Sampling rate	4 frames/sec
Packets per sec	0.5

Housekeeping	Nominal
Parameter field length	480 Octets
Frame size	3856 bits
Frames per packet	1
Packet size	4000 bits
Sampling rate	1 frames/sec
Packets per sec	1

% Budget Used		
Total packet rate	7.50	30.0%
Total data rate	34128.00	26.3%

Proposed changes to SPIRE IIDB 2.0**Herschel SPIRE IID-B updates**

Based on previously known I/P, 13-02-2002 CCB, more recent updates and SVM accommodation meeting

Description

- This document lists the updates needed for the document SCI-PT-IIDB-SPIRE-02124.
- These updates are intended so that the HIFI IID-B reflects the interface requirements of the instrument AS BEING DESIGNED and FABRICATED at the date of issue above.
- Further proposed changes to the design, implying a change in the interface requirements, shall be addressed after completion of the document update, via Change Requests.
- This list will also be used to identify points that need further discussion before formalization of the IID-B update.

Procedure

- Industry shall identify the updates that are according to their system design (□), not in accordance (□) or not applicable (NA).
- It is not demanded to provide any assessment or implication at this time.
- The update items that are found not to be in accordance (hence representing a discrepancy between the instrument and the S/C designs), shall be identified as such, and circulated to all parties.
- All parties are expected to prepare proposals for solving the discrepancies
- A convergence meeting shall be held to address all discrepancies and close them in real time.

Procedure summary and time line

1. SPIRE establishes the "updates list" and provides to ESA: April ?
2. ESA processes a "sanity check" and forwards to industry: April ?
3. Industry circulates and checks out the list, forwards to ESA: April ?
4. ESA forwards to instrument: April ?
5. ESA/industry/instrument convergence meeting is held at ESTEC: April ?

Limitation and further activity

The list below shall not comprise changes to requirements that are NOT part of the current design. These will be addressed subsequently to the update via the interface meetings and the Change Request process.

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SPIRE IIDB 2.0 Change item n° 1.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.6.1.2

Original text (from IIDB 2.0)

The thermal straps will be steadied by non-metallic Spire A-frames on the outside of the FPU, designed to minimise the forces the straps can apply to thermal lead-throughs, but not be Ohmic shorts.

Modified text (for inclusion in IIDB 2.1)

The thermal straps will be steadied by non-metallic Spire-provided A-frames on the outside of the FPU, designed to minimise the forces the straps can apply to thermal lead-throughs, but not to be Ohmic shorts. **Separate supports are needed to minimise cross-coupling between the two sorption cooler straps.**

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 2.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7.5.1

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

The table below shows the measurement of instrument cryogenic temperatures. These data are available in DPU science packets (unless otherwise indicated) via whichever is powered of the prime and redundant sides of the Spire electronics. They may also be included in some housekeeping packets.

Each Prime/Redundant side uses different, electrically isolated sensors and will therefore have subtly differing electrical to temperature calibrations. Note that the accuracy columns that follow refer to the performance of the complete system including cryoharness and electronics, not the sensors alone. "Resolutions" and "Accuracy" will need to be further defined as they are actually temperature dependant.

Cernox sensors type CX-1030 are used for all Spire conditioned hsk. temperatures. The below table is consistent with Spire Wiring Definition.

etc.

Table of Sensor type / range / res. etc.

Specific comments :

Originator	Comment
Astrium comment (n° 242) to IIDB 2.0	Temperature channels to be further analysed.
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 3.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7.5.3

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Location	Accuracy
• Level 0 Strap A to cooler	50 mK
• Level 0 Strap B to cooler	50 mK
• Level 0 Strap to HFSFPU 1.8k boxes	50 mK
• Level 1 strap to HSFPU	50 mK
• HSJFS Frame temperature	1K
• HSJFP Frame temperature	1K
• HOB at HSFPU centre foot	1K
• HOB at HSFPU +Y foot	1K
• HOB at HSFPU -Y foot	1K

Lower values for resolution and accuracy apply at bottom end of range, higher when hot and the absolute value of the requirement is much less stringent. The temperature of an item should be determined (accuracy+ resolution errors) to 2% of its absolute value in Kelvin, TBC.

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02, with the level-0 accuracies changed from (initially requested) 10 mK, to 50 mK.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 4.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.8

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Spire's only optical interface is that tolerated in section 5.3.2. The instrument's internal beam sizes have been optimised

For information, figure 5.8-1 shows the Spire optical beam envelope viewed as it passes out of the HSFPU, showing the contributions from the photometer and the spectrometer. The differing beams are extremes of BSM's jiggle and chop. The beam envelope formed is the geometric optical beam passing through the Spire cold stop. The 6mm clearance around it through the shutter frame is the allowance required for beam diffraction.

etc.

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 5.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01 SPIRE IBDR / 04-03-02
Affected IIDB chapter	§ 5.9.3

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Project Code	Instrument Unit	Dissipation	Comment
HSDPU	HS Digital Processing Unit	15.3 W	
HSFCU	HS FPU Control Unit	42.9 W	Incl. Power cond losses
HSDCU	HS Detector Control Unit	37.0 W	Lower in spectroscopy mode
HSWIR	HS Warm Interconnect Harness	0.1 W	
	TOTAL	95.3 W	

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 6.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.9.6.1

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Operating Mode	Max. Average load at BOL	Max. Average load at EOL	Long Peak
Observing	95.3 W	95.3 W	TBD
Parallel	95.3 W	95.3 W	TBD
Serendipity	95.3 W	95.3 W	TBD
Standby	95.3 W	95.3 W	TBD
Cooler recycle	95.3 W	95.3 W	TBD
On	15.3 W	15.3 W	TBD
Off	0 W	0 W	0

Project Code	Instrument Unit	Load per LCL (W)
HSDPU	Digital Processing Unit	15.3 W ¹
HSFCU	FPU Control Unit	80.0 W ²

Specific comments :

Originator	Comment
Alcatel comment to IIDB 2.0.	The "average" and "peak" power values provided must be stated to correspond to "worst-case" conditions, i.e. taking into account the specified supply bus voltage range : 26V and 29V. Power requirements cannot be accepted until assumed margins are clearly stated.
(1) BH – Alcatel	The maximum associated " Long Peak " load on this LCL is understood to be the mean value (above) X 1.20, i.e. 18.5 W .
(2) BH – Alcatel	The maximum associated " Long Peak " load on this LCL is understood to be the mean value (above) X 1.20, i.e. 96 W .
G. Lund	This § of ECR-005 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 7.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.9.6.3

Original text (from IIDB 2.0)

5.9.6.3 Interface Circuits

The FSDPU and the FSFCU receive both prime and redundant 28V feeds. The configuration is shown in figure 5.2.1, and the connectors are DPU J1-2 and FCU J5-6.

Their S/C power interfaces circuits shall be designed not to generate unwanted interaction with LCL switching limiters.

