HP-2-ASPI-1346

Annex 1

Herschel SPIRE IID-B updates

Annex to minutes SPIRE-AST-MOM-001244

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
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-xxxxxx Add RD7, Spire to Herschel Alignment Plan SPIRE-RAL-PRJ-00xxxx 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	Replace with reference 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				
5.3.1.1	Change tbd to "0.8 metre, see section 5.4.4" since actually achieved this				
5.3.2	Change (tbd) to 7				
5.4.1	Remove detailed drawing sheets and just put in the two HSFPU isometric views shown below. The detailed ones go in annex.				
5.4.4	Add an up-to-date drawing as below				
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	Update table as follows to IBDR based values:				

Project Code	Instrument Unit	Dimensions in mm^3	Nominal Mass	Allocated Mass
HSFPU	HS Focal Plane Unit	Non-rectangular, see section 5.4	45.5Kg	46.3Kg
HSJFP	HS JFET Rack-Photometer	262.5 x 101 x 114 TBC	3Kg	3.3Kg
HSJFS	HS JFET Rack-Spectrometer	101.5 x 91 x 104 TBC	1.2Kg	1.4Kg
	Total Mass for units on HOB		49.7Kg	**51Kg**
HSDPU	HS Digital Processing Unit	274 x 258 x 200 TBC	7Kg	7Kg
HSFCU	HS FPU Control Unit	330 x 330 x 380 TBC	14.28	15
HSDCU	HS Detector Control Unit	460 x 290 x 300 TBC	15.41	15.5
HSW1-8	HS Warm Inter-unit Harness	To suit.	1.5Kg	1.5Kg
	Total Mass for units on SVM		38.19Kg	**39Kg**
·	**Spire TOTAL MASS**			**90Kg**

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	Remove third paragraph which is just one part of the electrical grounding situation.				
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 CVV inner shield now has a thermal control insert plate with apertures that shall clear the viewing beams defined by Spire,				

<table>
<tr><td></td><td>taking into account worst case optical path to shield alignment"</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.8.1</td><td>Change (tbd) to 1.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.9.1</td><td>Remove table and the text that follows, which is a real mess.
Insert the following:
"Spire dissipates power inside the cryostat as follows:
<table>
<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>
<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>
<tr><td>SMEC</td><td>9.5</td><td>4.6ph/1.6sp</td><td></td><td></td></tr>
<tr><td>Photometer JFETS</td><td>42</td><td>42</td><td></td><td></td></tr>
<tr><td>Spectrometer JFETS</td><td>14.1</td><td>14.1</td><td></td><td></td></tr>
</table>
*Recycling is a special case, see section 5.9.
"Each item dissipates power per mode as in section 5.9.5."</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.9.3</td><td>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. The reduction in the HSDCU and resulting conditioning loss reduction in HSFCU when operating as a spectrometer is TBD"</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.9.6.1</td><td>Table is clearly not right in detail. No new data available. Add note?</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.9.6.2 / 3</td><td>Add HS before unit names</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.9.6.3</td><td>Add Herschel's before LCL on last line</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.10.1</td><td>Change Adxxx to AD5</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.10.1</td><td>Insert drawing of harness configuration from issue 0.9 as attached</td><td></td><td></td><td></td><td></td></tr>
<tr><td>5.10.1</td><td>Add harness specification summary tables from issue 0.9, not included explicitly here to keep document handleable</td><td></td><td></td><td></td><td></td></tr>
</table>

5.10.2	Flag problems at end of paragraph. We need to negotiate as text from issue 2.0 is apparently not acceptable to industry. At 13/2 Bruce stated that isolation should be put at best point, namely just inside FPU. MSSL have since said that this is unfeasible….which was just the reasoning behind the infamous ECR 11 in the first place! The problem is still open.				
5.10.4.2	Third paragraph. Change "units" to "HSDPUs".				
5.10.4.3	Change "to HERSCHEL….." to "skin mounted CVV connectors to confirm this, see connectors JA-JD on figure 5.2.1" Replace third paragraph with, "During launch preparations, hand-held Spire provided EGSE will require cable access to these connectors via the hatch used to top up the cryostat. Herschel shall provide skin connector blanking plugs for flight that connect pins as defined by Spire". Delete last paragraph.				
5..11.1.1	Delete all section contents. Either refer to SPIRE Budgets' document or insert table given below.				

