



## Minutes of Meeting

Date:	17.04.07	<b>Herschel</b>	
Doc.-No.:	HP-2-ASED-MN-1332		
Meeting place:	ASED FN	Chairman:	D.Hendry
Date/Time:	08-30 hrs	Secretary	D.Hendry
Agenda dated:		Close of Meeting:	10-00 hrs

Subject: IRR for SPIRE FPU PFM

Participants:	S. Idler, ASED D.Hendry, ASED A.Koppe ASED R.Stritter ASED Pt J.Lang ASED U.Gageur ESA E.Sawyer RAL A.Pearce RAL	<i>(Handwritten signatures: S. Idler, D. Hendry, A. Koppe, U. Gageur, E. Sawyer, A. Pearce)</i>	Additional Distribution:	ESA AAS-F
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Page: 1 of 8 Page(s)

Brief-Minutes (except following sheets)

Summary of Results of Sheets 2 till

Release for the integration of the SPIRE FPU PFM into the Herschel PFM PLM is given, pending redline update of the Mechanical and Electrical integration procedures as identified in these Mom.

Reference	Results	Remarks
	<p><u>AGENDA</u></p> <p><b>IRR Agenda :</b></p> <ol style="list-style-type: none"> <li><b>1. H/W Identification (Model, SN#, CI#, CIL)</b></li> <li><b>2. Qualification / Acceptance Reference / Status of H/W to be integrated</b></li> <li><b>3. H/W ABCL Reference / Status</b></li> <li><b>4. H/W ADP Reference / Status</b></li> <li><b>5. Integration Procedure / Status</b></li> <li><b>6. DRB MoM</b></li> <li><b>7. NCRs potentially affecting integration (H/W side, PLM side)</b></li> <li><b>8. Open Work Status</b></li> <li><b>9. Cleanliness / Inspection Report / Reference</b></li> <li><b>10. Safety and ESD Constraints</b></li> <li><b>11. AOB</b></li> <li><b>12. Release for Integration</b></li> </ol>	



Reference	Results	Remarks
	<p><b>Introduction:</b>            This IRR covers the integration of the SPIRE FPU PFM into the PFM PLM at ASED FN            Both mechanical and Electrical ( CVV internal) integration will be performed,            The activities will be performed by ASED AIT personnel supported by RAL personnel</p> <p><b>1. H/W Identification (Model, SN#, CI#, CIL)</b></p> <p>H/W to be integrated is the SPIRE FPU PFM :</p> <p>FPU FPU with (see SPIRE-RAL-PRC-002802 Iss 2 Section 2 for list of H/W)</p> <ul style="list-style-type: none"> <li>• Aperture cover (red tag item)</li> <li>• Alignment cube</li> <li>• Spectrometer JFET assembly</li> <li>• Photometer JFET assembly</li> <li>• Harness between FPU and JFETs</li> <li>• JFET fixation hardware</li> <li>• Isolation washers, special screws and studs.</li> <li>• LO straps (2 fitter to the FPU , 1 to be fitted during the interation)</li> </ul> <p><b>2. Qualification / Acceptance Reference / Status of H/W to be integrated</b></p> <p>FPU PFM hardware is fully flight standard.</p> <ul style="list-style-type: none"> <li>• All interface connectors of SPIRE FPU/JFETs are flight standard and can be connected directly to the flight cryoharness</li> </ul> <p>See NCR section for NCRs affecting Integration            ASED-1340            RAL-171</p>	



