ALCATEL SPACE

HERSCHEL/PLANCK

REF. : H-P-ASP-MN-4307

SPIRE Progress & Interface

DATE : 10/02/04 | PAGE : 1/14

COMPTE RENDU DE REUNION / *MINUTES OF MEETING*

LIEU / *PLACE* : RAL Chilton

OBJET / *PURPOSE* :

CLASSIFICATION :

SPIRE Progress & Interface Meeting

PARTICIPANTS *ATTENDEES*	SOCIETE *FIRM*	SIGNATURE *SIGNATURE*	PARTICIPANTS *ATTENDEES*	SOCIETE *FIRM*	SIGNATURE *SIGNATURE*
Guy Doubrovik	ASP		John Delderfield	RAL	
Bernard Collaudin	ASP		Eric Sawyer	RAL	
Carsten Scharmberg	ESA		Doug Griffin	RAL	
Horst Faas	ASED				
Marco Cesa	ALS		Chris Bockley-Blatt	MSSL	
Jan Rautakoski	ESA		John Coker	MSSL	

REDACTEUR / *WRITTEN BY* :

Bernard Collaudin

CONCLUSION :

DISTRIBUTION : PARTICIPANTS / *ATTENDEES*	POUR ACTION : *FOR FURTHER ACTION*
	POUR INFORMATION : *FOR INFORMATION*

APPROUVE PAR / *APPROVED BY*

NOM / *NAME*				
SIGNATURE / *SIGNATURE*				

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Agenda : see Annex 1-1/3

ACTION

Open Actions status (see annex 1-3/3):

(Annex 1-3/3 AI updated during the meeting according here under)

From last SPIRE IF Meeting 18-11-03 , H-P-ASP-MN-3961

AI 2: Expected further changes wrt IID-B 3.11 New date 27/02/04- 27/02/04

AI3: Termination of cryo-harness on DRCU. Connectors have swap on DCU & FCU. (CR 64, 65). QM (=FS) and FM shall be identical. Cryo-harness must be changed. Unit for SPIRE QM are built. Redundant connectors are not in yet and will be included on QM to support & terminate (EMC) the redundant harness.
Change will be processed via CR's: 64 & 65. The QM and FM harnesses have to be optimised for FM, and in addition be compatible the QM connectors position.
Affects only the SVM part of the cryo-harness, and the WIH.
Redundant connectors position should be included on CR 64/65 in a version 2 of the CR 64/65. AI 1 SPIRE

Alcatel position is that the Cryo-harness to DCU/FCU should have enough length at the warm unit side to accommodate both QM and FM. 20/2/04

AI4 closed by CR 64/65. But see AI1 above.

AI 9 : MGSE drawing: New date: 27/02/04 27/02/04
Shall be in agreement with the integration procedure. (comments from ASED). New arrangement with FPU and JFET that shall be now be integrated connected together is critical for integration in the FPU. Hoisting device supports both FPU + JFET. (ASED base line was independent integration of FPU then JFET)
This information is urgently needed (for HPLM CDR)
A sketch of the MGSE is handed out during this meeting (hoisting device)
Drawing MSSL A1 5264 404 (2/2/04) sheet 6/7 **see annex 2**

From SCI-PT-23600 SPIRE Progress Telecon #5_ 30-01-04

AI 1 review documents. Initiated. New date 27/02/04 27/02/04
Comments on integration procedure will be presented today.

From SCI-PT-22994 SPIRE Progress Telecon #4_ 07-01-04

AI 4: Answer sent to ESA. Considered as closed

From SCI-PT-21435 SPIRE Progress Telecon #2_ 29-10-03

AI 3: Update will be done, but low priority as all relevant information is included in IID-B.

From H-P-ASP-MN-3513 SPIRE IF&IIDB Meeting_4-09-03

AI 4 : AVM ICD's: DCU/FCU provided. DPU AVM are identical: Closed.
AI 9: AD/RD: Closed.
AI 6: closed LCL Available for LOAN / SPIRE to organise loan.
AI 10: Safing plugs is included in the integration procedure - Closed.
AI 11: ASED. Thermal aspects of cryoharness. This has been updated in the thermal model. Results of the analysis will be available with the CDR model (issue 4 of the document, available in April 04, together with SPIRE model 2.5)

From HP-2-ASED-MN-0387. AIV meeting.

AI 5 : Worst T environment to still be able to test the cooler in the cryostat vs L0 and L1 temperatures. Still open. Important. New date. 15/03/04 15/03/04

AI8 & 11-TN 982 (SPIRE EQM test program definition) not available. Still open. 13/2/03
To be answered by e-mail 13/2/03.

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IID-B issue 3.11 status

SPIRE has no objections to sign SPIRE IID-B version 3.11 after ESA CCB.
taking into account the Open points outlined in the Alcatel CCB, and the list of open points to be processed by SPIRE (to be included in further version), plus the ESA recommendations form ESA CCB on 12/1.
SPIRE to reply to list of open points from Alcatel CCB included in Annex 1-2/3

AI 2: SPIRE 27/2/04

IID-A 3.1 has been released for review. Comments expected by 20/2/04

SPIRE Status. See annex 3.

Testing of FPU CQM on going. Good results so far.
FM. Structure manufactured.
Note: PACS has modified the level 0 Strap to Cooler interface (evap and pump straps) by inserting a kel'f support on the cooler wall, allowing a ½ mass of suspended strap of 200g.
The implementation + mechanical & thermal analyses might be interesting for SPIRE.
Refer to HP-PACS-CR-42, available on ftp server (industry_to_instruments/change requests/

Strap Gold plating:

SPIRE straps will be gold coated.
Note: Air Liquid is using a nickel barrier (10microns) to allow annealing of the strap after gold plating. Nickel layer might not be necessary if the annealing is performed before gold coating.

Schedule: DRCU QM1 (delivered with QM FPU, to check FPU integration) is needed back to SPIRE for FM programme (August 2004). This will be a problem, as it should be available 1 year after delivery.
QM2 is available for SPIRE in Nov 2004.
Solutions can be:
1: to find out a solution by examination of details schedules of SPIRE FM programs and H-PLM CQM programme
2: to identify a spare DRCU (EM ?) to be able to do the job.
ESA to sort out the problem of availability of DRCU CQM 1 between HPLM EQM test & SPIRE FM test (summer/Automn 2004)

OPEN point to be solved.

AI 3 ESA. 03/3/04

Thermal interfaces issues.

TMM 2.5 delivered. ASED is expecting a go-ahead for using it.
ESA will provide comments , not approve.
As the model has been updated according to the SPIRE FPU updates and to the comments from ASED, it is agreed (common decision) that this model can be used for further H-PLM analyses.
FPU Temperature cooling rate: SPIRE agrees that the Cooler straps could be excluded from the 20K/h cooling rate (as the are connected only to the small and insulated cooler mass)

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Mechanical interfaces issues.

Clarification:
4 tapped holes on Open pod
6 tapped holes on Closed pod IF.
SPIRE FPU drawing set version 19 to be issued taking into account comments from ASED dated 15/2/04. (incl. strap IF, and update of the JFET design (height, …).
SPIRE to issue a CR with update of the FPU ICD version 19

AI 4 SPIRE 27/02/04

FPU supports.
It is confirmed (ref. last teleconf n° 5) that the carbon fibre feet will not be used on the SPIRE FPU MTD on the Herschel STM program (vibrations), as they are not available on time. Original steel feet will be used.

L0 updated strap interface will be part of FPU ICD n° 19.
This is included in the present H-PLM thermal strap design.

JFET: up to date since ICD pack 8 (included in IID-B 3.11).
2 Clamp for L3 straps will be provided by SPIRE with CQM, and 2 clamps for STM program.

Masse & Power Budget

Objective is to refer to the values in ICD's rather than in the table. Table will remain to indicate the sum.

Warm Interconnecting harness package has been delivered to SPIRE then CEA.
SPIRE is happy with the content of the package, and no further comments are expected.

Cryo-harness: Ref annex 4: mail from J.Lang HP-ASED-EM-0141/004 from 6/2/04
P1/13 of attachment– SPIRE double shielded branch design on the SVM: Faraday shield shall be connected to the backshell by removable cable lugs, and not connected to pins
P2/13: Gore-tex binder isolation (outside of the overshield) is acceptable by SPIRE. Astrium will raise an RFD against GDIR as this definition violates the GDIR (conductive coating
P3/13:

- Signal ground wire of individual 12-ax cable form a single ground plane. All ground wires are commoned in the 128 ways connectors.. The exception is the C2 branch where SSW & PTC ground planes are kept separate.
- for internal cryoharness, outer shield shall be the faraday cage, and internal shield shall be the signal ground. There is a misinterpretation of this point in the p3 of the annexe 4 document, which shall be corrected. (connect green (ground wires) to magenta (12-axe inner shields)).
- See corrected p 3 in annex 4

ASED to update the harness shield definition according to this clarification.

AI 5 ASED 17/02/04

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BSM chop motor drive and BSM Jiggle motor drive current

SPIRE asks if the current can again be increased from 50 to 60mA.
But it is advised to find an internal SPIRE solution.
SPIRE to issue a formal CR if they want to increase the BSM motors currents from 40 to 60mA, and to investigate alternative solution (internal to SPIRE) — AI 6 SPIRE 27/02/04

Cross check in IID-B 3.1 HDD (1.1) indicates a demand of 40mA for both cables types.
IID-A 3.1 indicates a nominal current of 10mA for BSM chop motor drive and 2.5mA for BSM jiggle motor drive
Action to ASED to cross check that the currents which are used to design cables are compliant with the one in the HDD 1.1 + annexes in IID-B 3.11 — AI 7 ASED 27/02/04
Note it has been checked in the past by ASED that the increase from 40 to 50mA should be feasible from cable point of view (no lifetime estimation performed).

FDIR

SPIRE confirm that the system level FMECA and FDIR as listed in the mail from B.Collaudin H-P-ASP-LT-4386 dated 5/2/2004 are the latest available versions, and should be used to identify the main failures and recovery actions involving the spacecraft.

AIT Issues :

EMC working group:

The comment of SPIRE is that the EMC working group should be discontinued because most of the points have already been covered.
Dedicated points should be covered during normal IF meetings.
The last activity that should have been done by the EMC WG is the definition of the EMC testing.

Integration procedure ref annex 5: procedure with redlined comments
SPIRE to update the integration procedure according to these comments. — AI 8 SPIRE
Use of vacuum grease (very low vapour pressure) is proposed by SPIRE as lubricant on screws to avoid cold welding on locking devices (can happen at low T with devices made with very clean parts) This is refused by ASED for class 100 constraints. It should be checked again if this vacuum grease can be used to avoid cold welding, of find an alternative for lubricating the screws. — AI 9 ASED 27/02/04

SCHEDULE

DCU/FCU model philosophy (QM2/FM) needs to be formalised . SPIRE will issue a RFW to formalise this situation — AI 10 SPIRE 27/02/04

Next SPIRE IF Meeting :
Teleconf: 3rd March 04
Meeting : **29 April 04**

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ALCATEL SPACE	**ACTION ITEM LIST**	REF. : H-P-ASP-MN-4307
	MEETING TITLE: SPIRE Progress & Interface Meeting	DATE : 10/02/04
	HERSCHEL/PLANCK	PAGE : 6/12

ACTION			**DATE**
N°	**DESCRIPTION**	**ACTION Firm / person**	***DUE***
1	Redundant connectors position on DCU/FCU QM1 should be included on CR 64/65 in a version 2 of the CR 64/65.	SPIRE	20/02/04
2	SPIRE to reply to list of open points from Alcatel CCB included in Annex 1-2/3	SPIRE	27/02/04
3	ESA to sort out the problem of availability of DRCU CQM 1 between HPLM EQM test & SPIRE FM test (summer/Automn 2004)	ESA	03/03/04
4	SPIRE to issue a CR with update of the FPU ICD to version 19	SPIRE	27/02/04
5	ASED to update the harness shield definition according to the clarification during the meeting.	ASED	17/2/04
6	SPIRE to issue a CR if they want to increase the BSM motors currents from 40 to 60mA, and to investigate alternative solution (internal to SPIRE)	SPIRE	27/02/04
7	Action to ASED to cross check that the currents which are used to design cables (ref IID-A 3.1 annex 8 tables) are compliant with the one in the HDD 1.1 + annexes in IID-B 3.11	ASED	27/02/04
8	SPIRE to update the integration procedure according to the ASED redlined version in annex 5	SPIRE	
8	It should be checked again if this vacuum grease can be used to avoid cold welding, of find an alternative for lubricating the screws.	ASED	27/02/04
10	DCU/FCU model philosophy (QM2/FM) needs to be formalised . SPIRE will issue a RFW to formalise this situation	SPIRE	27/02/04

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ANNEXES OF THE MINUTES

Annex 1: Agenda _IIDB Inputs asked & comments by ASP CCB#41_Actions Status

Annex 2: SPIRE Hoisting device drawing.

Annex 3: SPIRE status (presentation from Eric Sawyer)

Annex 4: mail from J.Lang HP-ASED-EM-0141/004 from 6/2/04

Annex 5: SPIRE integration procedure commented by ASED.

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Annex 1 _ 1/3
SPIRE IF Meeting Agenda, 10 February 2004
From 09:00 to 17:00

Actions status:
See attached tables (4 pages)

IID-B issue 3.11 status
- Signature: IIDB v3.11, SPIRE and ESA status
- SPIRE answer to ASP CCB#41 on IIDB 3.1 (see list of inputs here after, 1 page)

SPIRE general (or particular) technical status (TBD by SPIRE) **:**
- SPIRE schedule (if new inputs)
- Technical status (if new inputs)

Mechanical IF Issues:
- FCU & DCU FM ICD's, CR 64 & 65 (in pack issue 9)
- FCU & DCU QM ICD's, CR 65 (in pack issue 9)
- FPU ICD status
- JFET ICD status
- SPIRE Level-0 thermal strap IF:
  - Status of new design
  - Release of updated FPU IF drawings
- Status of FPU Support re-design
- MGSE status:
  - Design change of FPU MGSE: status

Thermal IF Issues:
- Updated SPIRE Thermal Model, Version 2.5 (just received).
- Use of this model at ASED.
- Thermal strap interface (gold coating)
- Temperature gradients & rate during cooling phase (versus IIDB § 5.15.1.2)

Electrical IF Issues:
- SPIRE Cryo-Harness Clarifications : shielding implementation
- Routing of SPIRE Scientific Harness

AIT Issues:
- Initial ASED comments on
  - SPIRE AIT data package delivered end of December 2003
  - SPIRE FPU Handling and Integration Procedure, SPIRE-RAL-PRC-001923, 15/12/2003
- AVM mechanical and electrical interfaces
- EMC working group. Continuation, objectives.