The HPCDU shall telemeter LCL current to better than 0.30mA resolution.

Modified text (for inclusion in IIDB 2.1)

5.9.6.3 Interface Circuits

The FSDPU and the FSFCU receive both prime and redundant 28V feeds. The configuration is shown in figure 5.2.1, and the connectors are DPU J1-2 and FCU J5-6.

Their S/C power interfaces circuits shall be designed not to generate unwanted interaction with LCL switching limiters. **Instrument power circuits are shown in sections 5.9.6.4.1 & .2.**

The HPCDU shall telemeter LCL current with a resolution better than 25 mA, or 1/256 of (trip X 1.5), whichever is larger.

Specific comments :

Originator	Comment
Alcatel comment to IIDB 2.0	Description of the interface circuits to be provided, or at least a statement made to the effect that the power interfaces will be designed to be compatible with the LCLs provided by the system.
Alenia comment to IIDB 2.0	CR not accepted : the PCDU current measurement accuracy is $\pm 5\%$.
BH (Alcatel)	Current telemetry is intended to enable "health status" (i.e. potential WU failure modes) to be checked, but is not designed to enable instrument performance to be measured. As a consequence, the foreseen current measurement resolution is $\pm 5\%$. This is to be determined from the nominal current, for the "best-case" bus voltage (here, maximum : 29V). Resulting LCL current resolutions would thus be : <ul style="list-style-type: none"> • DPU LCL : 0.05 X (15.3 / 29) ~ 25 mA. • FCU LCL : 0.05 X (80 / 29) ~ 140 mA.
G. Lund	Although this § of ECR-005 was accepted at ESA CCB / 13-02-02, it remains conditional to the above remarks.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 8.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.13.1

Original text (from IIDB 2.0)

5.13.1 On-board hardware

There is a single on-board computer in each of the prime and redundant SPIRE FSDPUs. The FSDPUs have the only non- hardcoded on-board software used in SPIRE.

Modified text (for inclusion in IIDB 2.1)

5.13.1 On-board hardware

There is a single on-board computer in each of the prime and redundant SPIRE FSDPUs. **Separate bus addresses are used for the nominal and redundant DPU units. It shall not be possible for a failure to cause both units to be ON simultaneously.**
 The FSDPUs have the only non- hard-coded on-board software used in SPIRE.

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 discussed at ESA CCB / 13-02-02. At the time it was accepted that only one 1553 address would be used. Since that time, it has been agreed (Data Management W.G. : HP-ASPI-MN-.... / 10-04-02) separate bus addresses shall be used (as blue-highlighted text).

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 9.

Origin of change	SPIRE ECR-005 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.15.3

Original text (from IIDB 2.0)

The SPIRE warm electronics units (FSDPU; FSFCU; FSDCU, FSWIH) will be transported in clean hermetically sealed containers to be opened only in class 100000 clean conditions (TBC) with less than 75% humidity (TBC).

The maximum shock any of the warm electronics units can sustain in any direction is (TBD). The transport containers are fitted with shock recorders and internal humidity monitors. The SPIRE warm electronics transport containers are shown in figure TBD.

Modified text (for inclusion in IIDB 2.1)

For reasons of possible damage caused by vibration during transport, environmental testing and launch, mechanisms shall be transported in their launch latched state.

The SPIRE warm electronics units (FSDPU; FSFCU; FSDCU, FSWIH) will be transported in clean hermetically sealed containers to be opened only in class 100000 clean conditions (TBC) with less than 75% humidity (TBC).

The maximum shock any of the warm electronics units can sustain in any direction is (TBD). The transport containers are fitted with shock recorders and internal humidity monitors. The SPIRE warm electronics transport containers are shown in figure TBD.

Specific comments :

Originator	Comment
G. Lund	This § of ECR-005 discussed at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 10.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.5

Original text (from IIDB 2.0)

Original Table (§ 5.5)

Modified text (for inclusion in IIDB 2.1)

Project Code	Instrument Unit	Dimenions (mm) incl. feet, & Drawing References.	Nom. Mass ¹ without margins (kg)	Allocated ¹ Mass (kg)
FSFPU	HS Focal Plane Unit	Non-rectangular, see section 5.4. drawing refs. : 5264 / 300 sheets 1,2 ... 6 (*)	45.5 45.5	51.3 46.3
FSJFP	HS JFET Rack Photometer	270.5 x 104 x 114 TBC 6 JFET Assembly – KE2896 – 30/11/01 – TBC (*)	3.0 3.0	3.3 3.3
FSJFS	HS JFET Rack Spectrometer	108.5 x 91 x 104 TBC 2 JFET Assembly – KE2897 – 30/11/01 – TBC (*)	1.2 1.2	1.4 1.4
		Total OB Units	49.7 49.7	56.0 51.0
FSFCU	HS Digital Processing Unit	374 X 409 ² X 330 SPIR-MX-5200 000 A – 12/01/02 (*)	15.0 14.3	12.0 15.0
FSDCU	HS Detector Control Unit	494 X 289 X 305 SPIR-MX-5100 000 A – 11/01/02 (*)	15.5 15.4	13.0 15.5
FSDPU	HS Digital Processing Unit	274 X 258 X 194 HER S003/02 – 10/02/02 (*) New update received, dated 05/04/02	6.6 7.0	7.0 7.0
FSW1-8	HS Warm Inter-unit Harness		2.0 1.5	2.0 1.5
		Total SVM Units	39.1 38.2	34.0 39.0
		Total	88.8 88.1	90.0 90.0

¹ Yellow highlighted values were agreed with SPIRE on 04-04-02;
Blue highlighted values are updated proposal from SPIRE, dated 17-04-02.

² This dimension includes an additional 80 mm for “internal” connectors and external jumpers.

Specific comments :

Originator	Comment
G. Lund	Some of above changes proposed in SPIRE ECR-006. Other changes discussed and agreed on 04/04/02 at Cannes, minuted in HP-ASPI-MN-1238.
G. Lund	(*) Drawing references : the corresponding, updated drawings are to be inserted into relevant chapters of the IIDB.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 11.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.4

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Update of FPU Drawings, to : "SPIRE Interface" drawings n° 5264 / 300 sheets 1,2 ... 6 / Dated 24-11-02.