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Reference	Results	Remarks
	<p><b>3. H/W ABCL Reference / Status</b></p> <p>SPIRE-RAL-DOC-002840 , issue 2,            Herschel ISL HP-2-ASED-LI-0032 dated 17.04.07</p> <p><b>4. H/W ADP Reference / Status</b></p> <p>SPIRE-RAL-PRJ-002017, issue 2            The EIDP is in the process to be updated in accordance with the actions from the DRB</p> <p><b>5. Integration Procedure / Status</b></p> <p>HP-2-ASED-PR-0083 Iss 1 Mechanical integration.            The draft issue 1 was distributed and the comments received from ESA and RAL included in the formal iss 1            Procedure will be redlined to include steps for resistance/isolation measurements during the mechanical integration.</p> <p>SPIRE-RAL-PRC-002802, Electrical integration.            Procedure will be redlined to include cleanliness protection and inspection of FPU and JFET connectors CRISTEK            during mating and demating NCR RAL-171.            Also minor updates to connector integration sequence and electrical measurements. CVV internal only.</p> <p><b>6. DRB MoM</b></p> <p>ESA-SCI-PT-46497 dated 14/03/07 Pre DRB            ESA-SCI-PT-46562 dated 15.03.07            Open work and open actions from these Mom are covered in sec 8 of these Mom</p>	

Reference	Results	Remarks
	<p><b>7. NCRs potentially affecting integration (H/W side, EPLM side)</b></p> <p>ASED NCR-1340 on the jack-posts To be checked during integration.</p> <p>ASED-NCR-2393 Resistance measurements. Partial shorting between JFET and OBA was investigated during CQM de-integration. 2 areas were identified.</p> <p>a) MLI integration NRB to be held prior to MLI integration with input from RAL in the form of a TN identifying the critical isolation joints.</p> <p>b) carbon fibre bushes for JFET mounting, the loose fibres caused shorting to the mounting bolts. The corrective action was to coat the inner surface of the bushes with epoxy and coat the bolts. A visual inspection will be performed prior to integration and the isolation will be checked during integration.</p> <p>RAL-NC-171 Cristek connector gasket cracking. RAL have updated the NCR with the results of the effect of cracking on a sample connector. ESA confirm to use as is, considering detail inspections and cleanliness protection for potential debris during mating/demating. The electrical integration procedure will be updated accordingly.</p> <p>EMC related NCRs are being process and potential changes to the CVV external connection HW are under consideration, but do not affect this integration.</p> <p><b>8. Open Work and Actions Status</b> Actions from DRB with impact on the FPU integration.</p> <p>A.23 Cleanliness, ESA samples taken at out going inspection were within spec. CLOSED          A.33 Delivery of Electrical Integration procedure, now delivered. CLOSED          A.91 ASED wipe tests during incoming inspection. The samples are waiting analysis. Open Work</p>	



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Reference	Results	Remarks
	<p>The following is a list of open work identified during the meeting</p> <ol style="list-style-type: none"> <li>1. Redline Mech Integration procedure HP-2-ASED-PR-0083</li> <li>2.Redline Elec Integration procedure SPIRE-RAL-PRC-002882</li> <li>3. Results of wipe tests</li> <li>4. Inspect Cristek connector gaskets (NCR RAL-171)</li> <li>5. Check connector jack post insertion during elec integration.</li> <li>6. Visual inspection of JFET mounting bushes and bolts (NCR ASED-2393)</li> </ol> <p><b>9. Cleanliness / Inspection Report / Reference</b>            RAL Cleanliness Cert see annex.            Out going Inspection SPIRE-RAL-REP-002862 dated 29.03.07 ESA cleanliness samples within spec.            See incoming inspection report HP-2-ASED-II-0195 dated 05.04.07 see annex            Bench Test Ref SPIRE-RAL-NOT-002318 Iss 12.</p> <p>Additional tape-lift and a wipe test were performed by ASED during incoming inspection, analysis ongoing, results will be reported.</p> <p><b>10. Safety and ESD Constraints</b></p> <p>Making Spire ESD safe SPIRE-RAL-NOT-002028</p> <p>Herschel ESD rules for PLM and S/C integration activities, HP-2-ASED-PR-0062, shall be considered.</p>	



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Reference	Results	Remarks
	<p><b>11. AOB</b> Planning/schedule: Mechanical Integration planned 17.04.07 PM Electrical Integration 18.04.07 AM</p> <p>Personnel: ASED Instrument Coordinator A.Koppe ASED Mech AIT T.Bayer ASED Elect AIT A.Grasl ASED QA T.Schmidt RAL Engineering E.Sawyer RAL Engineering A.Pearce</p> <p><b>12. Release for Integration</b></p> <p>The release for the integration of the SPIRE FPU PFM into the Herschel PFM PLM is given, pending redline update of the Mechanical and Electrical integration procedures as identified in these Mom.</p>	