Other:
- answer to mail H-P-ASP-LT-3868 from BC : SPIRE DCU - RCU FM's and spacecraft FM schedule
- JFET L3 Pressure Plate and bolts (1x for STM/PFM and EQM for Sener)
- Capton foil and Bolts for L1 (foil and installation at Sener or Air Liquide) PFM/EQM
- Interface FDIR

Minutes and actions, End of IF Meeting

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Annex 1 _ 2/3
Inputs asked & comments by ASP CCB#41 (H-P-ASP-MN-4169) on SPIRE IIDB 3.1

1. Section 5.1, last phrase: We have to make sure that the safing plugs are taken into account by ASED. The TBD shall be replaced in next issue

2. Section 5.4.4.3: ICD of FCU to be updated by SPIRE (M5 screws + contact area) : **Closed**

3. Note that JFET ICD has been updated with the +7.35mm. This change has not beed propagated yet to the SPIRE FPU ICD (sheet 2 & 6)

4. Section 5.6.1: The foot print of the Level 0 thermal interface is not yet included in this version of the IID-B. This has been agreed meanwhile (ref ASED fax HP-ASED-FX-1001-03 from 19/12/03)

5. Table 5.7.2: Ground thermal conditions. It has been agreed that the ground conditions should not be a design driver (ref meeting of 30/10/03 on FPU thermal interfaces). Instrument shall be testable on ground.

6. Section 5.7.3: According to ICD's, 2 units are black painted, and one has alodine (alochrome). Alcatel propose to keep the design as is. An RFD should be raised by instrument (and will be accepted)

7. Section 5.9.1: The table of dissipation inside the FPU is superseeded by the use of the FPU thermal mathematical model. This table is in agreement with latest thermal model version 2.5, (in annex 2 is the previous version of the TMM 2.3), which should be updated in next version of IID-B Closed ?

8. Section 5.9.3 (thermal dissipation table) is to be completed with the (lower) dissipation in spectrometer case to refine the thermal analysis (cold case)

9. Section 5.9.6.1: Long peak should be included in the second table (per LCL) and not in the first one

10. Section 5.9.6.2: an OBCP is needed to define switch on procedure: Not enough information is supplied in IID-B

11. Section 5.10.4.3: Launch latches: This section should be described more accurately in next version of the IID-B

12. Section 5.11.1.2: Spec 160 is not compatible with the implementation of the burst mode. Check with SPIRE if this requirement is still up to date or compliant with the normal data transmission.

13. Section 5.11.3: The start of Scan TC shall be defined more accurately by SPIRE

14. Section 5.11.4: Telemetry: Reference should be made to RD3 rather than AD TBD. SPIRE DATA ICD (SPIRE-RAL-PRJ-1078, draft 2 was part of IHDR datapack). SPIRE should state if this document is the one to be used. Action for next datamanagement working group.

15. Section 5.13.3 Specs 240 to 260 will need some OBCP's to be processed. Not enough information is given to define them

16. Section 5.13.3, 4, 5 should be substantiated in the next issue of IID-B, taking into account SPIRE FDIR

17. Section 5.15: Full of TBD, TBC, TBW. These should be replaced in the next issue of IID-B

18. Section 5-16: Deliverable matrix should be included (as for other IID's) . This section shall be properly updated in the next issue, as it is currently meaningless

19. Section 6: same remark as 5.16

20. Section 9.3 to 9.7 to be filled by SPIRE

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Annex 1 _ 3/3 _ SPIRE Actions Status

From last SPIRE IF Meeting 18-11-03 , H-P-ASP-MN-3961

N°	ACTION DESCRIPTION H-P-ASP-MN-3961 SPIRE IF Meeting 18-11-03	DUE DATE	Firm / person	ACTION STATUS
1	Alcatel / Alenia will check that the SVM is designed with M5 screws for FCU interface, and if not will initiate the change.	30/11	ASP/Alenia	**Closed** by Mail from GD ref : H-P-ASP-LT-4030 dated 26/11. ASP CR 515 sent in October to ALS .M5 applies only to FCU, no change for DCU.
2	Alcatel ask SPIRE to prepare a list of expected interface changes wrt current IID-B 3.0 baseline definition, to be discussed during next interface meetings	30/11→27 /02	SPIRE	**Open –** new date 27/02/04
3	Astrium will evaluate how the termination of the cryo-harness can be done in compliance with EMC test objectives (for instance terminating the unused cryo-harness at the SVM bracket.	15/12	ASED	**Closed** by Fax HP-ASED-FX-0055-04 dated 03/02/04, stating baseline is: EQM identical to FM for units and harness, no specific EMC measure. CR 64/65 to be reissued to modify QM/FM harness with both QM & FM DCU/FCU. (see AI 1 of this present meeting
4	DCU/FCU Update of the QM unit drawings will be delivered with indication of the changes & non conformances (position of connectors, …)	30/11	SPIRE	**Closed** by CR 65. QM1 DCU&FCU redlined drawing included in ICD pack issue 8, and by pack issue 9 received 28/01: CR 65.
5	SPIRE will issue formally Drawing pack 7 with and updated front sheet	25/11	SPIRE	**Closed** by ICD pack issue 8 (but front page missing)
6	In parallel, Astrium will check that the FPU ICD version 18 is acceptable, and if yes, this pack will be included in IID-B 3.1	25/11	ASED	**Closed** by Mail ref HP-ASED-EM-0740-03: Check of SPIRE FPU ICD, Issue 18 from HF/ASED dated 28/11. OK to include in IIDB with list of ASED comments
7	Astrium will check if the use of these SPIRE FPU feet can be undertaken.	15/12	ASED	**Closed** by Mail ref HP-ASED-EM-0035-04, dated 21/01/04 , and finally feet will not be used by ASED (see Telecon#5)
8	Design of the Open Pod bolt patter should be frozen in the next 2 weeks, by agreement with SPIRE/MSSL.	8/12	ASED	**Closed** by Mail ref HP-ASED-EM-0772-03: Delivery of updated SPIRE L0, L1 and L3 Interface Drawings from OBA CDR, dated 04/12/03 – And mail HP-ASED-EM-0816-03 dated 16/12/03 with file SPIRE_L0_IF.zip
9	SPIRE/MSSL will provide MGSE ICD by mid 01/04	15/01/04	SPIRE/MSSL	**Open:** New date 27/ 02/04
10	SPIRE will deliver updated Thermal Mathematical model	30/01/04	SPIRE	**Closed :** by ITMM v2.5 received 03/02/04
11	SPIRE will confirm that this available harness is compliant with the SVM (AVM) configuration.	30/11	SPIRE/ASED	Closed for SPIRE Concerns WIH, confirmed during Progress Telecon#3 SCI-PT-22418. But Astrium to solve out reduction of connector on SPIRE side: **replaced by AI 1 of this meeting**
12	Alcatel will check the type of EMC testing the AVM.	30/11	ASP	**Closed** by Mail from GD ref : H-P-ASP-LT-4247 dated 23/01/04

SPIRE Actions Status (only open AI) : from Progress Telecon's

N°	ACTION DESCRIPTION Progress Telecon #	DUE DATE	Firm / person	ACTION STATUS
	SCI-PT-23600 SPIRE Progress Telecon #5_ 30-01-04			
1	Astrium to review documents, and to provide comments until next SPIRE I/F Meeting. (EQM Test Plan ; Functional Test Specification ; DRCU Integration Test Specification ; Operating the SPIRE Instrument ; CQM build table to update the tables in PL-0021 ; SPIRE FPU integration procedure)	10/02/04	ASED	**Open** New date 27/02
	SCI-PT-22994 SPIRE Progress Telecon #4_ 07-01-04			
4	SPIRE answer to open IHDR RIDs	30/01/04	SPIRE	**Closed** (sent to ESA)
	SCI-PT-21435 SPIRE Progress Telecon #2_ 29-10-03			
3	SPIRE to issue the Harness Definition Document version 1.2, which will reflect HDD1.1 plus update according annex 5 of SPIRE IID-B version 3.0 "SPIRE HDD 1.1 Deltas"	30/11	SPIRE	**Open** Problem of availability. Patches in IID-B are equivalent (HDD 1.1 + patch v.3 (tech not v3.0 should be replaced in IID-B). Keep open.

SPIRE Actions Status (only open AI) : From previous IF Meetings

N°	ACTION DESCRIPTION	DUE DATE	Firm / person	ACTION STATUS
	From H-P-ASP-MN-3513 SPIRE IF&IIDB Meeting_4-09-03			
4	SPIRE to add AVM ICD's (in case they are different from FM's) in the next IID annex pack	30/11	SPIRE J.D.	**Closed** by QM1 DCU&FCU drawing included in ICD pack issue 9 received 28/01 (see AI 4 of H-P-ASP-MN-3961)
9	SPIRE to check that all AD/RD for IID-B documents are on livelink.	15/12	SPIRE JD	**Closed:**
10	SPIRE to provide TN with definition of safing plugs that are needed	30/9	SPIRE JD	**Closed** (incl. In integrationprocedure)
11	Astrium will make a detail evaluation of the conduction / Dissipation (discriminate between both) of the SPIRE cryoharness to the FPU. (this could mean using electrical resistance at operating temperature).	15/12	Astrium A.H	**Open** new date = issue of the document for CDR (april 04)
	From HP-2-ASED-MN-0387. AIV meeting.			
5	Thermal environment during IST-IMT- Worst T environment to still be able to test the cooler in the cryostat vs L0 and L1 temperatures	12/11/03	SPIRE	**Still Open** – Answer of SPIRE is that Instrument cannot be tested with proposed temperature environment (7K on level 1). No Cooler recycling possible. SPIRE will run the model and provide a feed-back. New due date: 15/03/04
8	most sensitive noises mode. Will be Identified in test sheet.	15/12/03	SPIRE	**Still Open**– Will be included in SPIRE TN 982 "SPIRE EQM test program definition" to be updated . New due date 13/02/04
11	Define power lines to be tested	15/12/03	SPIRE	**Still Open**– Idem AI 8

DRAWING No.			
A1	5264	404	SHT 6 OF 7

THIRD ANGLE PROJECTION

DO NOT SCALE

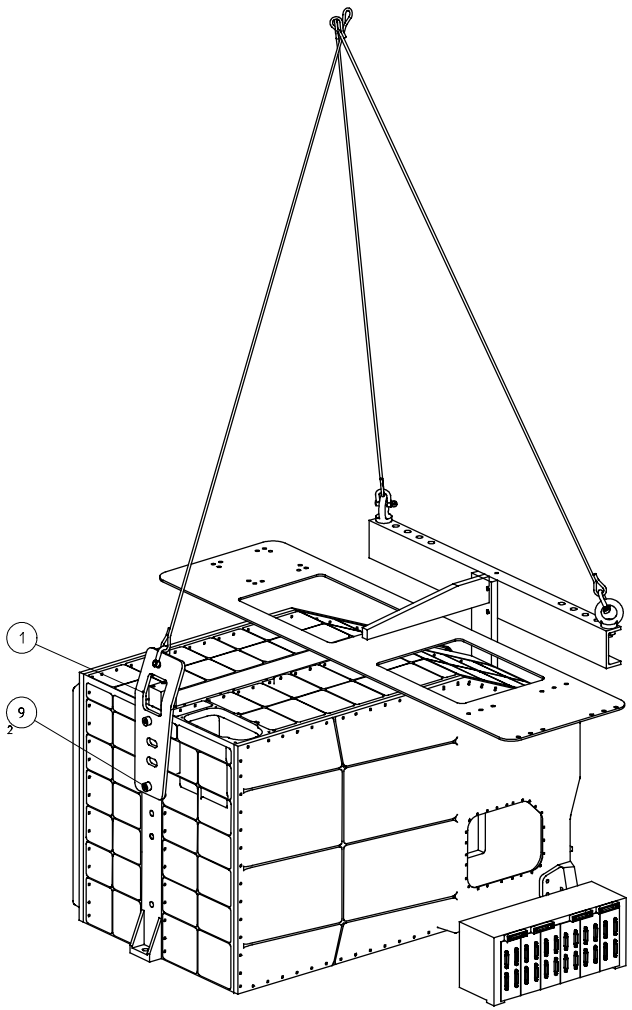
REMOVE ALL BURRS & SHARP EDGES

USED ON SPIRE MGSE

NOTES
1 DIMENSIONS ARE NOMINAL AND MAY VARY DUE TO MANUFACTURING TOLERANCES

Annex 2: SPIRE Hoisting device drawing.

NOTE
1 SEE SHEET 7 FOR SPIRE INSTALLATION LIFTING REFERENCE DIMENSIONS



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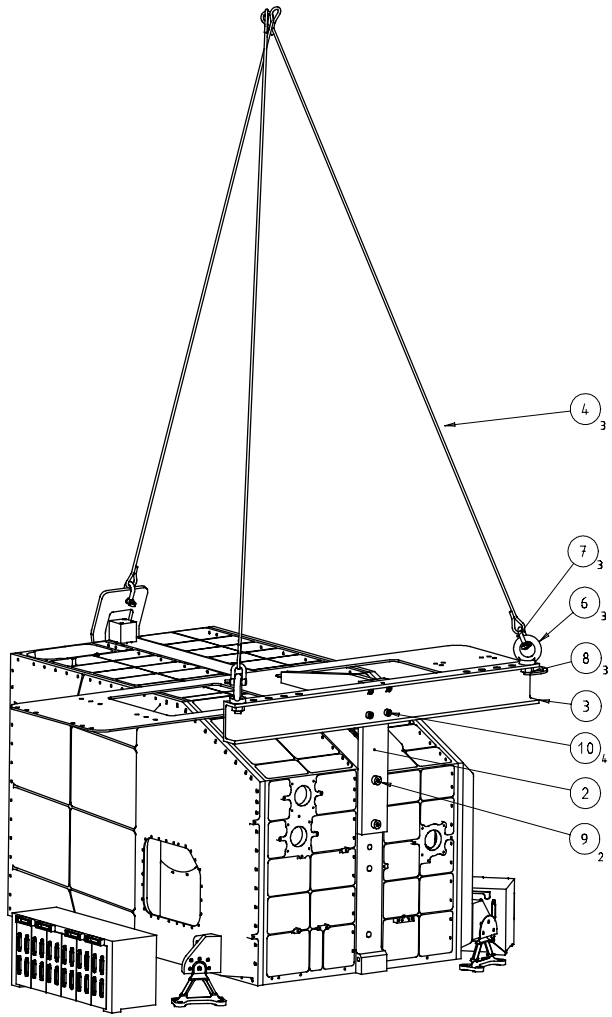

VIEW SCALE 0.25 : 1

ITEM No	DRAWING No	DESCRIPTION	QTY	REMARKS
10		SCREW M6x20 L SKT CAP HD	4	ST STEEL
9		SCREW M8X25 L SKT CAP HD	4	ST STEEL
8		M10 NUT HEX FULL	2	ST STEEL
7	927A078N	SHACKLE	3	KEY INDUSTIAL LTD
6		SHOULDER EYEBOLT M10	2	ANGLIA HANDLING
5				
4	A3-5264-404-22	HOIST CABLE	3	
3	A3-5264-404-16	REAR LIFT CHANNEL	1	
2	A3-5264-404-15	REAR LIFT PLATE	1	
1	A2-5264-404-34	FRONT LIFT BRACKET	1	

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CHECKED			
	5	2/2/04	SUPPORT PLATE FOR JFET BOXES ADDED
	4	28/1/04	ASSEMBLY JIG PARTS REMOVED DUE TO SPACE LIMITATIONS
TRACED	3	8/8/03	FRONT LIFT BRACKET REPLACED WITH FRONT LIFT STRAP
	2	28/3/03	
DRAWN	ISSUE	DATE	AMENDMENT
PMB	1	2/10/02	

COMPUTER FILE
SPIRE-LIFT (ASSEMBLY)
CONFIG1-SPIRE-LIFT
A1-5264-404-SHT 6 and 7 (dwg)

PROTECTIVE FINISH	MATERIAL & SPEC.	TOLERANCES UNLESS OTHERWISE STATED –
		LINEAR +/- 0.10
		ANGULAR +/- 0°15'
ESTD WT.		
ACTL WT.	DIMENSIONS IN mm	SCALE SEE VIEWS

DEPARTMENT OF SPACE AND CLIMATE PHYSICS
UNIVERSITY COLLEGE LONDON
MULLARD SPACE SCIENCE LABORATORY, HOLMBURY ST. MARY, DORKING, SURREY.