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

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Maximum Data Rate for Non-Chopping Observatory Functions:

POF5

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Maximum Data Rate for Scanning Observatory Functions:

SOF1, SOF2

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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	

[illegible]	[illegible]	[illegible]
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
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Maximum Data Rate for Step-and-Look Observatory Functions:

SOF3, SOF4

[illegible]	[illegible]	[illegible]
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	

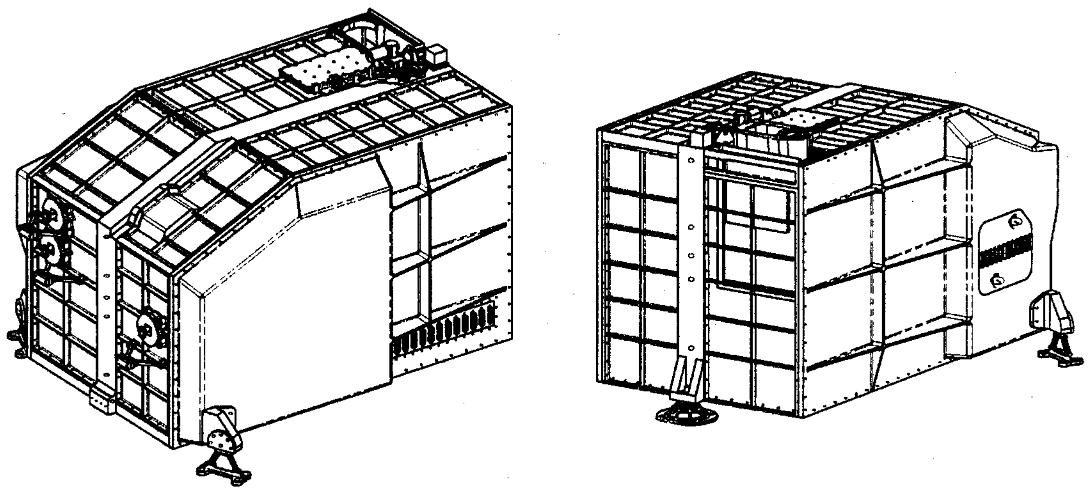
[illegible]	[illegible]	[illegible]
Number of data channels	10	Chop
Bits per channel	16	bits
Frame size	160	bits
Frames per packet	32	
Packet size	5344	bits
Sampling rate	64	frames/sec
Packets per sec	2	

[illegible]	[illegible]	[illegible]
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	