Meeting: HP-2-ASED-MN-1332  
Title: IRR for SPIRE FPU PFM  
Date: 17.04.07

## Action Item List

Herschel

No.:	Description:	Due Date	Originator Comp./Pers.	Actionee Comp./Pers.	Source	Completion
01						
02						
03						



**NCR Number:      HR-SP-RAL-NCR-171v2**

Spacecraft / Project	Herschel / SPIRE	Originator's Name	Dion Dawson
Experiment / Model	FPU/PFM	Signature	
Sub-System	connectors	Date	29 March 2007 – 5 Apr-2007
Assembly		Level (Highlight if applicable)	Major      Minor
Sub-Assembly			
Item	FPU connectors	NRB Reference	NRB at Astrium Attached
Serial Number			

NCR Occurred During (Highlight if applicable)	Manufacture	Inspection	Test	Integration	Other
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**NCR Title**      **Cracking between pins on blue gasket material - outgoing inspection**

**NCR Description**

Cracking was seen in the pin support between pins on FPU flight unit. Connectors numbers J24, J22, J25, J20-cracks seen on blue area inside connectors, alignment of pins OK. Not all connectors were checked as savers were in place. The gasket is not critical to connector operation and not part of the structure of the connector. Therefore the integrity of the connector is not compromised. Mating and de-mating is not expected to cause further degradation as this problem occurs at cryogenic temperatures.

**Cause of NCR**

Probable caused by multiple low temperature cycling during testing. This type of connector is now known to have cracking issues, but this was not known at time of fitting.  
The cracking was not observed at previous inspection, (two cryocycles ago).

**Disposition / Corrective Action**

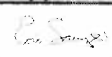

**Actions discussed at NRB at RAL and recorded on this NCR**

- 1) As there are two more planned mating for these connectors, one for electrical testing and one for final mating Further inspection is required before and after each mating.
- 2) Connectors with savers should be checked when savers are removed after delivery.
- 3) As it is now recommended to use as is - subject to no further degradation of connectors before final mating.

The Mating connectors on the Cryo Harness were inspected no defects or damage observed, Connectors on the Photometer Harness that had similar cracks in the Pink Gasket was also inspected No Movement of pins was detected all were solid. It was not possible to check beneath the Gasket Materials but this inspection would suggest no weakening to the connector body.

**SEE ASTRUIM NRB MoM's Attached Conclusion - Use as is**

Document or Drawing Affected (Title, Number & Issue)	Estimated COST OF NCR (cost of : correction, Materials, Resource, and delay to Project etc.)

NCR CLOSED	Name	Sign & Date	
		Approved	Rejected
Project Manager:	Ken King / Eric Sawyer	 <small>Digitally signed by Eric Sawyer Date: 2007.04.13 11:55:10 +01'00'</small>	
Product Assurance:	Eric Clark / Dion Dawson	 <small>Eric Clark 2007.04.13 08:05:19 +01'00'</small>	
CCB-Chairman:			
Principle Investigator			
Product Assurance:	Jan Rautakoski		
Co-Investigator			
Prime Contractor			
ESA Project Office			

NCR Number:

HR-SP-RAL-NCR-171v2

NRB for SPIRE-RAL-NCR 171  
Astrium Friedrichshafen  
4/4/07

Carsten Scharmberg, Doug Griffin, Eric Sawyer, Dave Hendry, Jan Rautakoski (TC)

Points raised by Astrium:-

Is the gasket bonded to the connector?

No the gasket is not bonded, it is a separate item not attached to the body of the connector.

The other connectors were inspected after the original outgoing inspection. No other cracks were found on the four remaining FPU connectors or the JFET connectors.

No loose debris has been found.

