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<b>MINUTES OF MEETING</b>		PLACE : RAL / Chilton - UK	

PURPOSE :	CLASSIFICATION :
<b>SPIRE - Interface Meeting</b>	

PARTICIPANTS	FIRM	SIGNATURE	PARTICIPANTS	FIRM	SIGNATURE
G. Lund	Alcatel		J. Delderfield	RAL	
B. Collaudin	Alcatel		A.S. Goizel	RAL	
G. Doubrovik	Alcatel		E. Clark	RAL	
H. Faas	Astrium		M. Griffin	Cardiff University	
A. Frey	Astrium		B. Winter	MSSL	
E. Sawyer	RAL		A. Heske	ESA	
K. King	RAL		J. Rautakoski	ESA	
B. Swinyard	RAL		F. Mariani	ESA	
Written by : G. Lund.					

CONCLUSIONS :

DISTRIBUTION : PARTICIPANTS	FOR FURTHER ACTION
	FOR INFORMATION      M. Cornut, Ph. Clavel, B. Hibberd, B. Collaudin, J.J. Juillet - ASPI

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**Agenda :**

See **Annex 1**

**Meeting**

**Tuesday 26/11**

**AI status**

from MN-1725 (22/07/02)

AI-3 Closed

AI-4 Open

AI-7 Closed -

AI-8 Open - will be reviewed today.

AI-9 Remained open, as Astrium has re-evaluated harness routing etc>., because of removal of 3<sup>rd</sup> ring of feed-through connectors on CVV.

**Summary of MN-1725 AIs**

n° 3 : Drawings with correct ref. n°s & dates, thermal capacity is still to be supplied.

n° 4 : Drawings with unambiguous dates still requested.

n° 7 : Request to be forwarded to harness provider (CEA).

n° 8 : Covered by new Instrument TMM, to be delivered 15/11/02 (see also AI-2 of present meeting).

n° 9 : Routing may also change due to cryoharness optimisation exercise. Astrium to include details of harness connectors at level of SVM upper closure panel. Due date now updated to 25/11/02.

From MN-2036 (08/10/02)

AI-1 closed

AI-2 imminent

AI-3 closed / ongoing exchange of models betw. Astrium / SPIRE.

AI-4 closed / lifetime reduction ~ 20 days. SPIRE comments that the more significant impact would be lower stability of FPU temperatures.

AI-5 fax has been sent to ESA. Astrium is now investigating the impacts in terms of lifetime.

AI-6 Email has been sent by ASPI confirming that ranges of reaction wheels can NOT be avoided, with present design.

AI-7 Closed

AI-8 Closed (Issue 2.3 sent by GL on 22/11/02)

AI-9 Closed : informal indication by ASPI that 345 mm could be accommodated. In any case, TBC by formal CR from SPIRE.



**Summary of MN-2036 AIs**

n°1: Deliver to Astrium an intermediate (steady-state only) updated model (informal version).


n°2 : Deliver to Astrium an updated TMM of SPIRE instrument, including timeline behaviour.

n°3 : Provide updated performance analysis (1 page) resulting from updated SPIRE TMM.

n°4 : Check the mission lifetime consequences of recycling the SPIRE cooler every 24 hrs, rather than once every 48 hrs.

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- n°5 : Make formal request to ESA, for an overshield to be reconsidered as a design requirement for the cryoharness.
- n°6 : Check whether ranges of reaction wheel frequencies can be avoided.
- n°7 : Forward PA requirements wrt PADs to co-investigators
- n°8 : Alcatel to prepare red-lined update of SPIRE IIDB 2.3
- n°9 : Alenia to check on height restrictions / availability for FCU (current height without connector backshells is 336 mm).

**Status Report (BS) – See  Annex 2.**

DRCU – schedule pbs. – Power supply delayed ... impacts in terms of CQM model functional representativity.

New sub-co appointed for Structure (previous one in receivership) => delays ...

Delays in delivery of optical components (mirrors in particular)

Detectors – pbs with testing / slippage of Kevlar suspension at cold vibrations.

**ECR Status (EC)**

Current ECRs on IIDBs : n° 9, 29, 30, 32, 33, 39, 40, 41

RFWs : 3 current :

2 on DRCU (11-12-01)

1 on JFETS (4-7-02)

SPIRE will send to ESA a request for PDF documents with electronic signatures to be formally acceptable as a means of submitting formal requests (eg. RFWs).

**TMM – presentation / A.Sophie Goizel – See  Annex 3.**

L3 updates from Astrium have been patched into Cryostat reduced model.

Cooler Hold-time has been implemented as a function.

Current SPIRE assumptions : 100 mW/K total conductivity for Evaporator strap, 50 mW/K for Pump strap.

According to Astrium: L0 IF "domes" now under responsibility of Air Liquide ... ultimate design, incl. conductivity (probably < ~ 150 mW/K for evaporator strap) remains TBD.

Alcatel proposes separating thermal conductivity of L0 straps into Astrium / SPIRE requirements. Exact numbers will have to be agreed later, following the Air-Liquide PDR (Feb. 2003).

BC recommends using "resistivity ratio" to define the conductivity of the high purity domes.