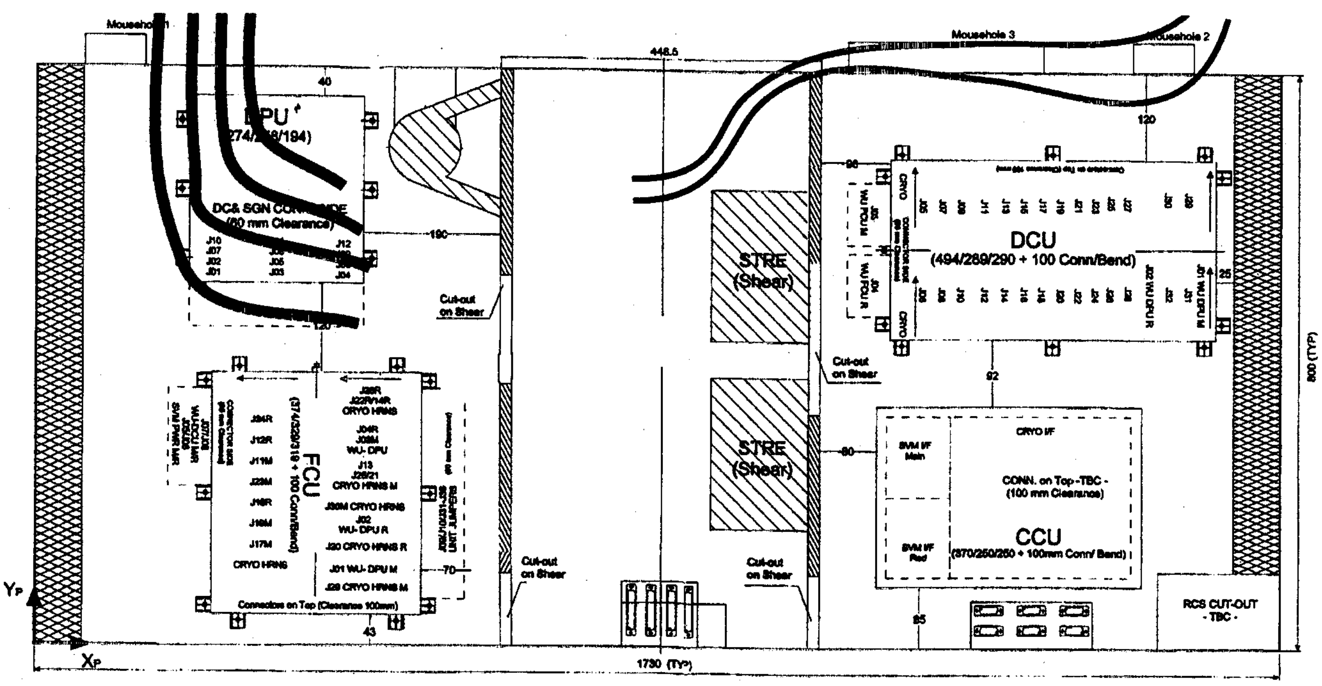
[illegible]	[illegible]	[illegible]
Number of data channels	8	TBC
Bits per channel	16	bits
Frame size	128	bits
Frames per packet	8	
Packet size	1248	bits
Sampling rate	4	frames/sec
Packets per sec	0.5	

[illegible]	[illegible]	[illegible]
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
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]



HSFPU Isometric Views



Preliminary Drawing showing Cyrharness bundles leaving in three bundles as per Spire Block Diagram

Herschel SPIRE IID-B updates

Based on previously known I/F, 13-02-02 CCB, more recent updates, and SVM accomm. meeting. G. Lund

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.

Herschel SPIRE IID-B updates

Version	*DRAFT*
Date of issue	
Prepared by	
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. Please attach annex.

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)

....

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 subtlely 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)

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)

....

Modified text (for inclusion in IIDB 2.1)

Spire's only optical interface is that toleranced 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° 6.

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

Original text (from IIDB 2.0)

....

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.

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)

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**

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 ± **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 ± **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 : • **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.

Needs to be clarified with BH. - Accuracy vs resolution.

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	Dimensions (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 [redacted]	51.3 [redacted]
FSJFP	HS JFET Rack Photometer	270.5 x 104 x 114 TBC 6 JFET Assembly – KE2896 – 30/11/01 – TBC (*)	3.0 [redacted]	3.3 [redacted]
FSJFS	HS JFET Rack Spectrometer	108.5 x 91 x 104 TBC 2 JFET Assembly – KE2897 – 30/11/01 – TBC (*)	1.2 [redacted]	1.4 [redacted]
		Total OB Units	49.7 [redacted]	**56.0** [redacted]
FSFCU	HS Digital Processing Unit	374 X 409² X 330 SPIR-MX-5200 000 A – 12/01/02 (*)	15.0 [redacted]	12.0 [redacted]
FSDCU	HS Detector Control Unit	494 X 289 X 305 SPIR-MX-5100 000 A – 11/01/02 (*)	15.5 [redacted]	13.0 [redacted]
FSDPU	HS Digital Processing Unit	274 X 258 X 194 HER S003/02 – 10/02/02 (*) New update received, dated 05/04/0[redacted]	6.6 [redacted]	7.0 [redacted]
FSW1-8	HS Warm Inter-unit Harness		2.0 [redacted]	2.0 [redacted]
		Total SVM Units	39.1 [redacted]	**34.0** [redacted]
		Total	88.8 [redacted]	**90.0** [redacted]

This data goes into the I/F drawing ICDs at end of doc. (Annexed). Some of the drawings to be updated following MN-1238.

Add values nom + margin, w % margin needed.

[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.