TITLE
SPIRE LIFTING FOR INSTALLATION

DRAWING No			
A1	5264	404	SHT 6 OF 7

Annex 3 of H-P-ASP-MN-4307 , SPIRE IF Meeting 10-02-04

Progress/Status

Eric Sawyer

SPIRE

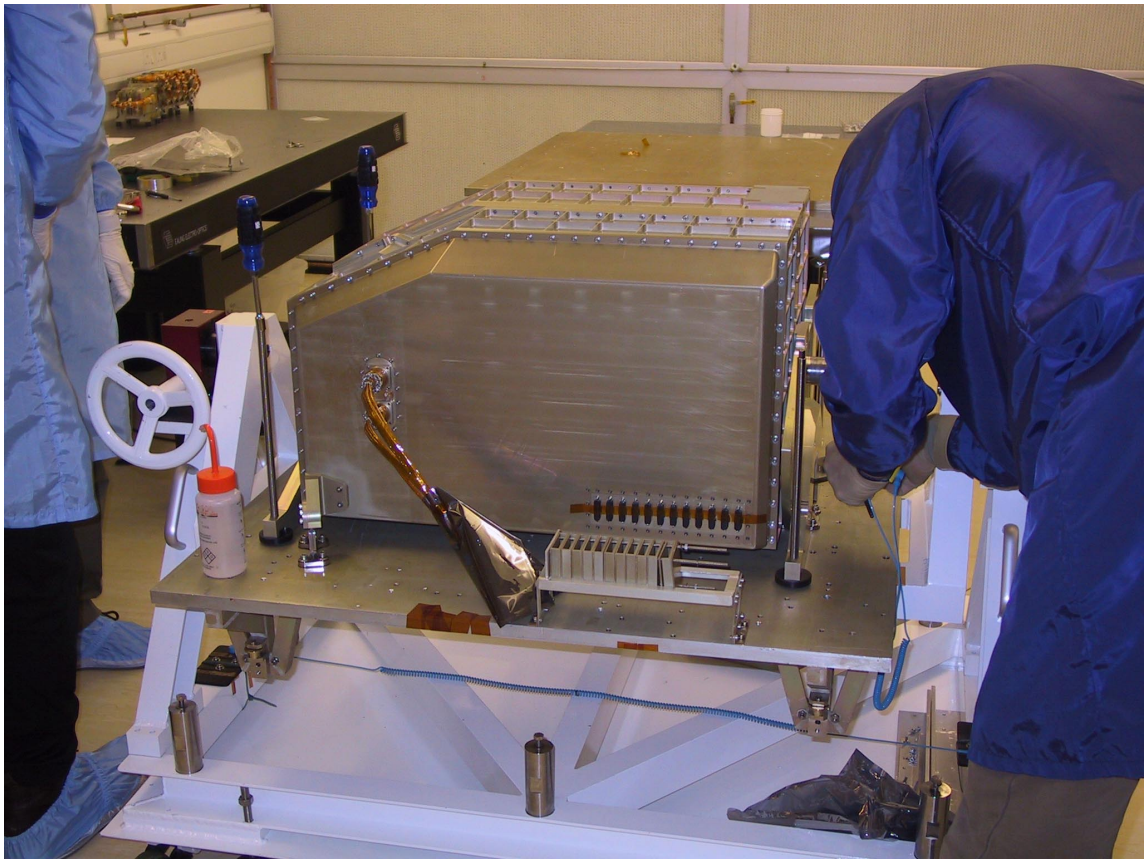
AVM

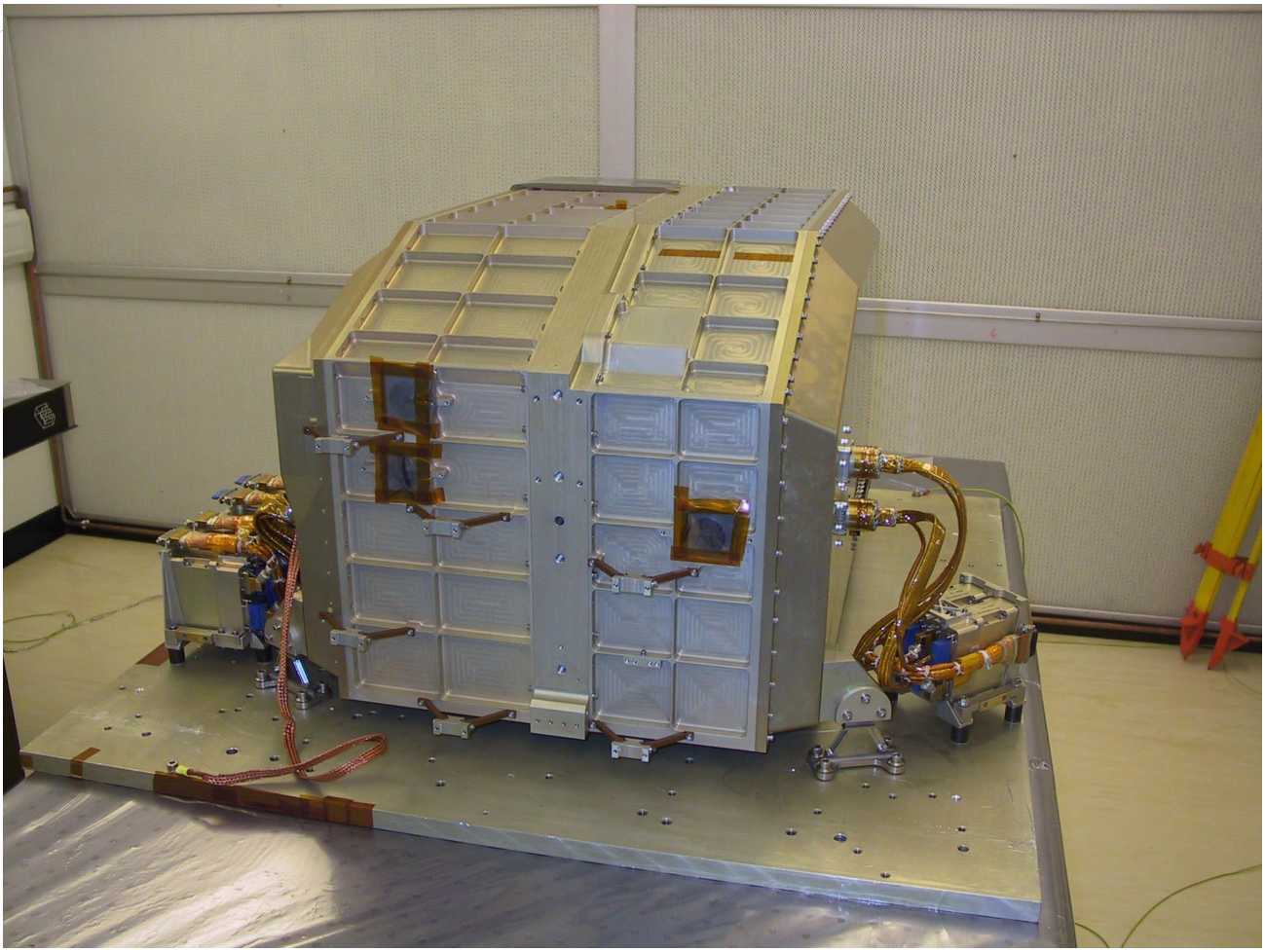
- No update from last meeting

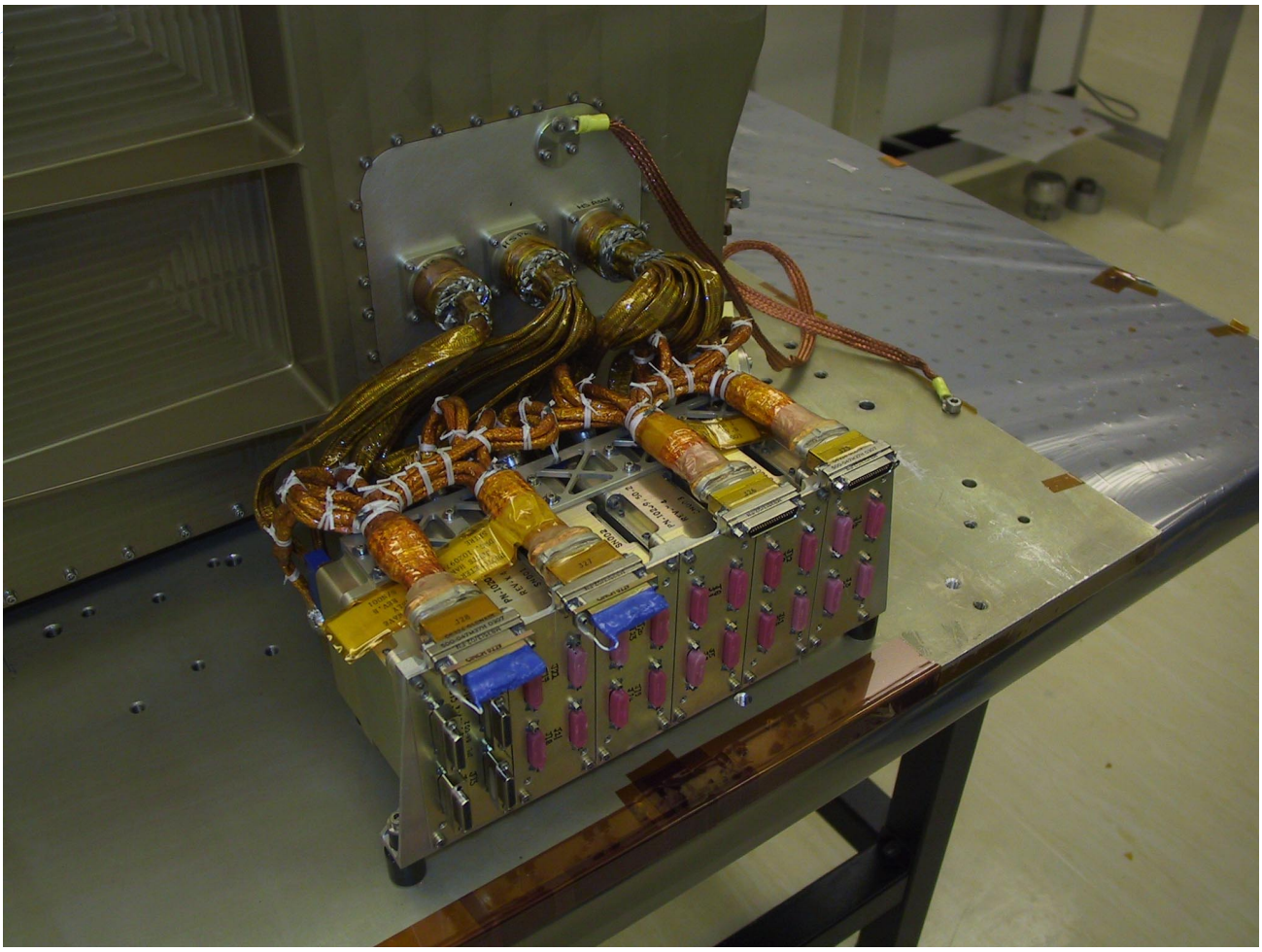
CQM

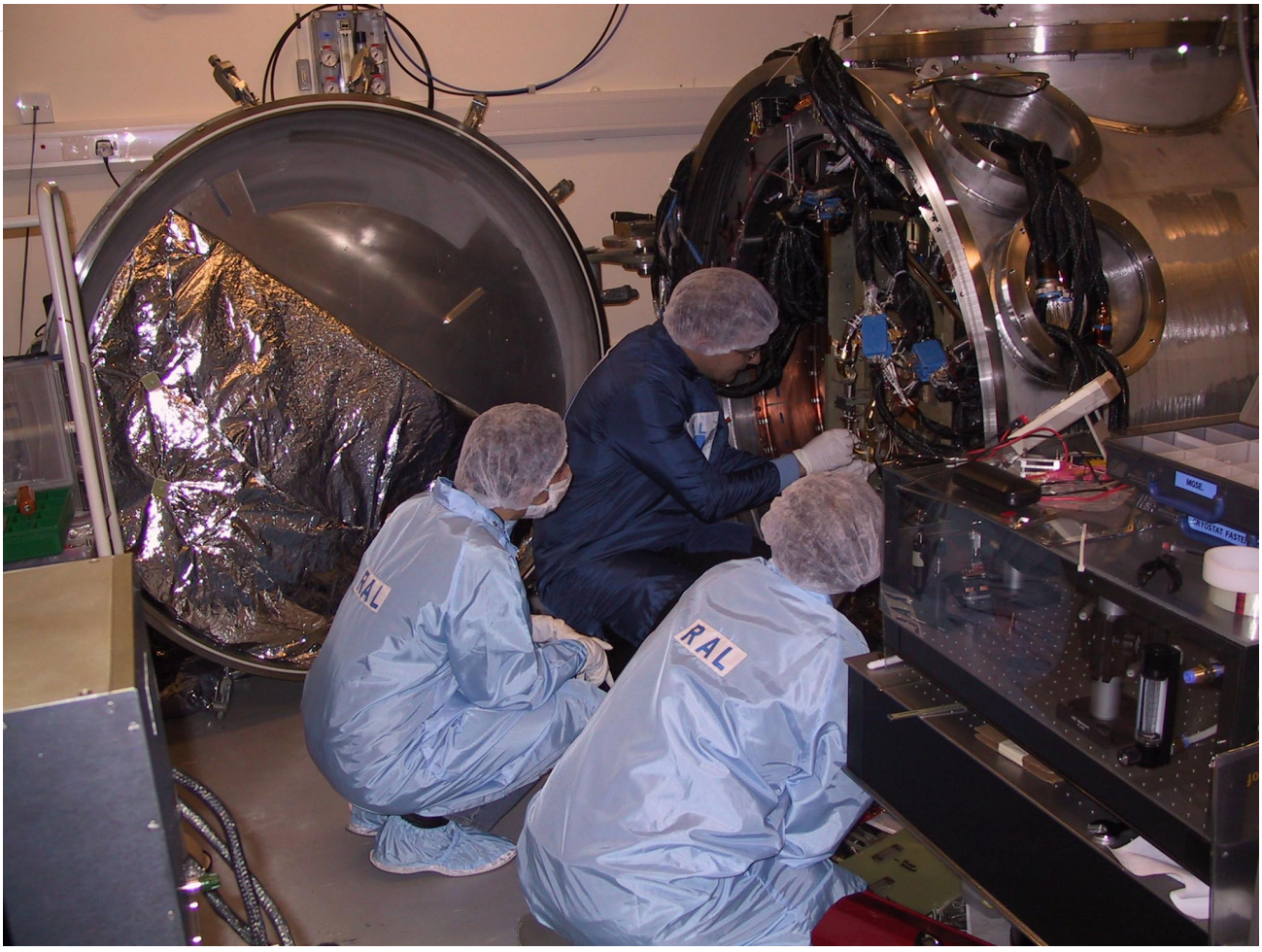
Cold Qualification model

- Cold test campaign started 21/1/04
- Thermal test cases
  - L1 4K
  - L0 1.4K
  - Cooler tip 265mK
  - Detector 285mK
- Functional tests
  - It seems to work.