3 New Cases presented, and compared with previous "baseline". With 0.5 mm Kevlar cords in Cooler, the hold-time reaches ~ 36 hrs.



SMEC dissipation varies from 0.9 mW to ~ 3.2 mW, between low-res. (small amplitude) and hi-res (max. amplitude) spectrometer modes.

SPIRE expect to be ready with updated instrument TMM by ~ 10 December: - then to be forwarded to Astrium (normal work).

Astrium will deliver a full updated system TMM in ~ Jan. 03. Corresponding reduced model ~ 8 wks later.

**Updating of ECR n° 9 : should await**

- updated system TMM, including confirmed characteristics of the L0 domes, and revised dissipations for L2 and L3.
- Revised (where applicable) internal design of SPIRE instrument.

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Alcatel proposes there be an initial exchange be made (between SPIRE & industry) of a draft re-issue of ECR-009, until an agreed version is found, which can then be included into the IIDB.

Temperature sensor positions and fixation to FPU : ongoing work at Astrium.

Thermal testing of SPIRE / FTS :

This requires the S/C to be tilted horizontally. SPIRE's initial comment is that ~ 3 hours could be sufficient for an FTS-specific test campaign. Industry believes the nominal He flow rate could be sufficient to maintain correct FPU temperatures for such a short duration.

SPIRE say that the most important test they need to perform is that of transient response in flight.

**AI-1** : Astrium to check expected thermal conditions for SPIRE, when the S/C is aligned horizontally outside thermal vacuum.

**Vibration levels (random)** – update from B. Winter

MSSL model has been updated for random vibration levels at instrument IF down to 0.0125 g<sup>2</sup>/Hz (+ 3-sigma notching of 1<sup>st</sup> resonance eigenfrequency) : initial results show the instrument can survive very well at this level.

However Alcatel points out that such reductions are not yet agreed by industry, in view of previous experience with ISO, and pending outcome of vibro-acoustic analysis of the Herschel S/C.

**Schedule**

Updated schedule presented by E. Sawyer.

Delays in supply of structure (~ 2 mo), leading to CQM delivery in Feb. 04. Recovery actions would involve reduction in STM cold vibration testing, with resultant implications in terms of risk.

AVM models could still be delivered on time, albeit with some shortcomings in terms of software.

FM schedule : no impact in principle, providing manpower limitations are not a driver.

**Mechanical IF issues**

Astrum have now received FPU step file from SPIRE, although JFET representation is missing.

IF torques at L1 : have been provided on drawings.



AI-1 of HP-ASED-MN-182 : closed by delivery of Issue 17 of Step Model.

AI-7 of HP-ASED-MN-182 : closed by delivery of Issue 17 of Step Model.

Contrary to requirements, present design of already constructed MGSE does not allow SPIRE to be integrated after PACS. Astrium fax Ref. 727 has tabled the requirements, which have been noted by SPIRE, but which they are not in a position to address before January 03.

Discussion of simultaneous integration of the FPU with the JFET racks : various open remain open for the time being, but remain 'normal work'.

**AI-2** : SPIRE to respond to set of questions sent out by Astrium in preparation for the (originally planned - 04/12/02) AIT meeting – see attached **Annex 4**.

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### IIDB Updates

Issue 2.3 - Draft-1 has been sent by GL to SPIRE / Astrium on 22/11/02.

SPIRE is in good agreement with this version, but has various comments.

Last 2 columns of first table on p. 5-23 can be removed.

Annex 1 needs to be included (Alcatel to check updated ICD IP from ECR 0040).

ECR-0009 needs updating, before it can be finalised. In particular, the L1 temperature has yet to be refined.

Fixation of the JFETs onto the HOB need to be updated in the IIDB :- this is covered by ECR-0040.

Once an agreed version is reached, the relevant ECRs (where applicable) are to be closed out.

**AI-3** : SPIRE to send set of comments / details for final update of issue 2.3. This should include :

- § 5.16 - a more detailed hardware matrix, as per Excel spread-sheet already provided by Alcatel.
- § 9 - provide input wrt testing & verification, including details relevant to microvibration testing.
- § 5 - details of all points of electrical isolation on SPIRE FPU & JFETs.
- § 2 - Respond to proposed change in identification of Applicable and Reference documents. - Note that ESA PA advises that AD-8 should not refer to PSS-05-02, and that AD-9 should be completely removed. TBC by K King.

### IIDA Updates

Review of proposed updates to the IIDA 3.0, according to **Annex 5**.

**AI-4** SPIRE to provide any comments to proposed updates to the IIDA 3.0 (PDR version) to Alcatel.

### Cryo-cover Splinter

SPIRE are basically happy with the design proposed by Astrium, involving toroidal mirrors which enable PACS & SPIRE to see themselves, reflected by an temperature-adjustable mirror with emissivity equivalent to a single Herschel telescope reflector. SPIRE would also be agreeable to such a system being implemented in the EQM.

Presently, no estimate is available for expected standing wave effects likely to be encountered by HIFI. This has to be investigated further.