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)

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)

Modified text (for inclusion in IIDB 2.1)

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

Reference TBC - updated in April.

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**

pb of a clash between SPIRE + PACS envelopes.

being addressed by thermal [illegible].

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)

Modified text (for inclusion in IIDB 2.1)

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

Reference TBC – updated in April.

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)

Modified text (for inclusion in IIDB 2.1)

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

Specific comments : TBC. Drawings to be updated. — + refs. / Mon. 22/04 at latest.

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)

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)

Modified text (for inclusion in IIDB 2.1) 0.3 Hz

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.

Spire needs knowledge of the level of the micro-vibration induced forces on the HSFPU 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.

(between 30Hz and 300 Hz)

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.

→ To be learned

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 ^{3}He Cooler

Operation of the Spire ^{3}He 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 ^{3}He 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 $T_{bath}+\Delta T$ (as small as possible), leading to a good condensation efficiency and less ^{3}He 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 ^{3}He 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
	qlkjqslkgjhqsg

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 ≤ 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 << 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 Cp = 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	*This version (17/11/01) does not represent the current status. ASED harness to be included in update, as far as applicable.*

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 cryo-harness meeting with SPIRE on 18-19/04/02.
G. Lund	The provision of an overharness, inside the cryostat, was not 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	**§ 5.7.1.1**

Original text (from IIDB 2.0)

Note that this isolation is within the strap system, that is a Herschel not a SPIRE element, would seemingly be common to all straps, and of the proven qualified ISO design. It should not form part of the instrument I/F itself.

Modified text (for inclusion in IIDB 2.1)

Note that the ohmic isolation will be an integral part of the thermal strap system, and will be provided by Spire as part of its FPU.

Specific comments :

Originator	**Comment**

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	**§ 5.4.4**

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° 27.

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 ? Not required.

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	**§ 5.10.3**

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° 29.

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° 270) 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**

Needs discussion

SPIRE IIDB 2.0 Change item n° 30.

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 be 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° 31.

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**

Annex 3

Rutherford Appleton Laboratory	DOCUMENT / ENGINEERING CHANGE REQUEST (ECR)	PRODUCT ASSURANCE Space Science and Technology Department

DCR / ECR Number: HR-SP-RAL-ECR-009-v5

Spacecraft / Project	Herschel-Planck	Originator's Name	JD
System / Experiment / Model	SPIRE	Signature	*John Delderfield.*
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

Affected Items / Workpackage: (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.