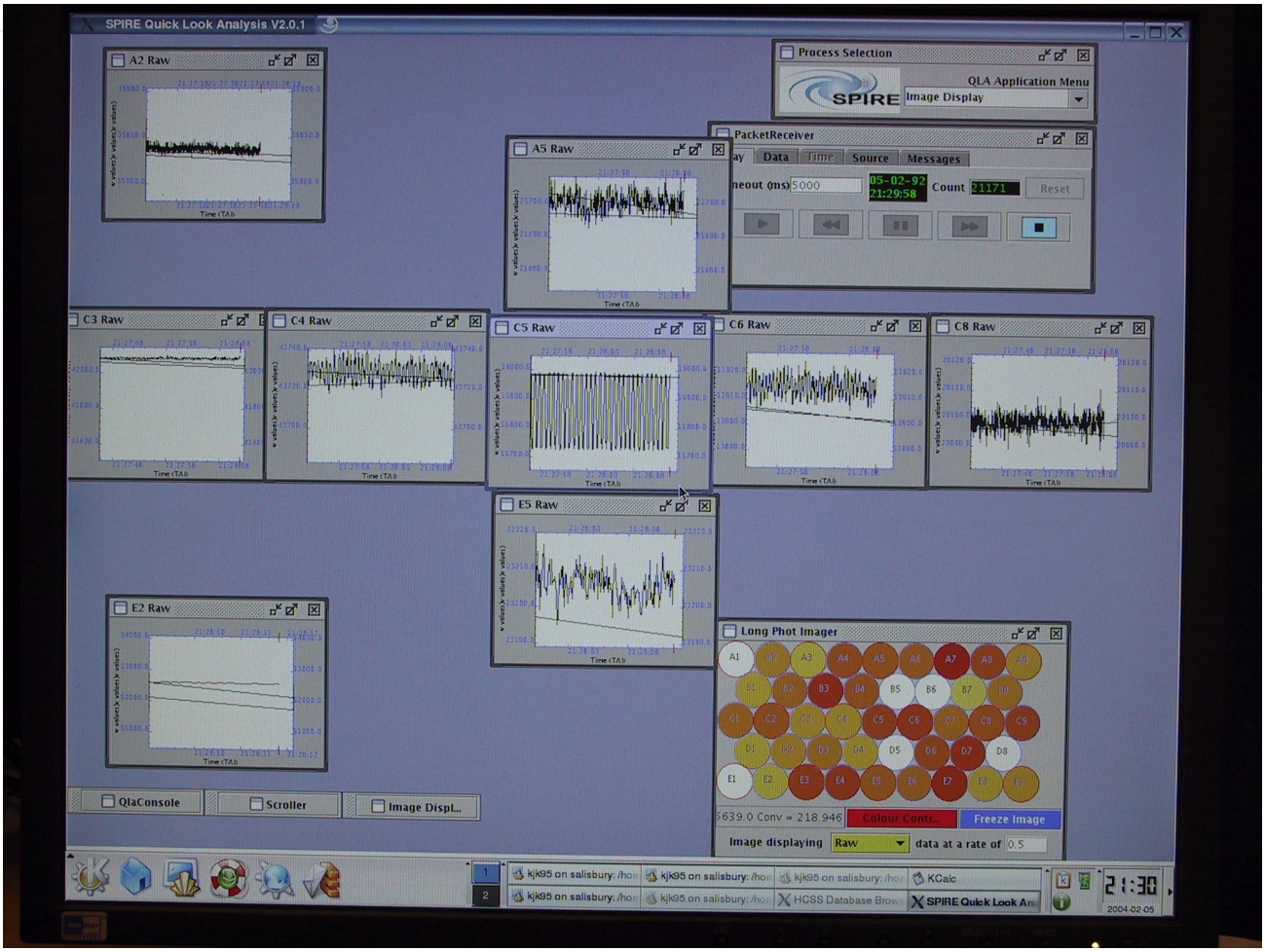




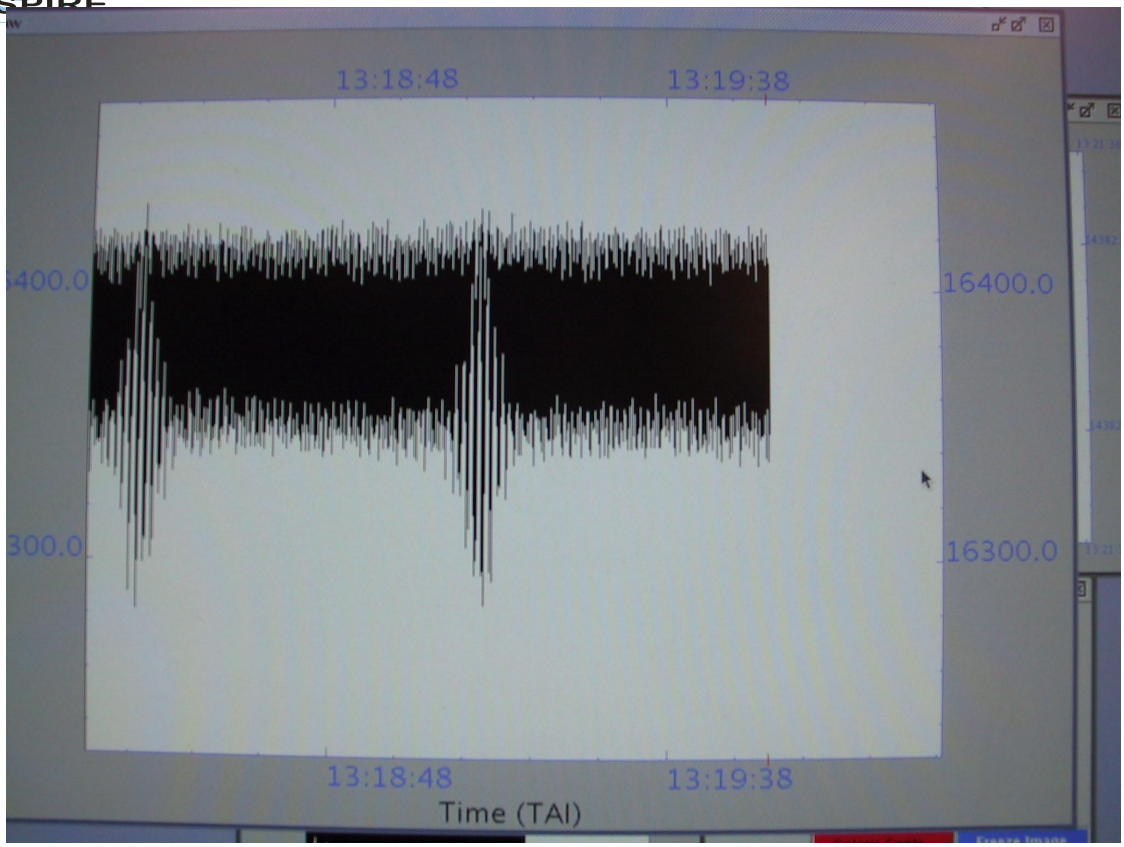



RAL
RAL


R68
R68


SPIRE Quick Look Analysis V2.0.1
A2 Raw
A5 Raw
Process Selection
SPIRE
QLA Application Menu
Image Display
PacketReceiver
Data
Time
Source
Messages
Count
21171
Reset
C3 Raw
C4 Raw
C5 Raw
C6 Raw
C8 Raw
E5 Raw
E2 Raw
Long Phot Imager
QlaConsole
Scroller
Image Displ...
Colour Contr...
Freeze Image
Image displaying
Raw
data at a rate of
KCalc
SPIRE Quick Look An...
21:30
2004-02-05


HEWLETT • PACKARD
ABORT
4.0
24.0
2.5
START SWEEP
PLOT IN PROGRESS
RETURN


13:18:48
13:19:38
16400.0
16300.0
13:18:48
13:19:38
Time (TAI)

Warm electronics

- QM1 DRCU performing well
- CEA have been awaiting test results from CQM programme, they need to wait no longer

PFM

- Structure manufactured, except CFRP legs and L0 straps
- Cooler – Review held, parts manufacture started.
- DRCU PFM release can now go ahead
- SMEC – CQM in manufacture, delivery in early April
- Mirrors –manufactured, some problems with quality, some re-manufacture, due for delivery 5/3/04
- BDA - SSW complete and in transit , SLW in assembly
- DPU – Status uncertain
  - Delivery of updated AVM is on hold due to funding issues.
  - New design for the PFM (based on mods tested on AVM) – status unknown.
  - Start of FM will be delayed.
- Calibrators, filters – in manufacture
- BSM – Built, some problems with range, modifications required.
- PFM FPU Preparation/integration to start on receipt of structure.
- First activities are bakeout and metrology.
- Realistic start is Feb due to staff availability.

AIV

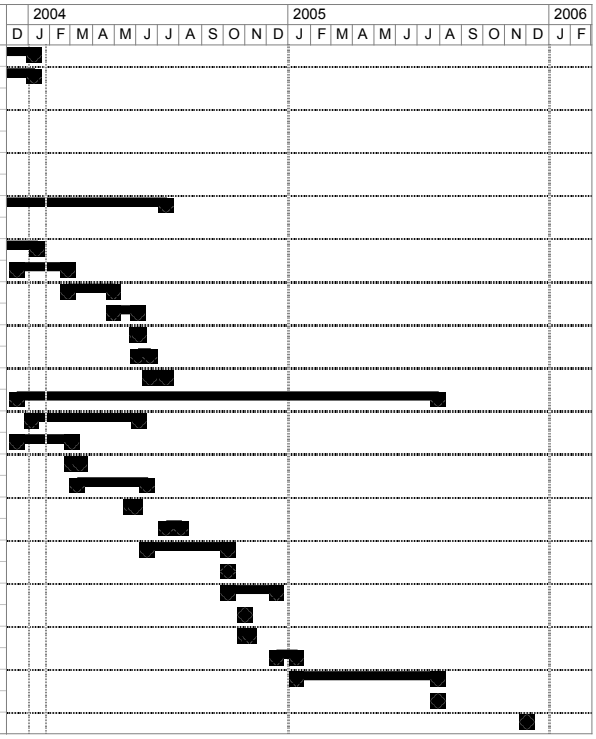
- Tests started, see CQM

schedule

Milestones.

- CQM build complete 5/12/03 Complete
- CQM cold verification 1 start 31/01/04
- Cold vibration start 27/02/04 TBD
- CQM Ready for delivery June with DRCU QM1 (temp)
- DRCU (QM1) required for FM programme.
- FM delivery July 05 with QM2 electronics

ID	Task Name	Duration	Start
1	**SM AIV programme**	**199 days**	**Wed 26/03/03**
2	**SM FPU Subsystem deliveries**	**178 days**	**Fri 25/04/03**
37	**SM Structure Integration**	**17 days**	**Wed 26/03/03**
49	**Early vibration test**	**9 days**	**Thu 17/04/03**
53	**AM programme**	**64.5 days**	**Fri 02/05/03**
89	**AVM programme**	**15 days**	**Mon 28/04/03**
91	**Warm electronics programme**	**10 days**	**Mon 08/09/03**
95	**CQM programme**	**275 days**	**Tue 24/06/03**
96	STM/CQM FTB Subsystem Deliveries	**76 days**	**Tue 24/06/03**
102	Preparation of CQM	**113.5 days**	**Mon 04/08/03**
139	CQM Cold Verification 1	**53 days**	**Mon 15/12/03**
155	CQM Cold Vibration	**45 days**	**Thu 26/02/04**
163	CQM Cold Verification 2	**24 days**	**Thu 29/04/04**
171	**Update QM1 DRCU**	**5 days**	**Mon 31/05/04**
173	CQM modifications before delivery	**13 days**	**Wed 02/06/04**
177	**Delivery to ESA FPU and DRCU**	**16 days**	**Fri 18/06/04**
181	**PFM AIV programme**	**423 days**	**Mon 15/12/03**
182	CQM/PFM FPU Subsystem Deliveries	**112 days**	**Mon 05/01/04**
203	PFM FTB Subsystem Deliveries	**57 days**	**Mon 15/12/03**
208	PFM FTB Integration	**8 days**	**Wed 03/03/04**
212	FPU integration phase 1	**69 days**	**Wed 10/03/04**
225	**Warm electronics Deliveries**	**5 days**	**Mon 24/05/04**
228	**QM1 Warm Electronics re Integration**	**15 days**	**Tue 13/07/04**
231	Instrument integration and test phase 1	**83 days**	**Tue 15/06/04**
247	**QM1 DRCU available for CQM delivery**	**0 days**	**Thu 07/10/04**
249	FPUintegration phase 2	**48 days**	**Fri 08/10/04**
257	**Delivery of DRCU QM2**	**0 days**	**Mon 01/11/04**
259	**Delivery of FM DPU**	**5 days**	**Mon 01/11/04**
261	Instrument integration and test phase 2	**20 days**	**Wed 15/12/04**
264	PFM Verification	**141 days**	**Wed 12/01/05**
299	**Delivery of PFM to ESA**	0 days	Wed 27/07/05
300	**Delivery of warm electronics to ESA**	0 days	Wed 30/11/05



Annex 4 mail from Juergen Lang HP-ASED-EM-0141-04

From: Lang, Juergen
Sent: Freitag, 6. Februar 2004 18:33
To: 'j.delderfield@rl.ac.uk'
Cc: 'juanjo@casa-de.es'; 'agg@casa-de.es'; 'Benito.Sanchez@casa-de.es'; 'Chris.Jewell@esa.int'; 'Thomas.Passvogel@esa.int'; 'carsten.scharmberg@esa.int'; 'jean-claude.boschel@space.alcatel.' ernard.Collaudin@space.alcatel.fr'; 'Andrew.Knight@support-externe.space.alcatel.fr'; 'Keithrobert_Hibberd@vzmta01.netfr.alcate.. , 'E.C.Sawyer@rl.ac.uk'; 'mesteban@casa-de.es'; Knoblauch, August; Hund, Walter; Kalde, Clemens; Faas, Horst; Lohr, Hans; Steinmann, Peter; Wietbrock, Walter

Subject: HP-ASED-EM-0141-04: SPIRE SIH Double-Overshield and Cable-Shield Interconnection Design

Hi all together,

pleasae find enclosed the SPIRE SIH shielding design between the SVM warm units and the cold units.
The different shielding and shield interconnection principals are defined for the 3 harness sections, SVM , CVV external , CVV internal.