Specific comments :

Originator	Comment
G. Lund	This § of ECR-006 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 12.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.4.2

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Update of FPU Drawings, to : 2 JFET Assembly – KE2897 – 30/11/01 - TBC

Specific comments :

Originator	Comment
G. Lund	This § of ECR-006 accepted at ESA CCB / 13-02-02. Colour isometric views to be replaced by above-referenced drawings.
Astrium comment (n° 225) to IIDB 2.0	The number and position of JFET racks (FSJFS and FSJFP) has been changed. Position of JFET racks on HOB need to be agreed with Instrument Team, Alcatel, Astrium and ESA. Cryostat / HOB design constraints need to be considered.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 13.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.4.3

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

Update of FPU Drawings, to : "6 JFET Assembly" – KE2896 – 30/11/01 - TBC
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Specific comments :

Originator	Comment
G. Lund	This § of ECR-006 accepted at ESA CCB / 13-02-02. Colour isometric views to be replaced by above-referenced drawings.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 14.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.4.4.2

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

DCU interface drawings : Ref. SPIR-MX-5100 000 A – 11/01/02
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Specific comments :

Originator	Comment
G. Lund	This § of ECR-006 accepted at ESA CCB / 13-02-02. Isometric views to be replaced by above-referenced drawings, as agreed on 04/04/02 at Cannes, minuted in HP-ASPI-MN-1238.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 15.

Origin of change	SPIRE ECR-006 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.4.4.3

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

FCU interface drawings : Ref. SPIR-MX-5200 000 A – 12/01/02

Specific comments :

Originator	Comment
G. Lund	This § of ECR-006 accepted at ESA CCB / 13-02-02. Isometric views to be replaced by above-referenced drawings, as agreed on 04/04/02 at Cannes, minuted in HP-ASPI-MN-1238.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 16.

Origin of change	SPIRE ECR-007 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.6.1.1

Original text (from IIDB 2.0)

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Modified text (for inclusion in IIDB 2.1)

<p>Spire's mechanisms (SMEC and BSM) are sensitive to μ-vibrations between 30 Hz and 300 Hz, with the potential effect to displace the SMEC suspended mirrors from their optical positions. The bolometers as accommodated probably have a similar susceptibility to HOB-driven micro-vibration. This is potentially due to harness flexure/capacitance change rather than movement of the detector elements themselves.</p> <p>Spire needs knowledge of the level of the micro-vibration induced forces on the HSFPFU at its HOB interface in order to be sure it can mitigate them. These levels of input acceleration will be provided by ESA/Alcatel as they become available.</p>

Specific comments :

Originator	Comment
G. Lund	This § of ECR-007 accepted at ESA CCB / 13-02-02, with the (previously requested) value of 0.1 Hz changed to 30 Hz. Availability date of results cannot yet be specified.
Astrium comment (n° 232) to IIDB 2.0	The micro-vibration requirement during SPIRE operations (maximum permissible input acceleration input by Herschel to the FPU HOB is 10micro-g peak). Further analysis required [to confirm this can be achieved]

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 17.

Origin of change	SPIRE ECR-009 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7

Original text (from IIDB 2.0)

The cryogenic interfaces are the most important category of interfaces for Spire's success, and the most complicated. They would provide the most gain to science performance from being somewhat improved.

Modified text (for inclusion in IIDB 2.1)

The cryogenic interfaces are the most important category of interfaces for Spire's success, and the most complicated. They would provide the most gain to science performance **from being improved.**

Specific comments :

Originator	Comment
G. Lund	ECR-009 was put "on-hold" at ESA CCB / 13-02-02. The proposed changes to § 5.7 of this ECR can nevertheless be accepted.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 18.

Origin of change	SPIRE ECR-009 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7.1

Original text (from IIDB 2.0)

The various instrument stages require straps to 3 different temperatures. The cryostat shall provide:
 Level 0: He tank for temperatures at the < 2 K
 Level 1: He vent-line at about < 6 K
 Level 2: He vent-line at about <15 K which may be achieved by conduction to the HOB.
 An overview of this system is:
 (Fig. 5.7.1-1).

Modified text (for inclusion in IIDB 2.1)

The various instrument stages require straps to 3 different temperature levels. An overview of the heat-flows in the system is :
 Updated drawing.

Specific comments :

Originator	Comment
G. Lund	ECR-009 was put "on-hold" at ESA CCB / 13-02-02. The proposed changes to § 5.7.1 of this ECR can nevertheless be accepted.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 19.

Origin of change	SPIRE ECR-009 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7.1.1

Original text (from IIDB 2.0)

5.7.1.1 Thermal straps for ³He Cooler

Operation of the Spire ³He cooler requires that it is recycled by heating the sorption pump to ~40-K whilst the evaporator is kept at 1.7-K, thus condensing the ³He into the evaporator. The temperature of the evaporator during condensation is critical to the overall efficiency of the cooler.

At the end of the condensation phase the heat switch on the sorption pump is turned ON and the switch on the evaporator is turned OFF. Then there is a substantial peak power from the sorption pump to the cryostat as it re-cools via the strap. This peak power and associated energy will not have any significant impact on the cryostat LHe tank. However it will have a significant temporary impact on the thermal gradient along the strap.

There are two straps from the cooler to separate points on the LHe tank, one for the sorption pump and one for the evaporator. In this way, during normal operation, the temperature of the evaporator strap will remain at $T_{\text{bath}} + \Delta T$ (as small as possible), leading to a good condensation efficiency and less ³He lost during the cooldown from 1.7 K to 0.3 K. The sorption pump will still operate properly even if the "hot" end of its strap rises momentarily to as much as 10 K.

The Spire FPU provides two Level 0 thermal strap interfaces to the ³He cooler. It also provides a third, separate, Level 0 strap interface for its 1.8K optical box structures which are interconnected internally so as to have just one instrument external I/F.

Modified text (for inclusion in IIDB 2.1)

5.7.1.1 Description of Interfaces for the ³He Cooler

Operation of the Spire ³He cooler requires that it is recycled by heating the sorption pump to ~40-K whilst the evaporator is kept at 1.7K, thus condensing the ³He into the evaporator. The sorption pump will still operate properly even if the "hot" end of its strap rises momentarily to as much as 10 K.

The temperature of the evaporator during condensation is critical to the overall efficiency of the cooler, required to get the best HERSCHEL Spire science return from a given amount of cryogen. Its manufacturer stipulates a conductance of >0.1Watts/Kelvin to ³He. The efficiency of the cooler also determines 300mK hold time, and Spire has no excess margin w.r.t to achieving its specified 48hour operating cycle.

At the end of the condensation phase of the cooler's regeneration, the heat switch on the sorption pump is turned ON and the switch on the evaporator is turned OFF. There is a substantial peak power from the sorption pump to the cryostat as it re-cools via the strap. This peak power and associated energy should not have any significant impact on the cryostat ³He tank. However it will have a significant temporary impact on the thermal gradient along the strap.

There are thus two straps from the cooler, one for the sorption pump and one for the evaporator. In this way, during normal operation, the temperature of the evaporator strap will remain at T_{bath}+? T (as small as possible), leading to a good condensation efficiency and less ³He lost during the cooldown from 1.7 K to 0.3K. Note that the cooler has an internal heat shunt between its pump and evaporator, but the braid from this shares an external cooler I/F with the evaporator braid.

Spire has two 1.8K optical box structures on isolating mounts inside the HSFPU. As shown in the overall scheme above, these provide a low temperature mounting for the detector assemblies. The photometer box and the spectrometer box are thermally linked internally to the FPU, and provide just one instrument external strap I/F to level 0.