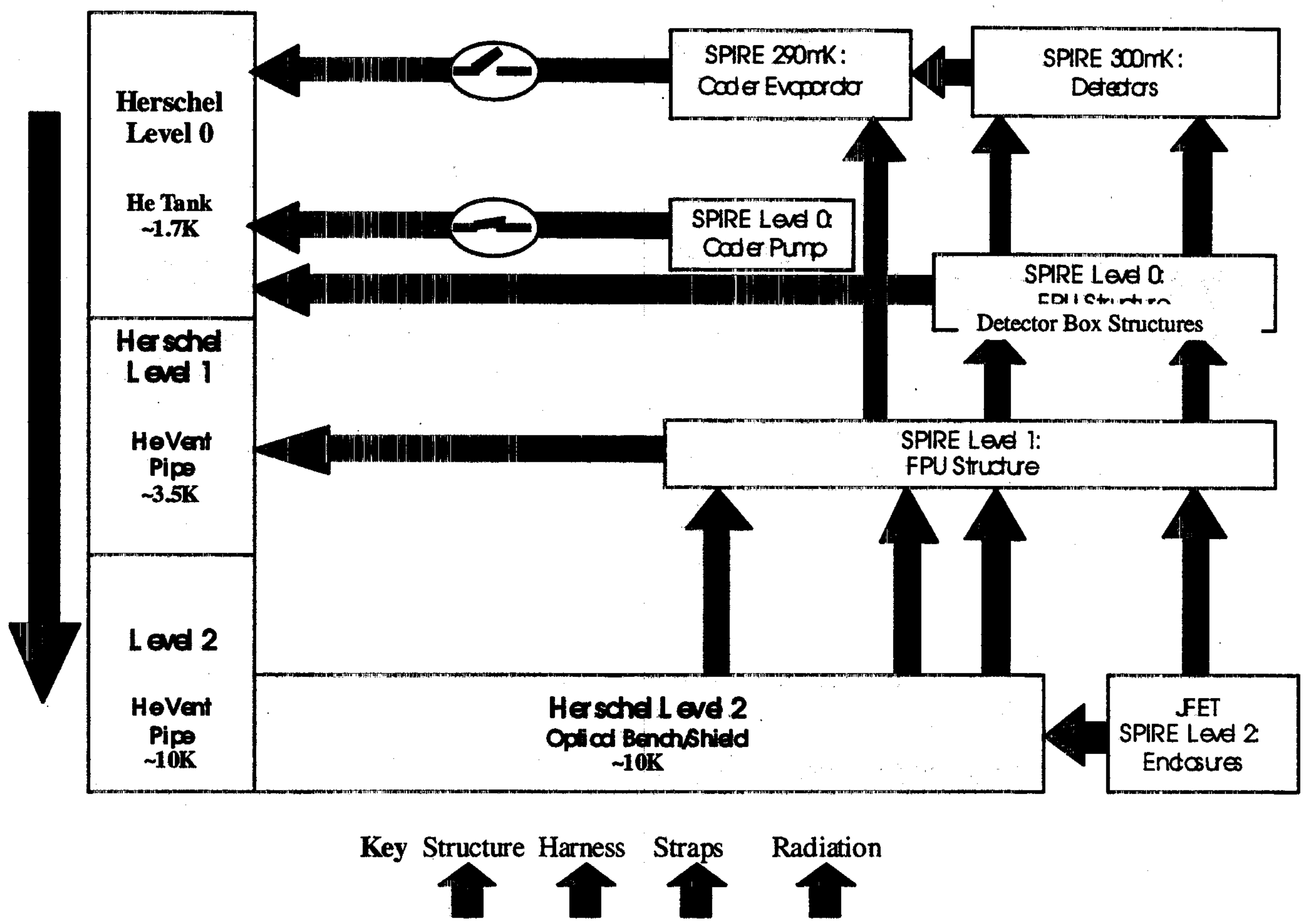
Two major thermal requirements for SPIRE are its sorption cooler cycle time of 48h min., and its cold tip temperature < 290mK.

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):

Herschel level	***Max K***	***Etc...***	
L0	***2***		
L1	***6***		
L2	***15***		

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

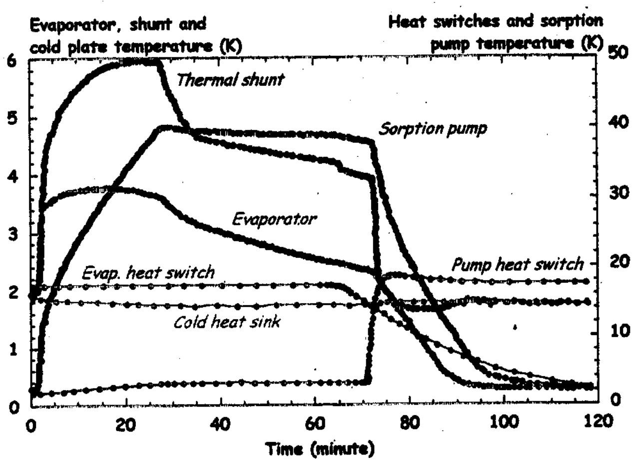
The **Spire** ^{3}He cooler has three operating phases: condensation; cooldown; low temperature. The combination of the first two is called re-cycling or re-generation.

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 ^{3}He condenses back into the cooler's evaporator. A temperature of the evaporator during this phase maximises the recycling efficiency (i.e. ratio of Liquid ^{3}He to condensed ^{3}He), 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.