**AI-5** : Astrium to update analysis of FP unit scattering, and deliver updated model back to SPIRE.

### Telemetry



Bus list has been sent (by BH) to SPIRE for comment. SPIRE may request the use of one additional sub-frame - i.e. to increase the total n° from 24 to 25. They will first contact BH to query the feasibility of such a change, before issuing a corresponding ECR.

Packet Structure ICD - new version has been given to SPIRE for comment. Some changes are not compatible with SPIRE's OBSW : - ESA first needs to receive all instrument comments, before re-issuing a formalised version. KK will send his comments to ESA (S. Thürey).

### Flight Harness - MTD

MTDs - need to be mechanically and thermally representative. Astrium will need various design details for procurement of these by ~ April 2003.

Astrium to propose design for fixation of the harness MTDs to the FPU dummies.

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### AIV / CQM

Clarifications from SPIRE on open points in HP-2-ASED-PL-0021 (Instrument Testing on PLM EQM levels) : SPIRE propose to respond to these according to priorities, to be defined by Astrium. Major areas are MGSE & EGSE, and comments to these will be provided by ~ end 02.

EGSE : SPIRE will provide test sequences/procedures to industry, as they would use them. This is however incompatible with CCS (Central Checkout System) definitions, defined in above-referenced document. This situation is unsatisfactory from SPIRE's point of view, and is likely to impose additional costs on them. At a minimum, this is likely to lead to the need for some sort of 'interpreter' and corresponding interface ICD.

SPIRE list of deliverables / corresponding table will be updated by BS, for introduction into the IIDB.

AIT meeting foreseen for 04/12 : this is postponed, date TBD, but SPIRE proposed to separate this into several components : main areas needing attention are considered to be EGSE, testing, & integration. Approach to this needs further clarification from industry..

AVM (DPU) may be delivered without any OBSW (reason - lack of availability of suitable EPROMs). The software can be loaded using SPIRE EGSE. SPIRE are not sure that this can be done via the CCS, at system level. This problem is also likely to apply (in principle) to ALL Herschel instruments.

SPIRE would also need to receive further updates on satellite AIT schedule. This is not likely to be ready before ~ end of the year.

### CQM

Astrium indicate there is a small delay (< 2 mo) in OBA delivery.



Astrium confirm that the CQM (ISO) cryostat will have a 'cold plate' which will be different to the cryo-cover plate design (discussed on 26/11 in a splinter) used with the FM.

### Electrical / EMC

*(Arrival of F. Mariani)*

Alcatel / Astrium indicate they have received SPIRE's ECR-0039 (Grounding Scheme update). This is currently under analysis at Astrium. First comments are that the introduction of an overharness will impact the following : Herschel lifetime, thermal behaviour of SPIRE instrument itself, mass and cost (possible delays with cryoharness procurement TBD). Astrium points out that the ultimate thermal impacts (and electrical performance) of such an overshield would depend quite strongly on the shield specification, which is currently not given in the ECR. Parameters of importance would include type of braid, % optical coverage, choice of material ... . Additional testing requirements have not been defined. Some iterations are needed between Astrium & SPIRE to agree on % optical coverage / traded against thermal conductivity & manufacturing difficulty - to be carried out over the coming week.

SPIRE is asked to provide appropriate modelling to justify their request for such an overharness. However, SPIRE points out that V. Hristov (JPL - Bolometer specialist) - would have very little faith in the reliability of any model at high frequencies (> ~ 5 MHz). In particular they are concerned about EMC being conducted into the CVV through all instrument and S/C harnesses. Such perturbations should be compatible with SPIRE's (instrument-level) noise specification of  $7nV/\sqrt{Hz}$  at ~ 2.5M $\Omega$  and 300mK.

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F. Mariani also points out that the effectiveness of overshielding can depend strongly on the way it is brought into the connectors. In the case of SPIRE, the proposed feed-through pin-connections may not be effective in the case of some of the SPIRE harnesses. In any case, if such an overshield were provided, its transfer impedance characteristics would need to be measured.

ESA (F. Mariani) and CEA (D. Schmitt) have looked into the possibility of refurbishing the PACS grounding/EMC model to represent the SPIRE configuration. F. Mariani is prepared to devote some time to assisting SPIRE with this activity. The model would however need to be updated / refined by SPIRE to ensure sufficient representativity of this model, and assumption of responsibility on their part. It is not yet clear whether this model could take into account the above-mentioned shielding efficiencies of the connectors.

**AOB**

Next SPIRE IF meetings :

- 27 & 28 February 2003
- 28 & 29 April 2003

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<b>ACTION ITEMS from main Meeting</b>			
N°	Description	Responsible	Due
1	Check expected thermal conditions for SPIRE, when the S/C is aligned horizontally outside thermal vacuum.	Astrium	
2	Respond to set of questions sent out by Astrium in preparation for the (originally planned - 04/12/02) AIT meeting	SPIRE	06-12-02
3	Send set of comments / details for final update of issue 2.3, according to details in minutes.	SPIRE	06-12-02
4	Identify / supply any comments to proposed updates to the IIDA 3.0.	SPIRE	15-12-02
5	Update analysis of FP unit scattering, and deliver updated model back to SPIRE.	Astrium	06-12-02