The clarification is necessary for the CVV external double shielded harness branch over-shield interconnection method and the CVV internal double-shielded cable interconnection definition to complete the subject manufacturing documentation at CASA and ASSE.

John , would you please so kind and control, if this interconnections shown below, will be complient to that you request w.r.t. the Signal GND , Farady-cage and outer harness branch / cable shield interconnection.

The outer harness branch shield within the SVM and the CVV external surfaces, has been discussed during one of our common telecons.

There will be no homogen isolated SIH branch routed without any ESD bonding to the SVM nor CVV structures.
The use of Gore-Tex to isolate the 2 shield-layers, is no requirement from John, but us, which has been manufactured on a sample basis by CASA and withstand a high-resistance test after several times bending the harness branch, which simulate the harness integration handling.

The material has been selected, to avoid the use of shrink-sleeves in between the 2 shield-layers and on top of the outer one.

Shrink-sleeves are not much practible in sight of any harness branch repair.

The actual baseline documents, do not contain the doubl-shielded cable design
within the CVV internal SIH Definition document, ref. SPIRE-RAL-PRJ-000608 issue: 1.1
nor the HP-2-RAL-TN-0002_1_1_181103_EICD, therefore I would need this cross-check,
before ASSE & CASA will manufacture any SPIRE harness branch / cable shield CVV external / internal.

I`ll send jpg-files, because the e-mail server capabilities.
On monday I will please Walter Wietbrock to place the original file to the ESA and Alcatel server.

Thanks and
Best Regards
Jürgen

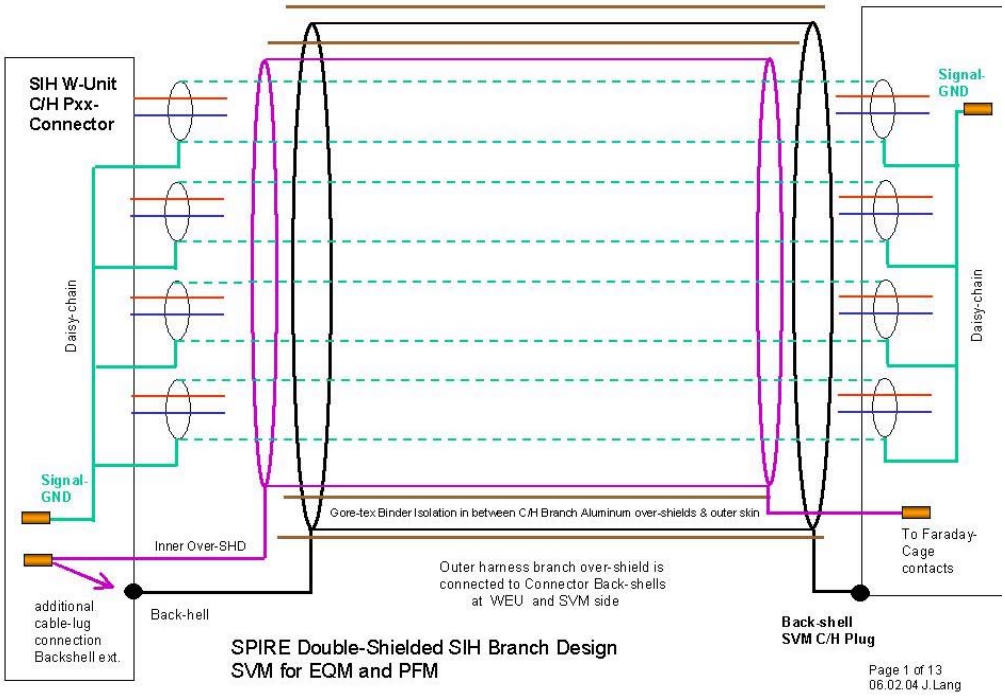
<<Slide1.JPG>> <<Slide10.JPG>> <<Slide11.JPG>> <<Slide12.JPG>> <<Slide13.JPG>> <<Slide14.JPG>> <<Slide15.JPG>> <<Slide2.JPG>> <<Slide3.JPG>> <<Slide4.JPG>> <<Slide5.JPG>> <<Slide6.JPG>> <<Slide7.JPG>> <<Slide8.JPG>> <<Slide9.JPG>>

HERSCHEL EQM and PFM Instrument Cryo-Harness

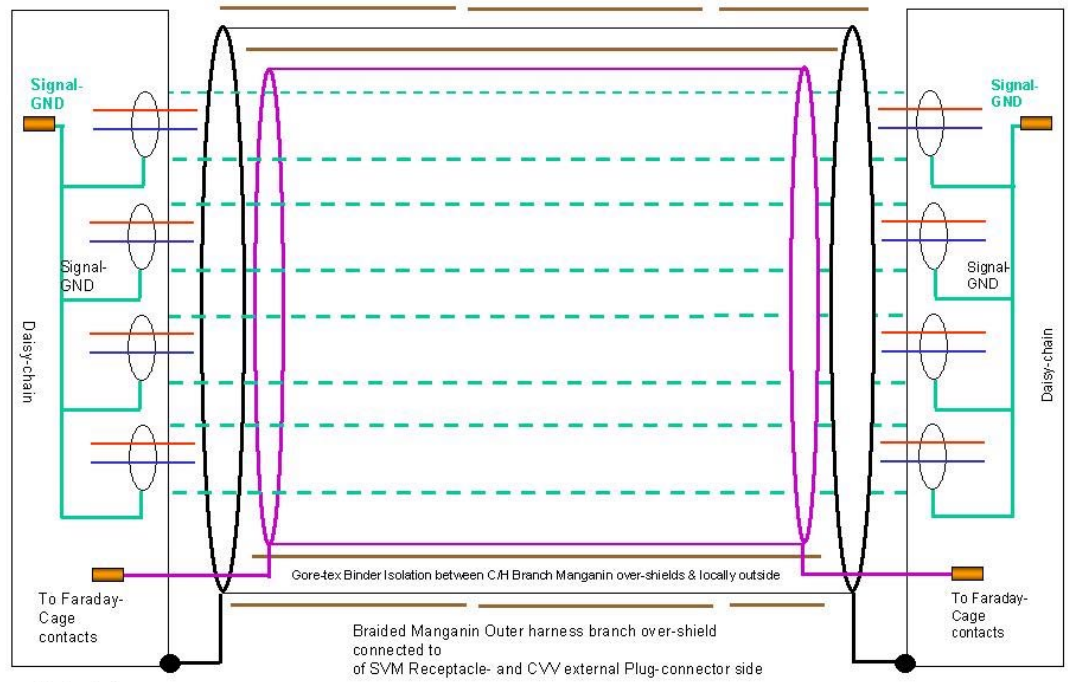
SPIRE SIH Double-Over-Shield and Cable-Shield Interconnection Design between Warm and Cold-Units

J. Lang

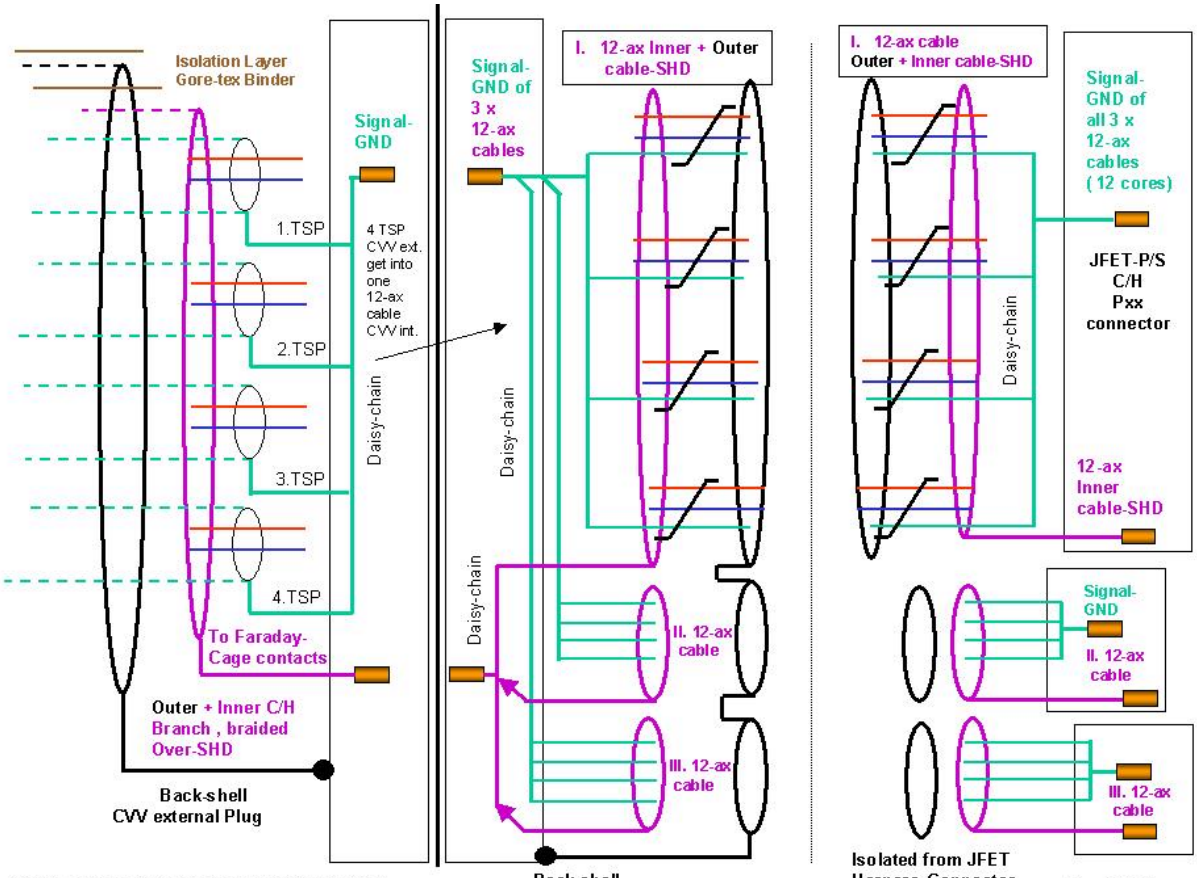
06.02.04



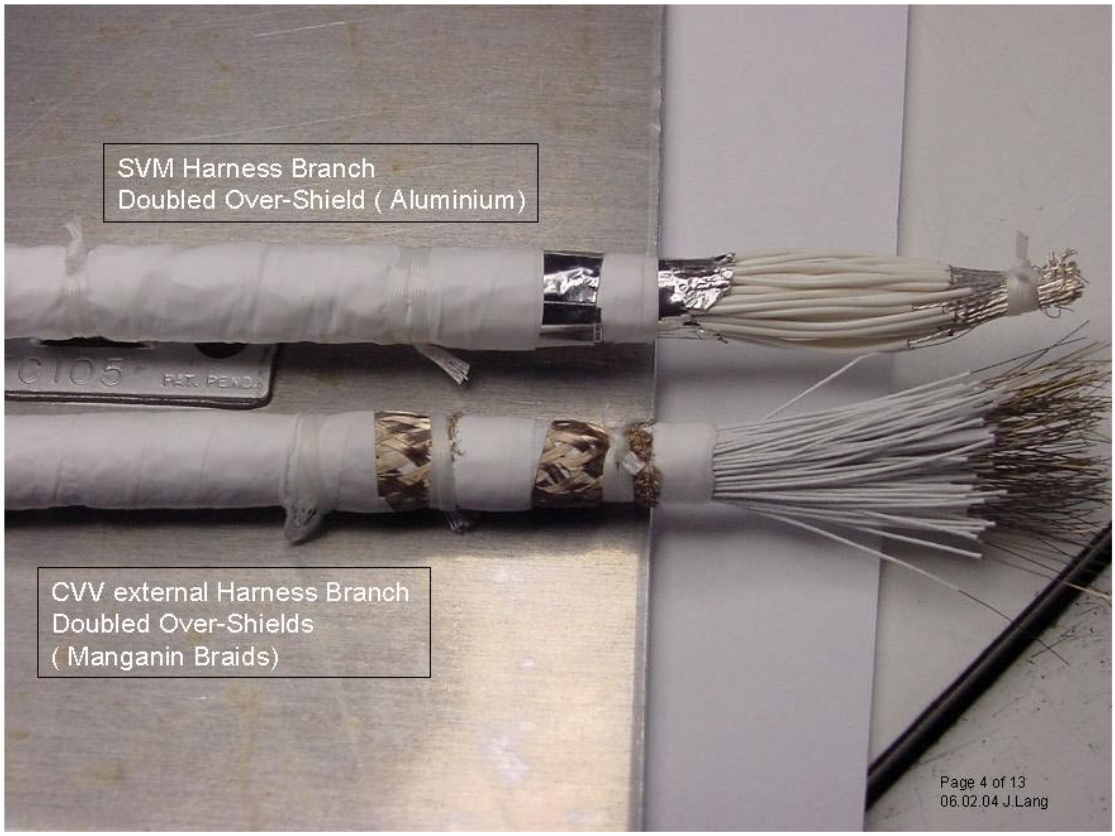
SPIRE Double-Shielded SIH Branch Design
SVM for EQM and PFM