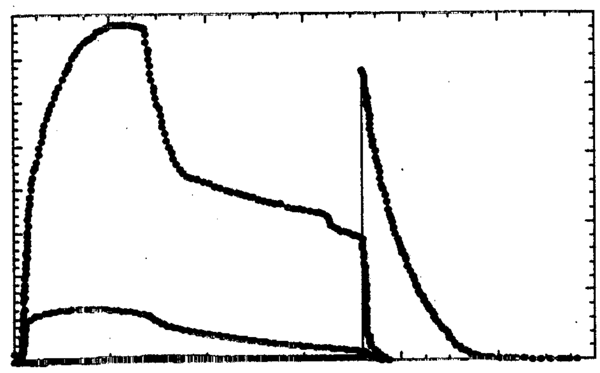
At the end of the condensation phase of the cooler's regeneration, the heat switch on the sorption pump is turned ON and the switch on the evaporator is turned OFF. There is a substantial (~450mW) peak power from the sorption pump to the cryostat as it is re-cooled. The design of HPLM Helium II cryostat 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}+DeltaT (as small as possible), leading to a good condensation efficiency and less ^{3}He 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:



Temperatures(not at I/F)



Heatflows

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**

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.

DCR / ECR Number:	HR-SP-RAL-ECR-009- v5

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	

Annex 4.

Withdrawn

ASTRIUM Comments to SPIRE IIDB 2.0

~~Alcatel comments to Sorption Cooler ICDI v draft 3.3 (PL-LFI-PST-ID-002 31/07/2001)~~

written october 2001

HP-2-ASPI-1396

Annex 5

Id	IID	Chapter	Company	Auth	Class [1]	~~Already known~~	Unacceptability and/or comments
236	SPIRE	§ 5.7.1.1	Astrium	AH	A	Covered by ECR#9 Version 4	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".
238	SPIRE	§ 5.7.1.2 p.	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.
X 291	SPIRE	§ §10.7.2	Astrium	HF	A		Delivery dates are not compliant with Astrium need dates.

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

Astrium comments to 2.0

Id	IID	Chapter	Company	Auth	Class [1]	Already known	Unacceptability and/or comments
225	SPIRE	§ 5.4.2 and 5	Astrium	HF	B	Covered by ASPI list	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.
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.
232	SPIRE	§ 5.6.1.1	Astrium	HF	B	Covered by ASPI list	The micro-vibration requirement during SPIRE operations (maximum permissible input acceleration input by Herschel to the FPU HOB is 10□g peak ...). Further analysis required.
242	SPIRE	§ 5.7.5	Astrium	HF	B	/	Temperature channels to be further analysed.
244	SPIRE	§ 5.7.5.2	Astrium	HF	B	Covered by ASPI list	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?
X 267	SPIRE	§ 5.10.2	Astrium	HF	B	open	New Grounding Concept need to be further analysed.
270	SPIRE	§ 5.10.3	Astrium	HF	B	/	Bonding section new: to be further analysed.
271	SPIRE	§ 5.10.4	Astrium	HF	B	/	Electrical Signal Interfaces (1553 data busses, master clock and launch confirmation) new. To be further analysed.