Specific comments :

Originator	Comment
	qlkjqlkgjhgsg

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 20.

Origin of change	SPIRE ECR-009 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.7.1.2

Original text (from IIDB 2.0)

Spire interfaces require to be adequately cooled by HERSHEL Level 0 straps. The straps shall have at least the following conductances seen at the Spire I/F plane, and act towards a sink at 1.7Kelvin:

Strap	Conductance	Nominal Heatflow
Enclosure	0.05 Watts/Kelvin	1 to 3mW
Cooler Pump	0.05 Watts/Kelvin	0.25 to 1.8mW
Cooler Evaporator	0.1Watts/Kelvin	0.25 to 0.6mW

where the reason for including the heatflow is that it will change the temperature of the warm ends and hence the straps' conductivity.

The Level 1 FSFPU strap shall have a conductance of >0.05Watts/Kelvin. In this case the sink is to an He boil-off pipe, so the cooling delivered to the Spire interface is not guaranteed by the strap conductance alone. At a worst case load of 18.25mWatts, which is a value Spire is presently trying not to need, this strap's equilibrium interface temperature shall remain <5Kelvin. With the specified conductance value, this corresponds to the nominal 3.5Kelvin level 1 boil-off pipe being raised to 4.63K

We ought to note that instrument performance would benefit if these were improved.

No FSJFS or FSJFP straps are listed because the present design uses direct mounting conduction to the HOB, so they are not fitted, TBC.

Input for modified text (for inclusion in IIDB 2.1)

BC comments (could be used in discussions leading to a revised version of this CR) ...

1. The following changes are proposed :

- Clarification of the description of the operation of the Sorption cooler.
- Move the Level 0 thermal strap interface to the bottom of the FPU, and provide a strap connection interface compatible with IID-A. Implicitly, the Sapphire electrical insulation moves to SPIRE, such that CR 11 becomes obsolete.
- Change the Level 0 temperature requirement to all 1.8K (tank at 1.6K)
- Provide a description of the heat pulse expected during cooler recycling, in order to verify that strap dimensioning is adequate. The SPIRE thermal model should enable this check to be made.
- Include an additional requirement for the Evaporator strap to be maintained at $\leq 2K$ during this pulse (to avoid evaporating 3He and preserve recycling efficiency)
- Reduce dissipation on level 1 from 18 mW to 13 mW, at the same time reducing the temperature requirement from 5 to 4.5K (the feasibility of the latter is TBC by Astrium - following the outcome of action items taken at thermal I/F meeting of 10-04-02).
- Correct the transcription errors on level 2 (-10mW on FPU was missing in the edition of the CR with MS word 97).
- The SPIRE suggestion in the minutes to reduce 12K to 10K is not introduced as it has not been discussed during the meeting.

2. Thermal strap considerations :

To ensure a peak of $\Delta T < 8 K$ at sorption cooler recycling (450mW), a thermal conductance of 56mW/K (50mW suggested) would be needed for the pump strap.

A value of 100mW/K is suggested for the evaporator strap, 50mW/K being required from the data for the detector strap.

For a total strap length of 68cm and width of 2cm, a thickness of 5mm is required together with appropriate quality control of the copper (meaning high quality - 99.999% purity and heat treatment to remove stress) to achieve a RRR >80 .

The mass of such a strap would be 0.6kg, so it would have to be supported, adding new heat loads. Losses from the strap supports shall therefore be $\ll 1 mW$ (Objective 50 microW).

The contact conductance shall be taken into account, as there will be 3 or 4 interfaces (Tank/Astrium/Spire Outside/Sapphire/Heat Switch).

Some problems might be expected with ground testing, as the top of the Helium II tank is usually warmer than the liquid, as it is planned for the ground test to be carried out with the cryostat in a horizontal position (+90° around +Z axis) for cooler recycling & FTS operation. This should be OK for PACS & SPIRE, but HIFI Level 0 interfaces will be warmer, and might have to be tested vertically (to cool the mixers).

The reduction in heat load from 18 mW to 13 mW, associated with a decrease of 0.5K in temperature, is compatible with a mass flow of 2mg/s and $C_p = 5200$ (with SPIRE alone, but this needs to be checked with the other instruments using the system TMM).

Specific comments :

Originator	Comment
B. Collaudin	The above comments were sent to SPIRE by email on 15-02-02. They could be considered as a starting point for elaboration of an updated CR. The final wording should take into account the outcome of follow-up work related to the Thermal Interface meeting held on 10-04-02 at Astrium.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 21.

Origin of change	SPIRE ECR-010 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.2

Original text (from IIDB 2.0)

SPIRE Block Diagram – fig. 5.2.1 / IIDB 2.0

Modified text (for inclusion in IIDB 2.1)

SPIRE Block Diagram – fig. 5.2.1 / **updated**.

Specific comments :

Originator	Comment
ASED	<i>This version (17/11/01) does not represent the current status. ASED harness to be included in update, as far as applicable.</i>

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 22.

Origin of change	SPIRE ECR-010 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.10.2

Original text (from IIDB 2.0)

--

Modified text (for inclusion in IIDB 2.1)

Updated grounding scheme diagram.

Specific comments :

Originator	Comment
ASED	Subject to EMC W.G. outcome.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 23.

Origin of change	SPIRE ECR-010 / SPIRE / 19-11-01
Affected IIDB chapter	§ 5.10.1

Original text (from IIDB 2.0)

Original harness layout diagram and wiring list.

Modified text (for inclusion in IIDB 2.1)

Updated harness layout diagram.

Updated wiring list - TBD

Specific comments :

Originator	Comment
G. Lund	This § of ECR-010 conditionally accepted at ESA CCB / 13-02-02 : in particular, peak & average dissipation columns were to be removed. SPIRE Cryoharness doc. v. 0.9, with updated wiring list, was then supplied to industry. This is TBC at forthcoming <u>cryo-harness meeting with SPIRE on 18-19/04/02.</u>
G. Lund	The provision of an <u>overharness</u> , inside the cryostat, was <u>not</u> accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 24.

Origin of change	SPIRE ECR-014 / SPIRE / 19-11-01
Affected IIDB chapter	§ 9.3, 9.4, 9.5, 9.6, 9.7

Original text (from IIDB 2.0)

"TBD" (in each of above paragraphs)

Modified text (for inclusion in IIDB 2.1)

"See Rxyz" (in each of above paragraphs)

Specific comments :

Originator	Comment
G. Lund	This § of ECR-014 accepted at ESA CCB / 13-02-02.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 25.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§ 5.4.4

Original text (from IIDB 2.0)

5.4.4 SVM Mounted Units

Figure 5.4-5 provides the layout of the SPIRE units on the SVM

.....

Figure 5.4-5 Spire SVM mounted units and the SPIRE warm interconnect harness

Modified text (for inclusion in IIDB 2.1)

5.4.4 SVM Mounted Units

Figure 5.4-5 provides the layout of the SPIRE units on the SVM.