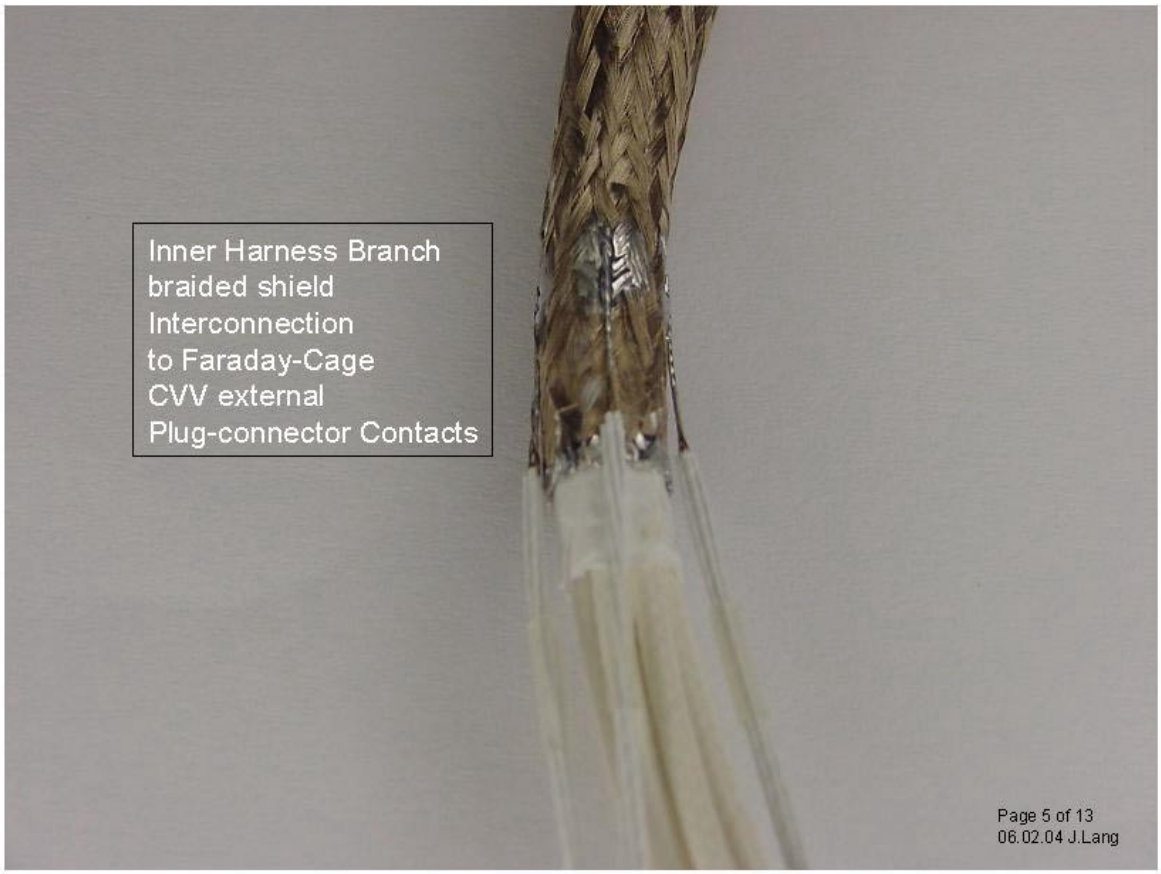


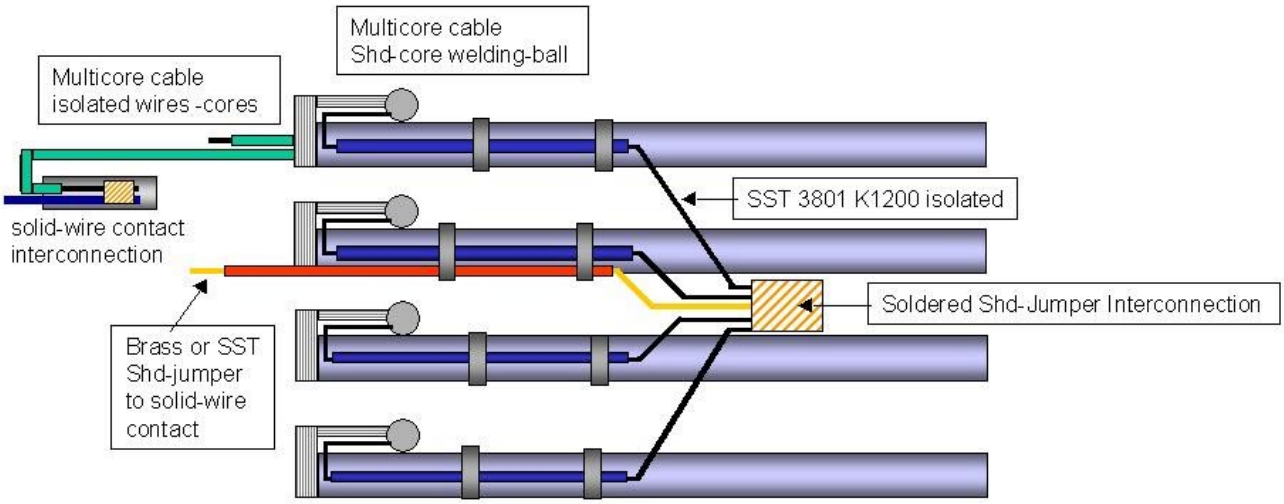
SPIRE Double-Shielded SIH Branch Design
CVV external for EQM and PFM



SPIRE Double-Shielded Cable Design
CVV Internal for EQM and PFM


SVM Harness Branch
Doubled Over-Shield (Aluminium)
CVV external Harness Branch
Doubled Over-Shields
(Manganin Braids)
Page 4 of 13
06.02.04 J.Lang


Inner Harness Branch
braided shield
Interconnection
to Faraday-Cage
CVV external
Plug-connector Contacts
Page 5 of 13
06.02.04 J.Lang



Herschel Cryo-Harness

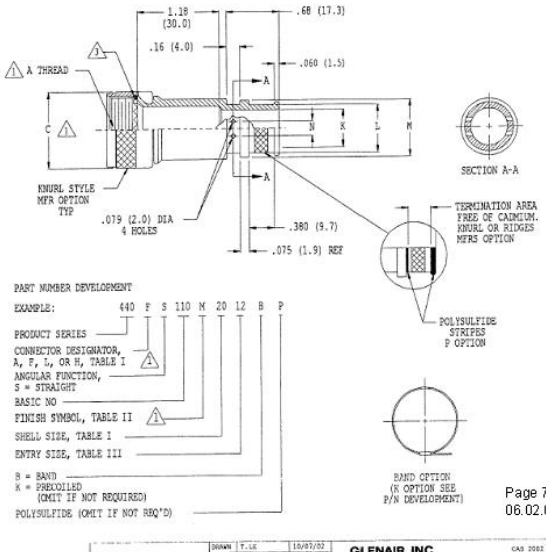
SIH Multicore-cable shield „Daisy-chain“ Interconnection

CVV ext. Cryo-Harness Receptacle Backshell at SVM I/F-CB

440-110

TABLE I				
SHELL SIZE		MAX AVAILABLE ENTRY		
A, F, L	H	A	F & H	L
08	09	02	02	32
10	11	03	03	33
12	13	04	04	34
14	15	34	05	35
16	17	35	06	36
18	19	06	35	07
20	21	07	37	08
22	23	08	09	09
24	25	09	10	10
28		10		
32		13		
36		14		

TABLE III						
DASH NO	K DIA		L DIA		M DIA	N DIM
02	.250	(3.2)	.375	(9.5)	.937 (11.1)	.171 (4.3)
32	.312	(7.9)	.438	(11.1)	.500 (12.7)	.197 (5.0)
03	.375	(9.5)	.500	(12.7)	.562 (14.3)	.197 (5.0)
33	.438	(11.1)	.562	(14.3)	.624 (15.8)	.197 (5.0)
04	.500	(12.7)	.625	(15.9)	.687 (17.4)	.197 (5.0)
34	.562	(14.3)	.688	(17.5)	.750 (19.1)	.197 (5.0)
05	.625	(15.9)	.750	(19.1)	.812 (20.6)	.197 (5.0)
35	.688	(17.5)	.812	(20.6)	.874 (22.2)	.197 (5.0)
06	.750	(19.1)	.875	(22.2)	.937 (23.8)	.197 (5.0)
36	.812	(20.6)	.938	(23.8)	1.000 (25.4)	.197 (5.0)
07	.875	(22.2)	1.000	(25.4)	1.062 (27.0)	.197 (5.0)
37	.938	(23.8)	1.062	(27.0)	1.124 (28.5)	.197 (5.0)
08	1.000	(25.4)	1.125	(28.5)	1.187 (30.1)	.197 (5.0)
38	1.062	(27.0)	1.188	(30.2)	1.250 (31.8)	.197 (5.0)
09	1.125	(28.5)	1.250	(31.8)	1.312 (33.3)	.197 (5.0)
10	1.250	(31.8)	1.375	(34.9)	1.437 (36.5)	.197 (5.0)
11	1.375	(34.9)	1.500	(38.1)	1.562 (39.7)	.197 (5.0)
12	1.500	(38.1)	1.625	(41.3)	1.687 (42.8)	.197 (5.0)
13	1.625	(41.3)	1.750	(44.5)	1.812 (46.0)	.197 (5.0)
14	1.750	(44.5)	1.875	(47.6)	1.937 (49.2)	.197 (5.0)
15	1.875	(47.6)	2.000	(50.8)	2.062 (52.4)	.197 (5.0)
16	2.000	(50.8)	2.125	(54.0)	2.187 (55.5)	.197 (5.0)



NOTES:

1. SEE SHEET 2 (COMMON INTERFACE DETAIL).
2. FOR EFFECTIVE GROUNDING, CONNECTOR WITH CONDUCTIVE FINISH SHOULD BE USED.
3. O-RING NOT SUPPLIED WITH CONNECTOR DESIGNATOR "A".
4. MATERIAL/FINISH:
   ADAPTERS, COUPLING NUT - AL ALLOY/SEE TABLE II
   O-RING -SILICONE/N.A.
   BAND - CRES/PASSIVATED

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED
1	PRELIMINARY	10/07/02	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: FRACTIONS ± 1/16, DECIMALS .XX ±.03, .XXX ±.015, ANGLES ± 2°
DO NOT SCALE THIS DRAWING
R/F 02-1376 | P/C 443

DRAWN	T.LE	10/07/02
CHECK	P.OAKES	10/07/02
ENGR	R.PAINTER	10/07/02

GLENAIR, INC. CAD 2002
1211 AIR WAY - GLENDALE - CALIFORNIA 91201

BACKSHELL, RFI/EMI, BANDING, FOR CONNECTORS PER TABLE I

CODE IDENT. NO.	SIZE		REV.
06324	C	440-110	1

SCALE N/A | WEIGHT N/A | SHEET 1 OF 2

NON REPEATABLE COMMERCIAL ITEM

CVV external Plug-connector with solid solder spills

197-012

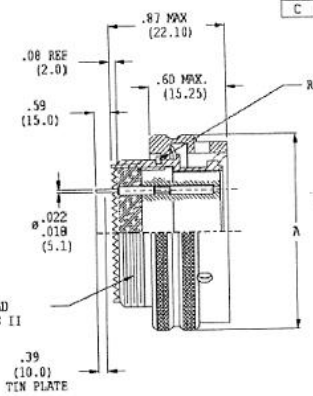
TABLE I			
SHELL SIZE	INSERT ARRANGEMENT	A DIA MAX	B THREAD CLASS 2A
18	18-35	1.391	1.062-18 UNEF
22	22-35	1.656	1.312-18 UNEF
24	24-35	1.777	1.438-18 UNEF

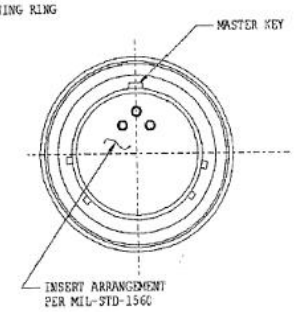
REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED
A	RELEASED	3/28/02	GSB
B	REVISED PER DCN 20019	10/31/02	GSB
C	REVISED PER DCN 20129	11/21/02	GSB

PART NUMBER DEVELOPMENT

EXAMPLE: 197 - 012 18 - 35 S

- PRODUCT SERIES
- BASIC NO.
- SHELL SIZE
- INSERT ARRANGEMENT
- CONTACT STYLE
  P= PIN
  S= SOCKET





1. ASSEMBLY IDENTIFIED WITH MANUFACTURER'S NAME AND P/N SPACE PERMITTING.
2. MATERIAL/FINISH:
   BARREL, COUPLING - AL ALLOY/ELECTROLESS NICKEL.
   WAVE WASHER - STAINLESS STEEL/PASSIVATE.
   CONTACTS - COPPER ALLOY/GOLD PLATE (TIN PLATE @ ENDS)
   INSULATORS - HI-GRADE RIGID DIELECTRIC/N.A.
   FILLER - EPOXY POTTING/ N.A
3. CONSULT FACTORY FOR ADDITIONAL SHELL SIZES AND INSERT ARRANGEMENTS.
4. METRIC DIMENSIONS (IN PARENTHESIS) ARE FOR REFERENCE ONLY AND ARE BASE ON 1 INCH = 25.4 mm

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONS ± 1/16
DECIMALS .XX ±.010
.XXX ±.005
ANGLES ± 1°
DO NOT SCALE THIS DRAWING
B/F01-1021 P/C

DRAWN TKN 12/07/01
CHECK
ENGR P.OAKES 12/07/01

GLENAIR, INC. CAD 1991
1211 AIR WAY GLENDALE, CALIF. 91201

PLUG, CONNECTOR, PC TAIL
MIL-C-38999, SERIES II

CODE IDENT. NO. 06324 | SIZE B | 197-012 | REV. C
SCALE N/A | WEIGHT N/A | SHEET 1 OF 1

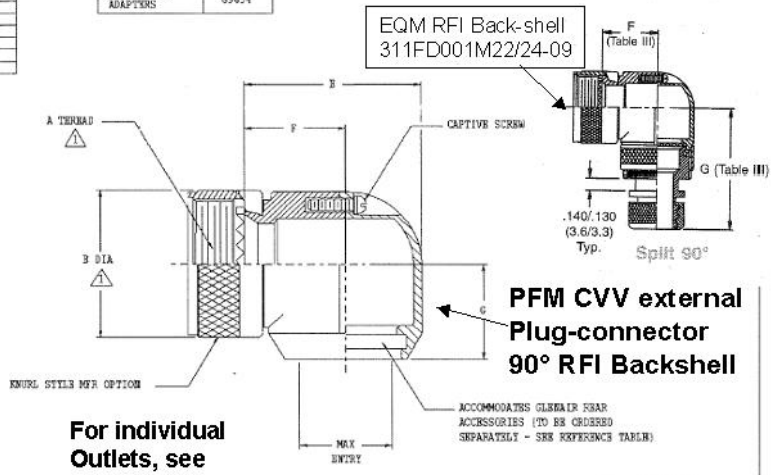
G9254

TABLE I						
SHELL SIZE A,D,F,H,J,S	SHELL SIZE E	B MAX REF	F MAX	G ENTRY	MAX ENTRY	ELBOW SIZE REF
08	09	.98	.68	.56	.250	08
10	11	1.11	.75	.62	.375	10
12	13	1.23	.81	.69	.500	12
14	15	1.36	.87	.72	.625	14
16	17	1.48	.93	.82	.750	16
18	19	1.60	1.00	.88	.875	18
20	21	1.73	1.06	.94	1.000	20
22	23	1.85	1.12	1.00	1.125	22
24	25	2.07	1.18	1.06	1.250	24
28	-	2.34	1.34	1.22	1.375	28
36	-	2.81	1.56	1.41	1.875	36
40	-	3.07	1.69	1.62	2.060	40
61	-	2.07	1.18	1.06	1.250	61

REFERENCE TABLE	
ACCESSORY TYPE	GLENAIR DRAWING
RFI/EMI ADAPTERS	G9255
SHRINK BOOT W/ BRAIDED SHIELD	G9256
STRAIN RELIEF ADAPTERS	G9267
SHRINK BOOT ADAPTERS	G9654

REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED
A	REVISED PER DCN 44414	10/27/93	R.P.
B	REVISED PER DCN 44445	11/21/93	T.P.
C	REVISED PER DCN 45391	12/20/95	T.T.
D	REVISED PER DCN 46421	12/09/96	C.T.
E	DRAWING ADD REVISED PER DCN 47748	10/29/97	T.T.
F	REVISED PER DCN 48791	12/09/98	T.T.
G	REVISED PER DCN 49687	12/20/99	T.T.