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

Astrium comments to 2.0

	Id	IID	Chapter	Company	Auth	Class [1]	Already known	Unacceptability and/or comments
	220	SPIRE	§ 5.3	Astrium	HF	E	covered	Figure 5.3-1 and Figure 5.3-2, page 5-3 : Text and figures out of date. Update top view and side view figures of Optical bench instrument accommodation.
	222	SPIRE	§ 5.3.1.1	Astrium	HF	E	covered	page 5-4 : Text not consistent with current baseline. Update text to add more information about harness to SVM. Specify tbd value.
x	223	SPIRE	§ 5.3.2	Astrium	HF	E	open	third paragraph: Mechanical process of mounting and aligning SPIRE on the HOB is described in AD, but TBD. Clarify alignment requirements. Update 3rd paragraph accordingly
x	246	SPIRE	§ 5.8	Astrium	HF	E	open	Optical Interfaces : Figures based on old information. Replace out-of-date figures
x	247	SPIRE	§ 5.8.1	Astrium	HF	E	open	Reference to straylight model missing. Add reference to straylight model.
	261	SPIRE	§ 5.10.1	Astrium	SI	E	covered by Harness IF tests	Detailed pin allocation list is missing. To be provided (minimum information is per source connector: designation, location, function, type, backshell type, and per source pin: number, signal designation, signal parameters (e. g. max. current, duty cycle), wiring or requirements on wiring (e. g. max. resistance), grouping (shield, cable, twist), designation and location of target connector, number of target pin).
	262	SPIRE	§ 5.10.1	Astrium	SI	E		For all units (DCU, FCU, HSJFP, HSFPU and HSJFS) the connector pin allocation lists are missing (see also fax HP-ASED-0092/01, dated 12/09/2001)
	263	SPIRE	§ 5.10.1, pag	Astrium	SI	E		C10 to C13 : assignment of units and connectors not correct (e.g. for C10 the related unit is HSFPU not HSFCU).
	264	SPIRE	§ 5.10.1, pag	Astrium	SI	E		For harness branches I10 to I 13 the connectors for the units are not defined
	265	SPIRE	§ 5.10.1, pag	Astrium	SI	E		Internal harness:: I10 to I 13 the assignment of the units and connectors is not correct (e.g. for I10 the related unit is HSFCU not HSFPU)
	281	SPIRE	§ 5.14	Astrium	CK	E	covered	Frequency Plan not provided. Please provide.
	283	SPIRE	§ 5.16.1	Astrium	TB/CS	E	/	page 5-40: Are there CQM models for the JFETs too? Please clarify.
x	285	SPIRE	§ 6.2	Astrium	TB/CS	E	open	page 6-1: Thus all test sequences will run already on instrument level on a similar EGSE as on module and system level, it is not clear, why the test procedures, including command sequences, will be delivered only in flow diagrams and descriptions and not as a sequence.
x	286	SPIRE	§ 7.1.1	Astrium	ES	E	open	"..Electrical and RF-shield connections (TBD) will be made between the boxes after mechanical integration with the Herschel optical bench. ..." --> please clarify TBD
x	287	SPIRE	§ 7.2.1	Astrium	TB/CS	E	open	page 7-1: There is no thermal balance test with the EQM foreseen, but a test under realistic cryogenic conditions. I assume that this is meant and not a test in a TV chamber.

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

Astrium comments to 2.0

	Id	IID	Chapter	Company	Auth	Class [1]	Already known	Unacceptability and/or comments
K	288	SPIRE	§ 7.2.1	Astrium	TB/CS/ES	E	open	page 7-2: Tilting of 90° around +z-axis or -z-axis required for verification of the FTS mechanism or equal? The same question refers also to the cooler recyling. Operation and timing open.
K	289	SPIRE	§ 7.2.1	Astrium	TB/CS	E	open	page 7-3: Is it possible to modify the sequence of the steps in order to optimize the cryostat operations w.r.t. the filling level of the tank. E.g. it could be useful to shift the functional tests with the FTS mechanism verification to the end of the test phase.
K	290	SPIRE	§ 7.2.1	Astrium	ES	E	open	"...EMC test of conducted susceptibility only. ..." -->please clarify is this required, accepted, only allowed ?
	381	SPIRE	General	Astrium	GP	E	✓	Change Project Code to Herschel
	382	SPIRE	§ 5.10	Astrium	GP	E	}	Provide readable Drawing for Fig 5.2.1 Provide Drawings from all Boxes showing the connectors with naming (eg Jxx) (Connector Locations) Provide Connector Function List (e.g. HSDPU J01 = Nom Pwr In etc) Provide Connector Type lists (HPDPU J01 = DDMA 50S NMBetc) Provide Electrical Interface Informations (Input Circuits, Output Circuits , Thermistors etc) if not in Harness Definition
	383	SPIRE	§ 9	Astrium	GP	E	✓	Provide more Details about all Verification and Testing

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

ALCATEL COMMENTS TO SPIRE IIDB 2.0

Alcatel comments to Sorption Cooler ICDI v draft 3.3 (PL-LFI-PST-ID-002 31/07/2001)

Written October 2001

Id	IID	Chapter	Company	Auth	Class [1]	Assoc CR ?	Unacceptability and/or comments	Theme	Impact	Time needed for complete evaluation	
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	- Use soft mounting	3 months	closed
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	Full impact can only	1 month after requiremen	closed
258	SPIRE	§ 5.9.5.3	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	This is only consider	1 month after requiremen	