The gasket provides no mechanical support to the pins; it is designed to be an environmental seal.

Similar problems have been encountered with connectors at Astrium, also debris has been found after vibration.

Recommendation is to use as is without removing the gasket. If these connectors have to be de-mated then extra precautions need to be taken to avoid distributing the possible debris.

No validation of the mechanical fixation is recommended (no pin wobbling)

It is proposed to inspect similar connectors at RAL which has suffered similar degradation.

Partial unpacking of the FPU down to inner container has been completed.

Electrical interface tests have already been carried out at RAL and will be repeated at Astrium, currently scheduled for 11/4/07

This NRB came to the following conclusions:

The gasket does not contribute to the mechanical integrity.

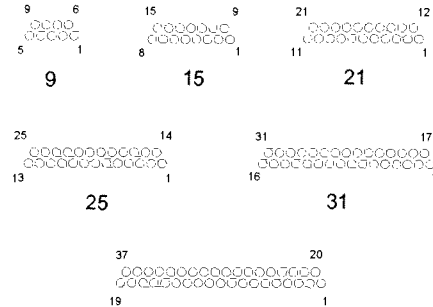
Visual inspection to be carried out after the final electrical interface test.

Ensure extra precautions are taken if these connectors need to be de-mated to avoid spread of possible debris.

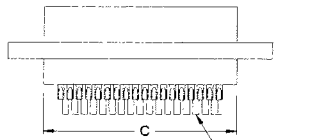
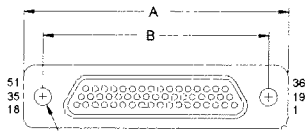
Recommendations: Use as is.

## 1.1 MICRO CONNECTORS / M83513 MICRO D

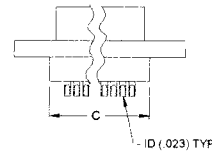
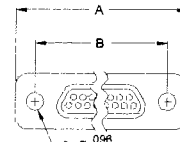
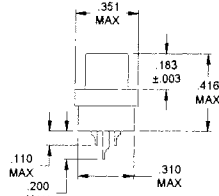
NO. OF CONTACTS	A MAX	B	C MAX
9	.785	.565	.400
15	.935	.715	.550
21	1.085	.865	.700
25	1.185	.965	.800
31	1.335	1.115	.950
37	1.485	1.265	1.100
51	1.435	1.215	1.050
100	2.170	1.800	1.442



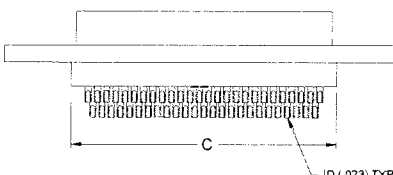
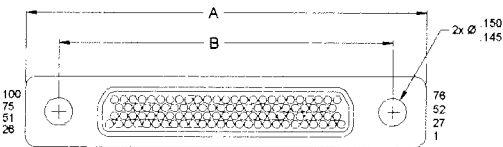
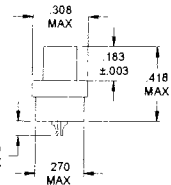
MATING FACE



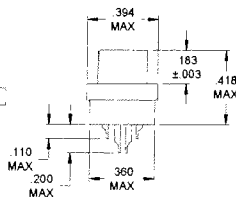
51 CONTACTS



9-37 CONTACTS



100 CONTACTS



CIM 01 - # #

CRISTEK'S P/N EQUIVALENT TO M83513 MIL SPEC.

PLUG, CLASS M, SOLDER CUP PIN CONTACTS

NUMBER OF CONTACTS

A = 9    D = 25    G = 51  
 B = 15    E = 31    H = 100  
 C = 21    F = 37

SHELL FINISH  
 C = CADMIUM  
 N = NICKEL

1. MATERIALS:

SHELL - ALUMINUM PER QQ-A-200/8, QQ-A-250/11, OR QQ-A-591  
 INSULATOR - DIALLYL PHTHALATE PER MIL-M-14, TYPE SDG-F  
 PIN CONTACT - BERYLLIUM COPPER

2. FINISH:

SHELL - CADMIUM PER QQ-P-416, TYPE II, CLASS 3 OVER  
 ELECTROLESS NICKEL PER AMS 2404  
 OR ELECTROLESS NICKEL PER AMS 2404.  
 CONTACT - GOLD PER MIL-G-45204, TYPE II, GRADE C.  
 CLASS I OVER NICKEL PER QQ-N-290.