EQM RFI Back-shell
311FD001M22/24-09



PART NUMBER DEVELOPMENT

EXAMPLE: G9254 A 16 M

- BASIC NO
- CONN DESIGNATOR: A, D, F, H, J, OR S TABLE A
- SHELL SIZE, TABLE I
- FINISH SYMBOL, TABLE II

PFM CVV external Plug-connector 90° RFI Backshell

For individual Outlets, see next sheet

NOTES:

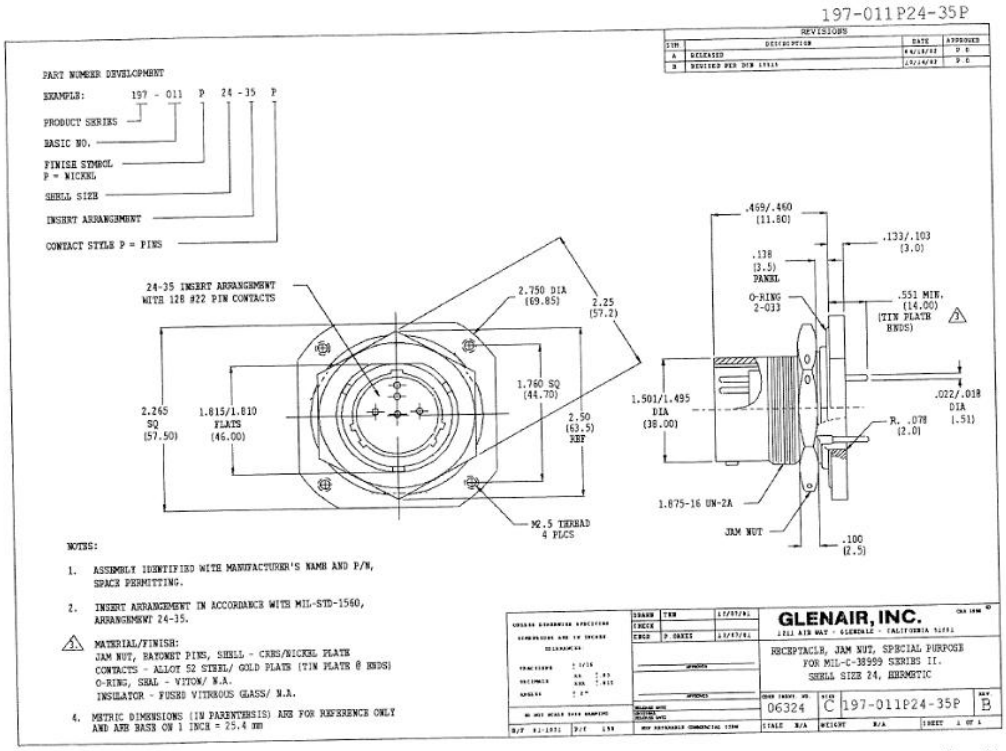
1. SEE SHEET 2 (COMMON ACCESSORY INTERFACE DATA).
2. FOR EFFECTIVE GROUNDING, CONNECTOR WITH CONDUCTIVE FINISH SHOULD BE USED.
3. MATERIAL/FINISH:
   COUPLING NUT, ELBOW - AL ALLOY/SEE TABLE II
   HARDWARE - CRES/PASSIVATED

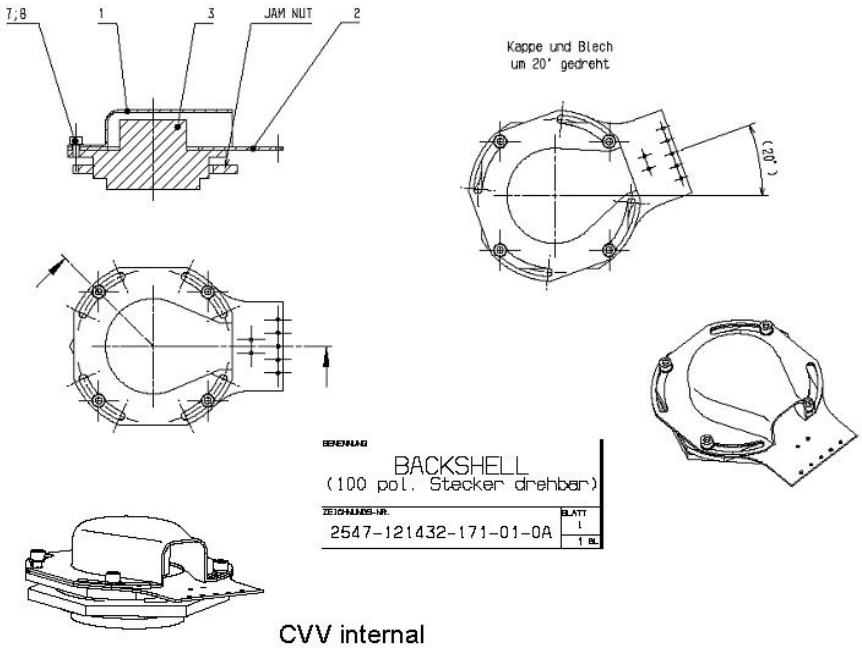
DRAWN T.LE 05/17/91
CHECK G.DUBOIS 05/17/91
ENGR D.OAKES 05/17/91
RELEASED 05/17/91
REVISED 08/26/03

GLENAIR, INC. CAD 1992
1211 AIR WAY - GLENDALE - CALIFORNIA 91201

ELBOW, 90°, SPLIT

CODE IDENT. NO. 06324 | SIZE C | G9254 | REV. G
SCALE N/A | WEIGHT N/A | SHEET 1 OF 2





CVV internal
Feed-through connector Back-shell

CCLRC
Rutherford Appleton Laboratory

6th February 2004

SPIRE-RAL-NOT-001932

To:Wolfgang Rühe

From: John Delderfield

cc:Eric, Doug, Horst, Jeurgen, Guy.

Ref: HO-ASED-FX-0063-04 of 5/2/2004

re:Goretex shield.

Spire neither has a requirement for a Goretex shield, nor a requirement for a lack of it.

This statement has nothing to do with the precise material, Goretex.

Whether or not such a shield is fitted is a matter of constructional implementation, to be decided by the satellite integrator.

The Spire requirement is that the shields around the outer cryoharness are 360° terminated on the 128 ways at the CVV, pass through two 360° terminations at the SVM connector bracket and are fully terminated to closed back-shells at the DCRU. Elsewhere they shall travel close to chassis but not with low electrical impedance joins to chassis.

We know and it has been repeated flagged (i.e. HO-ASED-FX-0063-04 is not pointing out a new specification discrepancy) that the satellite baseline is for a whole series of low impedance chassis joins.

So the means of achieving the Spire requirement is a decision for the manufacturer, not for Spire to decree. He would need to look at wherever these Spire harnesses traverse across metal chassis/panels.

Note that Spire has already agreed to the harness touching the sides of the carbon fibre cable trays down the outside if the CVV, and for the SVM connector brackets to be just glued on to the carbon fibre surface of the top panel. We would anticipate a few Ohms for such contacts, not the milliOhms of a hard ground.

Best Regards.

? John Delderfield 2004.02.06 10:33:10 Z

Received today to same subject.

Annex 5: SPIRE integration procedure commented by ASED.

SPIRE

SUBJECT: **SPIRE FPU Handling and Integration Procedure**

PREPARED BY: **E Sawyer**

DOCUMENT No: **SPIRE-RAL-PRC-001923**

ISSUE: **Draft 2** **Date:** **15/12/03**

CHECKED BY: **……** **Date:** **……**

APPROVED BY: **……** **Date:** **……**

Distribution

Change Record

ISSUE	DATE	
Draft	3/12/03	First draft
Draft 2	15/12/03	Additions from MSSL Inclusion of electrical integration procedure

Table of Contents

Glossary

SPIRE	Spectral and Photometric Imaging REceiver
FPU	Focal Plane Unit
CQM	Cold Qualification Model
PFM	Proto Flight Model
JFET	Junction Field Effect Transistor
RAL	Rutherford Appleton Laboratory
MSSL	Mullard Space Science Laboratory
HSJS	Herschel Spire JFET Spectrometer
HSJP	Herschel Spire JFET Photometer
DCU	Detector Control Unit
FCU	Focal plane Control Unit
L0	Level 0 (zero)
HOB	Herschel Optical Bench
ESD	Electro static Discharge
TBC	To Be Confirmed
OBA	Optical Bench Assembly

References

Applicable Documents

AD1	SPIRE-RAL-DOC-001132	SPIRE warm electronics integration plan [ASED: Please provide copy]
AD2		Cryo-harness cross talk check procedure

Reference Documents

1. INTRODUCTION

2. SCOPE

This document describes the procedures to be followed when handing the SPIRE FPU after delivery to ESA/Alcatel.
It covers the handling and integration procedures to be followed.
It covers both the CQM and PFM units

3. DELIVERY CONDITION

The SPIRE instrument is delivered in the following condition:-

The FPU is supplied in a dedicated, re-useable, container.
Alignment cube is fitted to the FPU. (red tag item). [ASED: If alignment cube is removed, please ensure that if can be re-fitted in a reproducible way, if the FPU has to be taken off the HOB]
FPU aperture cover fitted (red tag item). [ASED: Please provide drawing]
Harnesses Between the FPU and JFETs fitted.
FPU and JFETs attached to a baseplate. [ASED: Please provide drawing with handling and lifting interfaces]
Shorting plus or covers will be fitted to all electrical connectors.[ASED: Connector savings?]
FPU and JFETs double wrapped in polythene or lumalloy film.
[ASED: Clanliness status particular/molecular; contamination control samples inside the container? Grounding/ESD Protection?]

3.1 Shock recorders

Attached to the FPU baseplate, inside the transportation container are re-settable shock recorders [ASED: Indicators?]. These operate in three axis and are set to 5,10 and 25g.
Upon inspection, if any of these recorders have triggered the project team at RAL should be informed.
'Tip and Tell' tilt sensors are attached to the outside of the FPU container.
Upon inspection, if any of these recorders have triggered the project team at RAL should be informed

4. TRANSPORT

4.1 In dedicated experiment containers

Protect from rain and moisture. [ASED: Note that blue silica gel (self indicated) is not allowed!]
Transport in closed vehicles only.
Protect from extremes of temperature, -10°C to +50°C, and prevent the formation of dew at any time.

4.2 After integration on the spacecraft (in spacecraft container) [ASED: Cleanroom 100 conditions]

Protect from extremes of temperature, -10°C to +50°C, and prevent the formation of dew at any time.
Assuming that the cryostat is closed:
FPU Aperture cover (red-tag item) shall be removed
Alignment cube (red-tag item) shall be removed.[ASED: see comment above. If yes, alignment cube will only be removed before the integration of the OBA Thermal Shields]
No other specific requirement.
[ASED: for transport the CVV is closed, evacuated, cooled, OBA in vertical position, z-axis downwards]

5. STORAGE

5.1 In dedicated experiment container

Ensure aperture cover (red-tag item) is fitted.
Protect from rain and moisture.
Protect from extremes of temperature, 10°C to +30°C.
Alignment cube is fitted.

5.2 In spacecraft container [ASED: What is the S/C Container? In case of He filling the CVV will be closed and cold. Ambient conditions: 22+/-3°C, 50%+/-10%, RR100000)

Protect from extremes of temperature, +10°C to +30°C.
Protect from rain and moisture.
No other specific requirements.

5.3 Out of container (in cleanroom, awaiting integration) [RR100?, 22°+/-3°C]

Ensure aperture cover (red-tag item) is fitted.
Alignment cube is fitted

6. HANDLING

6.1 General.

The FPU is a delicate optical instrument and should be handled with extreme care at all time. Contamination of the optical surfaces within the instrument is prevented by the aperture cover. This cover should remain in place unless it is necessary to remove it.
WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. [ASED: loads from

vibration, lateral expansion, thermal tests, etc.?] These are at risk at all times when the FPU is not attached to a rigid plate.

6.2 Unpacking from dedicated experiment container.

The FPU is supplied attached to a baseplate together with the JFETs and the JFET harness already integrated. It is bagged in polythene or lumaloy film.
To remove the FPU and JFETs from its container, the following procedure should be followed: -
In an area with a cleanliness of class 100,000 minimum, undo the eight latches that secure the container lid and remove the lid.
The protective bagging encloses the FPU, JFETs and harness and is taped to the baseplate.
Unscrew and remove the cap head screws [ASED: mm or inch?]that secure the baseplate to the anti vibration mounts.
Attach the lifting frame Ref MSSL/5264/404 to a crane and hydra-set. Lower the lifting frame to the baseplate and attach to the eyebolts provided on the baseplate.