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

Alcatel comment to 2.0

Id	IID	Chapter	Company	Auth	Class	Assoc. CR	Unacceptability and/or comments	Theme
228	SPIRE	§ 5.5	Alcatel	PR	B		DPU size to be confirmed and agreed.	Configuration closed
233	SPIRE	§ 5.6.1.2	Alcatel	PhC	B		Clarify responsibility for A frames – TBC.	Configuration closed
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 closed
235	SPIRE	§ 5.7.1	Alcatel	MC	B		ASED to check adequacy – TBC.	Thermal Control closed
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 OK
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
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 closed
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 closed
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
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

Alcatel comments to 2.0

Id	IID	Chapter	Company	Auth	Class (1)	Assoc. CR ?	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** close
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** OK
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** close
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** OK
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** OK
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** OK
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**

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

~~Alcatel comments to Sorption Cooler ICDI v draft 3.3 (PL-LFI-PST-ID-002 31/07/2001)~~

Alcatel comments to 2.0

Id	IID	Chapter	Company	Auth	Class [1]	Assoc. CR ? ...	Unacceptability and/or comments	Theme
240	SPIRE	§ 5.7.3	Alcatel	MC	D		~~Temperature stability of 3K/hour~~. Acceptability TBC ?	Temperature
241	SPIRE	§ 5.7.3	Alcatel	MC	D		Alu-chromed surface finish. Black paint is preferred (TBC).	Thermal Control ok
278	SPIRE	§ 5.12.	Alcatel	PR	D		Some details of the requested S/C performance, wrt various SPIRE pointing modes, are still TBC.	Pointing closed
279	SPIRE	§ 5.12.1	Alcatel	PR	D		The S/C will then adjust the pointing accordingly. TBC.	Pointing
280	SPIRE	§ 5.12.1	Alcatel	PR	D		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

Annex 6

SPIRE	Technical Note SPIRE Requirements on Spacecraft Information	Ref: SPIRE-RAL-NOT-001152 Issue: 1.0 Date: 14th February 2002

1. INTRODUCTION

Science data produced by the SPIRE instrument is only of use if the Herschel telescope is operating in a stable configuration (i.e. either fixed pointing or scanning at a constant velocity). In order to identify these times at which the science data is valid SPIRE has requested that information is available from the spacecraft on the current telescope status. This information takes the form of an On Target Flag (for pointing observations), a Telescope Scan Flag (for scanning observations) and (TBC) a Peak Up Flag.

This note describes a possible implementation of these flags using the Information Telecommand Service of the CDMS (see the Herschel/Planck Packet Structure ICD, SCI-PT-ICD-7527) to pass the information from Spacecraft to instrument.

Note: Currently the SPIRE instrument OBS does not take any action based on this information (i.e. it does not wait for the flag before taking data, as this would lead to an indeterminate length of time for a command to be executed). The information is used solely in the ground processing software. For this reason it is not a requirement that the information is passed to the instrument, provided that it is available in the spacecraft telemetry, in an easily extracted form, and that this is available to the processing software. We believe that it will be more convenient if the information appears in the SPIRE telemetry stream and describe its implementation below.

2. ON TARGET FLAG

When pointing, it is required that we know when the telescope pointing is sufficiently close to the commanded position that it will have no affect on the science data. We expect that the maximum difference between the actual pointing position and the commanded position for which the telescope will be deemed to be 'on target' will be commandable from the ground. We suggest that following a movement of the telescope an Information Telecommand (Service 20,4) is sent to the instrument by the CDMU when the current pointing is confirmed to be within this maximum distance (and also when the current pointing is outside this).

The information required is an indication of the type of event (on target, off target), the on-board time that this occurred and the commanded maximum error distance.

The table below indicates the expected structure of the telecommands.

0 0 0 1 1	APID1
1 1 0 0 0	Count
Length = 13	
0 0 0 0 0 0 0 1 0 0 0 1 0 1 0 0	
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	
INFOTYPE	
OTFTIME	
OTFERROR	
Checksum	

Parameter

Name	Comment
INFOTYPE	Type of information 0 = Off Target 1 = On Target
OTFTIME	On Board Time of Report
OTFERROR	OTF flag is set if pointing is within this value