Provide figure !

Figure 5.4-5 Spire SVM mounted units and the SPIRE warm interconnect harness

Specific comments :

Originator	Comment
Astrium comment (n° 226) to IIDB 2.0	Provide figure of position of SPIRE units on SVM and harness.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 26.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§ 5.7.5.2

Original text (from IIDB 2.0)

5.7.5.2 Shutter Temperature Sensors

Handled by EGSE, not FCU/DPU, and therefore included here only for completeness.
 Not available for flight.

Etc.

Modified text (for inclusion in IIDB 2.1)

TBD (see comment)

Specific comments :

Originator	Comment
Astrium comment (n° 244) to IIDB 2.0	Shutter Temperature Sensors : The role of the shutter in the locked position during flight needs to be clarified. Are the temperature sensors not required during the launch phase until the shutter is put in the locked position ?

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 27.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§ 5.10.3

Original text (from IIDB 2.0)

.....
 We note that presently all Warm Electronics units rely in conductivity via their mechanical mounting feet to S/C. SPIRE would much prefer a formal S/C aluminium strap bounding tree, coupled by controlled straps to all equipments, and will therefore provide a bounding strap mounting point on each SVM mounted unit to permit this.

Modified text (for inclusion in IIDB 2.1)

TBD (see comment)

Specific comments :

Originator	Comment
Astrium comment (n° 270) to IIDB 2.0	Bonding section new: to be further analysed.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 28.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§ 5.10.4.1, § 5.10.4.2, § 5.10.4.3

Original text (from IIDB 2.0)

--

Modified text (for inclusion in IIDB 2.1)

TBD (see comment)

Specific comments :

Originator	Comment
Astrium comment (n° 271) to IIDB 2.0	Electrical Signal Interfaces (1553 data busses, master clock and launch confirmation) new. To be further analysed.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 29.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§ 5.11.3

Original text (from IIDB 2.0)

....
 Spire requires to be able to deduce where Herschel is pointing to 0.1 of its smallest pixel IFOV. So when using the telescope scan mode, a "start of scan" indication will be sent to the DPU to give a timing precision of better than 5TBC milliseconds. This is required so that the Spire data can be located in time and correctly ground processed to link to Herschel attitude; it is not required for the operation of the Spire instrument.

Modified text (for inclusion in IIDB 2.1)

TBD

Specific comments :

Originator	Comment
Alcatel comment to IIDB 2.0	The requested accuracy of the "start of scan" signal is 5 ms – TBC. This is not accepted, the likely acceptable value being closer to 100 ms (TBC). SPIRE shall provide a schematic showing all the electrical I/F with the spacecraft.

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA

SPIRE IIDB 2.0 Change item n° 30.

Origin of change	Industry comment to SPIRE IIDB 2.0
Affected IIDB chapter	§

Original text (from IIDB 2.0)

Etc.

Modified text (for inclusion in IIDB 2.1)

Etc.

Specific comments :

Originator	Comment

Agreement matrix :

Agreement (subject to above comments)			
ESA	ASPI	ASTRIUM	ALENIA



DCR / ECR Number:

HR-SP-RAL-ECR-009- v5

Spacecraft / Project	Herschel-Planck	Originator's Name	JD
System / Experiment / Model	SPIRE	Signature	<i>John Delderfield.</i>
Sub-System	Instrument level I/F	Date	19th April 2002
Assembly		Classification	Urgent
Sub-Assembly		Ref. Doc. / Drwg No.	Spire IID-B 2/0
Item		Reference	SCI-PT-IIDB/SPIRE-02124

ECR Title	SPIRE IID-B UPDATE, #5
-----------	------------------------

ECR Description
Required SPIRE detailed temperatures and heatflows at I/F.
Need /Justification For "Change"
New chapter 5.7 as agreed between ESA/Industry/SPIRE during IID-B convergence meeting, RAL 19-04-02



DCR / ECR Number:

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Affected Items / Work package (Title, Number, Issue, Para)

Incorporate the following replacement sections:

5.7 THERMAL INTERFACES

The cryogenic interfaces are the most important category of interfaces for **Spire** 's success, and the most complicated. They would provide the most gain to science performance from being improved.

5.7.1 Inside the cryostat

ESA, SPIRE and Industry recognize that the definition of the thermal interface between the SPIRE FPU and the Herschel Cryostat is an open issue that requires urgent settlement. However, in the midst of various analyses both on Industry and SPIRE side, no convergence was found prior to this issue 2.1 of the SPIRE IID-B.

Two major thermal requirements for SPIRE are its sorption cooler cycle time of 48h min., and its cold tip temperature < 290mK.

The following paragraphs (5.7.1 to 5.7.1.2) are a statement of the SPIRE requirements on the Herschel system. However, industry can not commit to the requirements below, but is investigating refining its design with these as objectives. A number of technical options have been identified, both on satellite and SPIRE instrument sides, which need to be analysed to converge to an interface definition. An objective is to meet both the cryostat lifetime and SPIRE thermal requirements. This shall be settled and formalized via the regular Change Request process.

Until convergence is reached, Industry is contractually committed to the following interface (as per SPIRE IID-B 1.0 para 5.7.1, repeated below):

The various instrument stages require 3 different temperatures. This will be achieved by strapping the stages to various "cold" parts of the cryostat. These cryostat parts are:

- Level 0: The He II tank for temperatures at the 1.7 K level
- Level 1: Strap to the He ventline at about 4K
- Level 2: Strap to the He-ventline at about 10 K

The table below shows the required operating temperatures at the interface of the instrument unit with the cryostat or parts thereof:

Project code	Operating		Start up	Switch-off	Non operating	
	Min. K	Max. K	Deg. C	Deg. C	Min. C	Max. C
FSFPU (Level 1 enclosure)	N/A	6	TBD***	TBD***	TBD	+60* +80**
FSFPU (dedicated ³ He cooler strap)	N/A	2****	TBD***	TBD***	TBD	+60* +80**
FSFPU Level 0 Enclosure	N/A	2	TBD***	TBD***	TBD	+60* +80**
FSFTB	N/A	15	TBD***	TBD***	TBD	+60* +80**

* Continuous temperature limit.