The FPU, JFETs and baseplate can now be lifted out of the container with a crane.
Transport to cleanroom, minimum class 10,000 and remove bagging material.
[ASED: ESD protections? (during handling/lifting)]
[ASED: cleaning of bagging material and baseplate, then transport to RR100 airlock ->remove bagging material ->transport to RR100]

6.3 Preparation for integration. (ASED: standard tooling sufficient or special tools requested)

The FPU is supplied with the JFETs and associated harness already fitted.

The following tasks need to be carried out before integration onto the spacecraft.

a) Fitting of JFET supports.
The JFETs will be fitted to the spacecraft together with the FPU. They will need supporting during this activity.
A support beam is supplied for this purpose. [ASED: Please provide drawings and further details to check feasibility of integration on HOB]
Position the support beam on the top of the FPU as shown in fig…… Connect the wire support straps to the JFET boxes as shown.

b) **Fitting of Lifting attachment [ASED: Provide drawings]**
Fit the lifting attachment to the FPU as shown in fig…….

c) **Alignment cube.**
The FPU is supplied with the alignment cube fitted, and should be left in place until all alignment activities are complete.[ASED: see above]

d) **Removal from baseplate**
WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. These are at risk at all times when the FPU is not attached to a rigid plate.

Undo the five M4 fasteners which secure the Photometer JFET rack (HSJP) (8 JFETs) to the baseplate.
Undo the four M4 fasteners that secure the Spectrometer JFET rack (HSJS) (2 JFETs) to the baseplate. Note that two of these fasteners are studs with nuts on the top, the nuts should be removed and the studs left in place.[ASED: Explain why]
The three L0 straps are also secured to the baseplate. To release these, undo the 4 off M4 fasteners on each strap and remove. NOTE. The underside of these straps form the thermal interface to the spacecraft helium tank pods. Their surfaces are flat and soft gold plated, these surfaces can easily be damaged and the thermal performance of the instrument may suffer as a result.
Remove the Level 0 straps from the supports by undoing the clamps at the top of the strap support frames and the bolts at the joining plates, situated after the light traps.
Unbolt the cone from the FPU by undoing the M8 nut, thus leaving the cone on the baseplate.
Undo and remove the 8 fasteners that attach the FPU to the baseplate.
The FPU and JFETs can now be lifted from the baseplate.
Undo and remove the FPU cone from the baseplate and re-attach it onto the spacecraft deck [ASED: Optical Bench?]. Note: there are special washers (part number A3/5264/302-3) under the head of each screw and also Vespel insulating bushes (A3/5264/302-2) either side of the mounting flange.
Torque the screws to 8.1 Nm. [ASED: Tolerance?]
The FPU and JFETs are now ready for integration. [ASED: Sketch would be helpful]

[ASED - General Comments: Confirm that all supports, baseplate are with mm threads. All screws M4, M5, M6 need torque indication]

6.4 Preparation for packing (not planned under normal circumstances [ASED: true? EQM needs to be packed.).

All units should be wrapped in clean film and replaced in their transit containers. The FPU should be refitted to its baseplate using the following procedure:

Assuming activities described in section 6.3 have been carried out, and the FPU and JFETs are supported on a crane, with the FPU mounting cone still attached to the Spacecraft deck [OB Plate].
Remove the cone mount from the spacecraft deck (OB Plate].
Fix the cone to the SPIRE baseplate using the four M6x21 cap head screws. Note: there are special washers (part number A3/5264/302-3) under the head of each screw and also Vespel insulating bushes (A3/5264/302-2) either side of the mounting flange.
Torque the screws to 8.1 Nm.
The Spectrometer JFET studs (2 off) as indicated on interface drawing 0-KE-0104-360. Should still be fitted to the baseplate
Lift the FPU and JFETs using the lifting gear as described in section 6.
Very gently lower the assembly onto the baseplate, ensuring that the JFET studs engage on the JFETs and the cone mount engages in its location on the FPU.
NOTE: the cone is very thin walled section and large moments can be applied if the FPU is not lowered with its interface plane parallel to the baseplate
When all units are resting on the baseplate, fit the attachment screws (M6X21) to the bipod feet as for the cone mount, torque the screws to 8.1 Nm.
Fit the M8 kaylock nut and Belleville washer to the mounting cone. Torque to 8.25 Nm.
Remove the lifting/handling fixture.
Fit the two long bolts and two nuts to secure the spectrometer JFET. Torque the screws to 2.1 Nm.

Fit the 5 long bolts to secure the photometer JFET. Torque the screws to 2.1 Nm.
Secure the L0 straps to the baseplate using M4X20 socket head cap screws. Torque the screws to 1.5 Nm.
Cover the FPU and JFETs with a double layer of clean polythene or lumaloy film and secure each one with tape to the baseplate.
Fit the lifting frame …….. to the four eyebolts in the plate.

6.5 Packing in containers.

Lift the plate into the container.
Remove lifting frame.
Secure baseplate to the anti-vibrations mounts in the floor of the transit container.
Fit container lid.

7. INTEGRATION

7.1 Required tools/MGSE

SPIRE supplied tools/MGSE:-

FPU handling frame.
JFET support beam
FPU/JFET/baseplate lifting gear
JFET fixation screws, special screws
Temporary FPU Grounding Strap including M4 x 6mm fastener to connect to OBA [ASED: Please clarify the required I/F to OB Plate. Not foreseen in OBA baseline].

Supplied by spacecraft
[ASED: More specified in detail (material, standard etc.)

Crane, with 'Hyroset' Hydraset
Fixation bolts,
FPU M6 12 off - [LN or …]
L0 straps M4 16 off -
L0 pressure plate 4 off
L1 strap M8 2off, M3 4off
L3 strap M4 4off
Torque wrench [range?]
Allan key, spanners etc
DVM for electrical isolation testing

ASED Comments:

Supplied by SPIRE:
- L3 pressure clamp 2-off
- JFET Thermal washers, Fixation stuts and bolts ?? M4 4off, M4 5-off (two stuts)
- L1 electrical insulation Kapton tape

7.2 Mechanical integration to spacecraft. (ASED: ESD precautions?, according assembly drawing/part list?)

FPU and JFETs

Assuming activities described in section 6 have been carried out, and the FPU and JFETs are supported on a crane.

Torque the screws to 8.1 Nm. [which screws?]

Fix the Spectrometer JFET studs (2 off) as indicated on interface drawing 0-KE-0104-360. Note these should be screwed into the HOB until 37mm [ASED: JFET Issue J: 45mm] of stud are protruding from the surface.

Lift the FPU and JFETs using the lifting gear as described in section 6.

Very gently lower the assembly onto the HOB, ensuring that the JFET studs engage on the JFETs and the cone mount engages in its location on the FPU.

The flexible ends of the L0 straps are unsupported at this stage and will need to be guided into place as the FPU is lowered. [ASED: The Detector strap need to be dismounted before integration on HOB. Is guidance of the two remaining straps by a hand/person ok?]

NOTE: the cone is very thin walled section and large moments can be applied if the FPU is not lowered with its interface plane parallel to the HOB

When all units are resting on the HOB, fit the attachment screws (M6X21) to the bipod feet as for the cone mount.

Fit the two Bellville washers and the M8 Kaylock nut to the cone mount. Torque to 8.25Nm.

Remove the lifting/handling fixture.

L0 straps

The light baffles, upper flexible strap and the Torlon A frames should already be in place on the FPU.

Move the level 0 main strap into place and align the dowel holes (see Assembly drawing 5264/xxx).

Place the cold strap support clamp plates over the top.

Push in Dowels and ensure that the flexibles are aligned. Fit the twelve 0-80 [??] fixings to the cold strap support clamp plates to secure the main strap. Torque to xxxx Nm.

Ensure that the lower flexibles align with the pod interface. Fit the attachment screws (ten M4 For the evaporator strap, six M4 screws for the pump Strap and six M4 screws for the spectrometer detector box strap).

Torque to xxxx Nm.

Fit the joining plates of the main supports to the joining plates of the upper flexibles, using 24 4-40 [??] bolts and Kaylock nuts. Torque to xxxx Nm.

L1 straps.

Fit the two L1 straps to the FPU using at each location, one Bellville washer type B0750-056-S and one M8 bolt, torque to 10.5 Nm. And two M4 bolts and two Bellville washers (type B0375-020-S) under each screw head. Torque to 1.5 Nm. Note a small amount of low vapour pressure lubricant, e.g. Apiezon AP100 ?? [ASED - Note: Are in RR100 environment], should be used on the M4 screws as these are locking inserts. On final assembly the two M8 fasteners to be wire locked together. (ASED: Accessibility if other FPU's already installed? Who will deliver the wires? Screws to be prepared for wire locking.)

L3 straps.

Fit the two L3 straps to the JFETs using the attachment hardware as shown in interface drawings 0-KE-0104-350 and 0-KE-0104-360. Torque to 2.5 Nm. [ASED: L3 thermal strap clamp provided by SPIRE]
Note. Spacecraft temperature sensors fit to this interface. [ASED: two sensors on each clamp]

Isolation test

Measure and record the electrical isolation between the chassis of the FPU and the cryostat. Fix the temporary grounding strap from the FPU to the OBA [ASED: There is no I/F foreseen on the OBA. To be checked]. Repeat the measurement of the resistance between the cryostat and the FPU to ensure that grounding has been successful. (ASED: What values to be achieved?)

7.3 Electrical integration

7.3.1 General

Several subsystems with the SPIRE FPU are ESD sensitive, and especially vulnerable during the integration process. All normal precautions shall be taken when handling the FPU especially when open connectors are present.

Assumptions:

1. The cryoharness has been routed on the S/C and the grounding checked as per 7.3.2 below.
2. The FPU, JFP and JFS are mechanically integrated to the OBA and are temporarily grounded to OBA chassis.
3. The warm electronics have been integrated on to the SVM as per 7.3.3

7.3.2 Cryo-Harness check

Before any electrical integration of the SPIRE FPU a check of the grounding within the cryoharness shall be carried out. This must verify that the FPU Faraday shield[1] is isolated from the chassis of the CVV/SVM when the Cold SIH, the Intermediate SIH and the Warm SIH are routed on the S/C but not mated with either the focal plane units or the SVM units. To verify this, it may be necessary to temporarily isolate the un-mated cryoharness connectors of the cold units from the CVV.

7.3.3 Warm electronics units integration.

Before any electrical integration of the SPIRE FPU, the warm electronics shall be integrated according to the warm electronics integration plan. AD 1.

7.3.4 Cryo-harness Cross talk checks

Before any electrical integration of the SPIRE FPU, a cross talk check of the cryo-harness shall be carried out. This is described in a separate document AD2

[1] The FPU Faraday Shield is fully explained in the SPIRE Harness Definition Document, SPIRE-RAL-PRJ-000608, Issue 1.1, 05/03/03.

7.3.5 Electrical Connection. (ASED: step by step procedure would be helpful)

When delivered, the JFET units will be fitted with shorting connectors and/covers to protect the detectors. These should be left in place during the mechanical integration.

NOTE: This order of connection must be maintained to protect the sensitive electronics in the SPIRE FPU and warm electronics.

Connect the cryo-harness to connectors J19 to J30 on the FPU.
Connect the warm end of the cryoharness to connectors, J11, J12, J13, J14, J17, J18, J19, J20, J21, J22 J23, J24, J25, J26, J29, J30, on the FCU.
At the warm end of the cryo-harness SPIRE supplied shorting plugs (these plugs will be supplied on a panel with the same layout as the DCU (tbc) shall be fitted to the connectors on the cryo-harness that connect to the fixed connectors, J5 to J28, on the DCU.
HSJFS harness should be connected to connectors J1 to J8 on the spectrometer JFET (HSJFS), removing the connector covers one at a time and connecting the harness to that connector.
HSJFP harness should be connected to connectors J1 to J24 on the photometer JFET (HSJFP), removing the shorting plugs or covers one at a time and connecting the harness to that connector.
Connect the HSJFS bias harness to connectors J9 and J10, on the spectrometer JFET (HSJFS), by removing the shorting plugs one at a time.
Connect the HSJFP bias harness to connectors J25 to J28, on the Photometer JFET (HSJFP), by removing the shorting plugs one at a time.
Connect the warm end of the cryoharness to the DCU by removing the bias harness, connectors J29 to J32 one at a time from the shorting panel and connecting them to J29 to J32 on the DCU.
Repeat the process for J5 to J28.
Remove the temporary ground strap from the FPU.[ASED: See above]
[ASED: Connector savers required?]

7.4 Grounding verification

On the DCU and FCU cryoharness connectors, break all the connections between the FPU Faraday Shield Link and the EMC backshells.

Measure and record the isolation resistance between the FPU Faraday Shield links and the chassis of the DCU.

Reconnect all the links between the FPU Faraday Shield Links and the Cryoharness EMC backshells.

The electrical integration is now complete.

[ASED: Start of SFT Warm possible?

7.5 Electrical disconnection

Disconnection is the reverse of connection

7.6 Removal from spacecraft.

WARNING: The bipod legs on two corners of the instrument are very thin section and easily damaged. Care must be taken at all times not to put side loads into these items. These are at risk at all times when the FPU is not attached to a rigid plate.
Unbolt the cone from the FPU by undoing the M8 nut, thus leaving the cone on the baseplate.
Remove all electrical connections, see section 7.4
Undo the five M4 fasteners which secure the Photometer JFET rack (HSJFP) to the HOB.
Undo the four M4 fasteners that secure the Spectrometer JFET rack (HSJFS)to the HOB. Note that two of these fasteners are studs with nuts on the top.
Undo the 6 off M4 fasteners on each L0 strap and remove, separate the cold strap from the helium tank pod. NOTE. The underside of these straps form the thermal interface to the spacecraft helium tank pods. Their surfaces are flat and soft gold plated, these surfaces can easily be damaged and the thermal performance of the instrument may suffer as a result.
Remove the Level 0 straps from the supports by undoing the clamps at the top of the strap support frames, the lower flexibles from the spacecraft pod interface and the bolts at the joining plates with the upper flexibles.
Undo and remove the one M8 and two M4 screws from each of two L1 cold strap interface, separate the cold strap from the FPU
Undo and remove the two M4 screws from the L3 interfaces on each JFET, separate the cold strap from the JFET.
Undo and remove the 8 fasteners that attach the FPU to the baseplate.

The FPU and JFETs can now be lifted from the HOB

8. RED TAG ITEMS

The following red tag items are fitted to the FPU when delivered.

1 An aperture cover
2 Alignment cube [ASED: see above]
3 Temporary grounding strap [ASED: details to be provided, not part of baseline]

When removed all red tag items shall be bagged and stored in the dedicated “red tag box”.

The aperture cover is removed by unscrewing the four 2-56 cap head screws [Clarify screw type. Inch?] and lifting the cover clear.

The alignment cube is removed by unscrewing the three fixing screws and lifting clear.

9. GREEN TAG ITEMS

There are no green tag items