** Short-duration temperature limit for bake-out during a maximum of 72 hours.

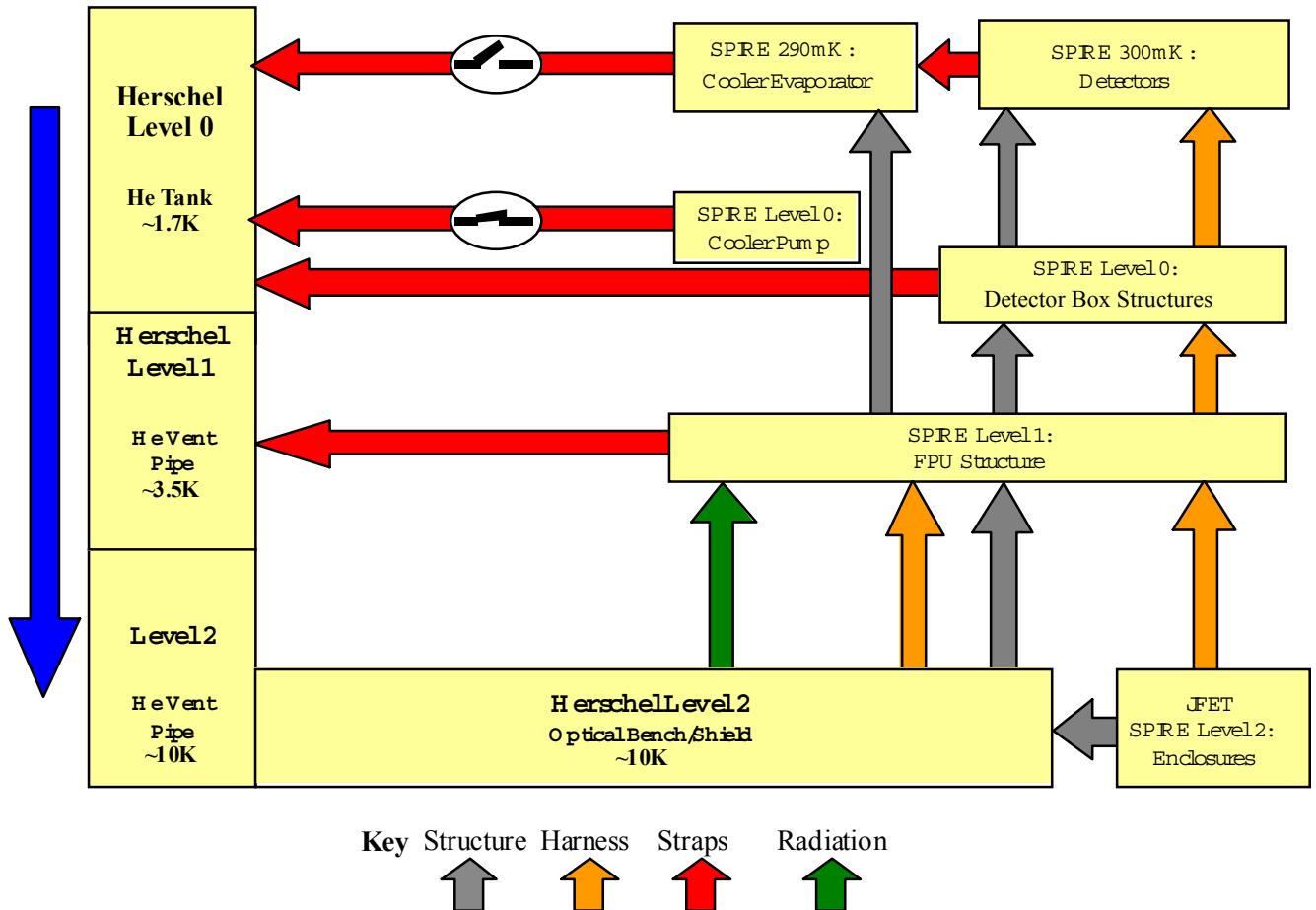
*** Certain sub-systems may not be able to be operated above 20 K.

**** For sorption cooler recycling see 5.7.1.1

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The various instrument stages require straps to 3 different temperature levels. An indicative overview of the heatflows in the system is:



5.7.1.1 Reasons for Spire Level 0 interfaces

The **Spire** ³He cooler has three operating phases: condensation; cooldown; low temperature. The combination of the first two is called re-cycling or re-generation.

First the sorption pump is heated to ~40K and the evaporator's heatswitch ON to conduct heat to the HPLM Helium II tank, so the ³He condenses back into the cooler's evaporator. A temperature of the evaporator during this phase maximises the recycling efficiency (i.e. ratio of Liquid ³He to condensed ³He), a factor in maximising its subsequent 300mK hold time. The sorption cooler manufacturer stipulates a conductance of >0.1Watts/Kelvin between the HPLM Helium II tank and the sorption cooler evaporator heatswitch I/F.

At the end of the condensation phase of the cooler's regeneration, the heat switch on the sorption pump is turned ON and the switch on the evaporator is turned OFF. There is a substantial (~450mW) peak power from the sorption pump to the cryostat as it is re-cooled. The design of HPLM Helium II cryostat should be such that this peak power and associated energy does not have any significant impact, such as cryogen surface film breakage. During this phase, the evaporator strap shall be below 2K, to avoid re-evaporating the condensed ³He.

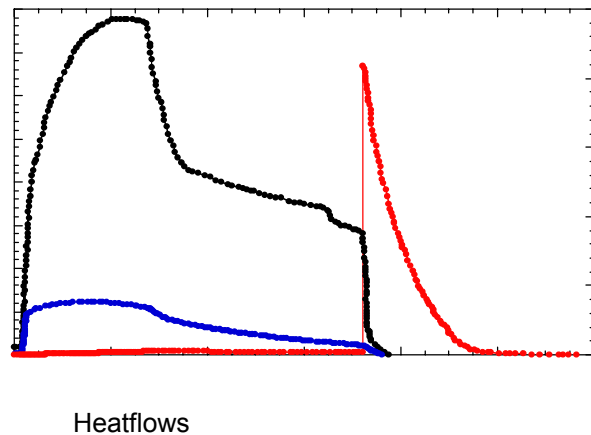
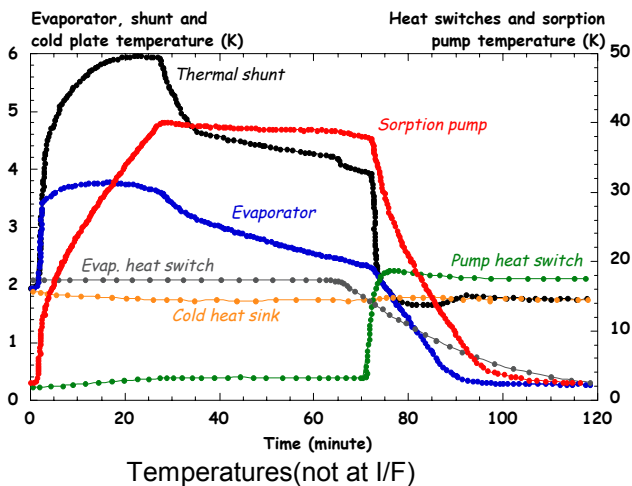
These operating modes mean that the Pump Strap and the Evaporator straps must be sufficiently insulated from each other. There are thus two straps from the cooler, one for the sorption pump and one for the evaporator. In this way, during normal operation, the temperature of the evaporator strap will remain at $T_{bath} + \Delta T$ (as small as possible), leading to a good condensation efficiency and less ³He lost during the cooldown from 1.7 K to 0.3K.

Spire plans to operate the Sorption cooler to fit in with the HERSCHEL mission, namely a 48hour cycle comprising 46 hours of cold operation and 2 hours of recycling. An indicative overview of this two hours recycling is:



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Note that the cooler has an internal heat shunt between its pump and evaporator, but the braid from this uses a common external cooler I/F with the evaporator heatswitch.

Spire has two 1.8K optical box structures on isolating mounts inside the HSFPU. As shown in the overall scheme above, these provide a low temperature mounting for the detector assemblies. The photometer box and the spectrometer box are thermally linked internally to the FPU, and provide just one instrument external strap I/F to level 0.

5.7.1.2 Thermal Interface Requirements

3 thermal strap interfaces at Level 0.

The thermal interface applies at the mechanical positions shown in section 5.4, namely **Spire** supported connections of the type described in IID-A fig 5.7.1.2. located near -X end of the HSFPU's -Z face.

HPLM will have three thermal links from these I/Fs to Helium II tank which shall provide at least the following cooling at an I/F temperature of **1.8K**:

Strap	Max Heatflow	Lifetime Heatflow Operating	Lifetime Heatflow Non-Operating
Detector Enclosures	5mW	3mW	1mW
Cooler Pump	2mW	1.8mW	0.25mW
Cooler Evaporator	1mW	0.6mW	0.25mW

The lifetime heat flows are the values which should be used to estimate the Herschel cryostat lifetime (taking into account averaging during **Spire** operation).

At the end of the condensation phase, the cooler connects its 40K pump back to the level 0 pump strap via a gas switch. The heat pulse from the pump can be approximated to a triangular pulse (Max 450mW, duration 1560s, =Energy 350J), similar in shape to that shown in the figure above. During this pulse, the pump strap interface is allowed to rise up to 10K, but the evaporator strap interface shall remain below 2K.

A thermal strap of 0.1W/K is recommended for the evaporator strap, and 0.05W/K for the pump strap. The detector strap must be also 0.05W/K for a tank at 1.7K.

1 thermal strap interfaces at Level 1.

At least the following cooling at the **Spire** I/F shall be provided

Strap	Temperature	Heatflow
HSFPU SOB	4.5K	13 mW



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The HOB interfaces at Level 2.

At least the following cooling at the **Spire** I/F shall be provided

Interface	Temperature	Heatflow
Three HSFPU Feet	12K	-10mW
HSJFP rack feet	12K	50mW
HSJFS rack feet	12K	25mW

- Notes:
- i. Only one of the HSJFP or HSJFS operates at this effective power at any one time
 - ii. The -10mW indicates that the HSFPU is tending to cool the HOB; this value is subject to change
 - iii. **Spire** has proposed that the 12K value of the HOB I/F be reduced to 10K, a value that would improve instrument thermal accommodation and appears to be consistent with cryostat thermal models. This has been discussed but not agreed.

No HSJFS or HSJFP level 2 straps are listed because the present design uses direct mounting conduction to the HOB, so they are not fitted

The level 2 to level 1 non-bolometer ESA-provided cryo-harness shall not input more than 0.2mWatts into the HSFPU.

To provide the required overall thermal balance boundary, since the inner instrument shield is nominally black at level 2, the effective temperature seen from any point on the surface of the HSFPU when integrated over an outward hemisphere shall not exceed 16K. This surface of course includes the areas around **Spire**'s input aperture.



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INDUSTRY ASSESSMENT / IMPACT OF CHANGE

Schedule

Cost

Industry Assessor Signature

Related Factors

Spacecraft	Performance	Power	Others (Specify)
Ground Segment	Elect. Interfaces	Weight	I/F
Launch Vehicle	Mech. Interfaces	Schedule	
Payload	Test/Verification	Cost	

Attachments

Distribution

None

See covering Sheet

Change Approved		Signature / Date	
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HP-ASPI-MN-1346 / Annex 4

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This Annex not used
(due to annex numbering error in minutes).

Id	IID	Chapter	Company	Auth	Class ⁽¹⁾	Att ea du	Unacceptability and/or comments	Theme
231	SPIRE	§ 5.6.1.1	Alcatel	PR	A		10microg peak for micro-vibration level at optical bench interface cannot be reached (more realistic values are 2 ~ 3 orders of magnitude higher). See also micro-vibration analyses (§7) of Herschel / Planck design report for SRR.	Microvibrations
236	SPIRE	§ 5.7.1.1	Astrium	AH	A		Page 5-12, last sentence : The Level 0 interface temperature level for SPIRE is at < 2K , thus the "1.8 K optical box structure" should be replaced by a "2 K box structure" .	Temperature
238	SPIRE	§ 5.7.1.2 p. 3	Astrium	AH	A		The Herschel Level 0 and Level 1 cooling straps are under PLM responsibility. Thus, the conductance requirements are considered as not relevant. The temperature requirements at the cooling strap interfaces are <2 K for Level 0 <6 K for Level 1; i.e. not < 5 K or even nominal at 3.5 K. Nominal and/or worst case heat loads on the interfaces should be defined, for example 18.25 mW at level 1 (TBC). In case lower temperatures at level 1 are required, this might require a higher mass flow and consequently a larger He tank volume or a reduction of the lifetime requirement.	Temperature
245	SPIRE	§ 5.7.5.3	Alcatel	BH	A		Accuracy and resolution requirements of some temperature sensors remain to be specified. Realistic temperature measurement accuracies are not likely to be better than 2 ~ 3 % over the full measurement range. The sensors shall be provided by the spacecraft, at fixation points on the SVM panels close to each respective box.	Thermistor
258	SPIRE	§ 5.9.6.3	Alcatel	BH	A		"The HPCDU shall telemeter LCL current to better than 0.30mA resolution". This resolution is considered as a typo, why is such a precise resolution required ? The probable resolution will be the max LCL current capability mapped to an 8 bit A/D converter, with a 5A LCL this would provide a resolution of about 20mA.	Electrical
291	SPIRE	§ §10.7.2	Astrium	HF	A		Delivery dates are not compliant with Astrium need dates.	Schedule

- 1 A: New description / requirement (v1.1) considered unacceptable
 B: New description / requirement requiring further analysis
 C: Already known (IID1.1) still considered unacceptable
 D: Already known (IID1.1) under analysis.
 E: Comment or recommendation

Id	IID	Chapter	Company	Auth	Class ⁽¹⁾	Area	Unacceptability and/or comments	Theme
225	SPIRE	§ 5.4.2 and 5.4.3	Astrium	HF	B		Figure 5.4-1b : Number and position of JFET racks (FSJFS and FSJFP) has been changed. Position of JFET racks on HOB need to be agreed with Instrument Team, Alcatel, Astrium and ESA. Cryostat / HOB design constraints need to be considered. Update figure and text.	Configuration
226	SPIRE	§ 5.4.4	Astrium	HF	B		Position of SPIRE SVM units and SPIRE warm interconnect harness. Provide figure of position of SPIRE units on SVM and harness.	Configuration
228	SPIRE	§ 5.5	Alcatel	PR	B		DPU size to be confirmed and agreed.	Configuration
232	SPIRE	§ 5.6.1.1	Astrium	HF	B		The micro-vibration requirement during SPIRE operations (maximum permissible input acceleration input by Herschel to the FPU HOB is 10g peak ...). Further analysis required.	Microvibrations
233	SPIRE	§ 5.6.1.2	Alcatel	PhC	B		Clarify responsibility for A frames – TBC.	Configuration
234	SPIRE	§ 5.6.3	Alcatel	PhC	B		Units on SVM will have to comply with requirement in GDIR/IID-A for defining attachment points and number.	Configuration
235	SPIRE	§ 5.7.1	Alcatel	MC	B		ASED to check adequacy – TBC.	Thermal Control
237	SPIRE	§ 5.7.1.2	Alcatel	MC	B		ASED to check new requirement. In particular, specification of conductance requirement is rest understood – TBC.	Thermal Control
239	SPIRE	§ 5.7.3	Alcatel	MC	B		Instrument charges and impact on instruments accommodation, require to re-assess operating temperature requirements and temperature stability requirements from Instruments.	Thermal Control
242	SPIRE	§ 5.7.5	Astrium	HF	B		Temperature channels to be further analysed.	Thermistor
243	SPIRE	§ 5.7.5.2	Alcatel	MC	B		New shutter temperature sensors. Requirements of this table to be analysed and confirmed by ASEd.	Thermistor
244	SPIRE	§ 5.7.5.2	Astrium	HF	B		Shutter Temperature Sensors : The role of the shutter in the locked position during flight need to be clarified. Are the temperature sensors not required during the launch phase until the shutter is put in the locked position?	Thermistor
248	SPIRE	§ 5.9.1	Alcatel	BC	B		Helium flow rate assumption is not given. Acceptability of FPU power dissipation levels TBC, following system level analysis by ASEd / ESA.	Thermal Control
249	SPIRE	§ 5.9.1	Alcatel	HF	B		Figure in table reflect current status and at least L2 heat load estimate is not compliant with IID-A (33mW is the SPIRE baseline). Figures in table in Section 5.9.1 need to be updated according to Thermal Model at system level (currently updated by ESA) and the apportionment in the IID-A.	Power dissipation
250	SPIRE	§ 5.9.3	Alcatel	MC	B		Change in instruments dissipation to be assessed in conjunction with other instruments changes – see comment on § 5.7.3.	Power dissipation
253	SPIRE	§ 5.9.6.1	Alcatel	GL	B		Nominal BOL power requirement (95.3 W) leaves only 5% margin wrt total allocation of 100 W. This margin appears insufficient, as previous "with contingency" estimate was 103.2 W.	Margin
267	SPIRE	§ 5.10.2	Astrium	HF	B		New Grounding Concept need to be further analysed.	Electrical
270	SPIRE	§ 5.10.3	Astrium	HF	B		Bonding section new: to be further analysed.	Electrical
271	SPIRE	§ 5.10.4	Astrium	HF	B		Electrical Signal Interfaces (1553 data busses, master clock and launch confirmation) new. To be further analysed.	Electrical
274	SPIRE	§ 5.10.4.3	Alcatel	BH	B		This paragraph introduces several new requirements: The need for 6 discrete TM lines, these have not been identified previously ! Will power be required to maintain the launch lock ? If so via which LCL and power requirements have to be detailed. How will the launch lock be released ?	Electrical

1 A: New description / requirement (v1.1) considered unacceptable

B: New description / requirement requiring further analysis

C: Already known (IID1.1) still considered unacceptable

D: Already known (IID1.1) under analysis.

E: Comment or recommendation

Annex 5 : Industry Comments to SPIRE IID-B v. 2.0

Id	IID	Chapter	Company	Auth	Class ⁽¹⁾	Al ea dr	Unacceptability and/or comments	Theme
227	SPIRE	§ 5.5	Alcatel	PR	C		SVM Warm Units : The number of warm electronic boxes has increased wrt IIDB 1.0 : instead of 2 there are now 3 – the FSDRC has now been split into HSDCU + HSFCU (see § 5.1). Dimensions of the new warm unit to be confirmed. Growth of FSDPU to be assessed in conjunction with impacts due to FSFCU and FSDCU.	Configuration
229	SPIRE	§ 5.5	Alcatel	GL	C		Nominal mass properties leave only 6% margin wrt total allocation of 90 kg. Mass reduction exercise is needed.	Margin
251	SPIRE	§ 5.9.3	Alcatel	MC	C		The DRCU has been split into 2 separate units, i.e. FSFCU and FSDCU. : dissipation of each unit is thus required.	Configuration
254	SPIRE	§ 5.9.6.1	Alcatel	BH	C		The average "with-margin", and peak "with-margin" total power loads are also to be provided. Power requirements cannot be accepted until assumed margins are clearly stated.	Margin
255	SPIRE	§ 5.9.6.1	Alcatel	BH	C		The "average" and "peak" power values provided must be stated to correspond to "worst-case" conditions, i.e. taking into account the specified supply bus voltage range : 23V < V < 29V.	Power Demand
257	SPIRE	§ 5.9.6.3	Alcatel	BH	C		Description of the interface circuits to be provided, or at least a statement made to the effect that the power interfaces will be designed to be compatible with the LCLs provided by the system.	LCL
276	SPIRE	§ 5.11.3	Alcatel	BH, PC	C		The requested accuracy of the "start of scan" signal is 5 ms – TBC. This is not accepted, the likely acceptable value being closer to 100 ms (TBC). SPIRE shall provide a schematic showing all the electrical I/F with the spacecraft.	Electrical

240	SPIRE	§ 5.7.3	Alcatel	MC			Temperature stability of 3K/hour. Acceptability TBC ?	Temperature
241	SPIRE	§ 5.7.3	Alcatel	MC			Alu-chromed surface finish. Black paint is preferred (TBC).	Thermal Control
278	SPIRE	§ 5.12.	Alcatel	PR			Some details of the requested S/C performance, wrt various SPIRE pointing modes, are still TBC.	Pointing
279	SPIRE	§ 5.12.1	Alcatel	PR			The S/C will then adjust the pointing accordingly. TBC.	Pointing
280	SPIRE	§ 5.12.1	Alcatel	PR			The step size will be between 1.7 and Arcsec. Acceptability of this requirement is not confirmed. – TBC.	Pointing

- 1 A: New description / requirement (v1.1) considered unacceptable
- B: New description / requirement requiring further analysis
- C: Already known (IID1.1) still considered unacceptable
- D: Already known (IID1.1) under analysis.
- E: Comment or recommendation