3. SPECIFICATIONS:

CURRENT RATING ----- 3 AMPS MAX  
 TEMPERATURE RATING ----- 55° C TO +125° C  
 INSULATION RESISTANCE ----- 5000 MEGOHMS MIN  
 DWV AT SEA LEVEL ----- 600 VAC  
 DWV AT 70,000 FT ALTITUDE ----- 150 VAC  
 CONTACT RESISTANCE ----- 8 MILLIOHMS MAX AT 2.5 AMPS  
 LOW LEVEL CONTACT ----- 10 MILLIOHMS MAX  
 RESISTANCE  
 CONTACT RETENTION ----- 5 LB MINIMUM AXIAL LOAD  
 ENGAGEMENT FORCE ----- 6 oz MAX  
 SEPARATION FORCE ----- 0.5 oz MIN

4. ADDITIONAL INFORMATION:

FOR CROSS-REFERENCING CRISTEK PART NUMBERS TO M83513, SEE CROSS REFERENCE INFORMATION IN THE FRONT OF THIS SECTION. FOR MOUNTING HARDWARE OPTIONS, SEE THE HARDWARE PAGES AT THE END OF THIS SECTION

CRISTEK INTERCONNECTS, INC.  
 www.cristek.com  
 1301 S. Lewis St.  
 Anaheim, CA 92805  
 Phone: (714) 618-2000  
 FAX: (714) 535-4897

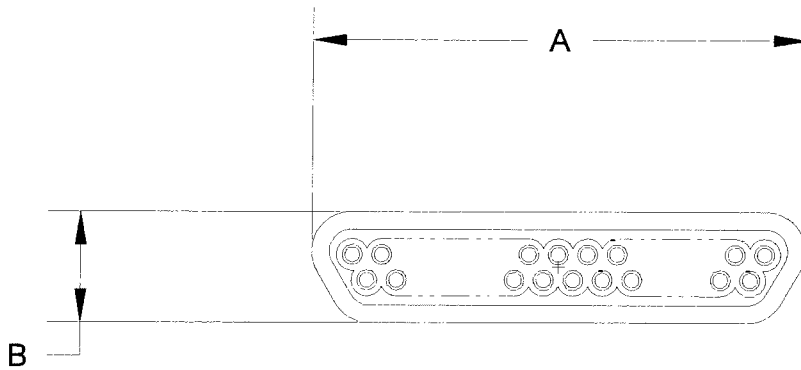
TITLE  
**MICROMINIATURE D METAL SHELL  
 PLUG, SOLDER CUP**

FILENAME  
**ADS-CIM01-1**

DWG. NO.  
**M83513/01**

CODE IDENT NO  
**67720**    SHT **1** OF **1**    REV **D**

TOLERANCE: XXX ±.005    XX ±.01    ANGLE ±1°



ORDERING INFORMATION

2

PART NUMBER	SHELL SIZE	A REF	B REF
C90-00021-01	9	.33	.18
C90-00021-02	15	.48	.18
C90-00021-03	21	.63	.18
C90-00021-04	25	.73	.18
C90-00021-05	31	.88	.18
C90-00021-06	37	1.03	.18
C90-00021-07	51	.98	.23
C90-00021-08	69	1.28	.23
C90-00021-09	100	1.3	.27

1. MATERIAL:  
35-45 SHORE FLUOROSILICONE PER MIL-R-25988.
2. ALL MICRO-D METAL SHELL RECEPTACLE CONNECTORS ARE SHIPPED WITH THIS ITEM INSTALLED. INFORMATION PROVIDED HERE IS ONLY FOR PURCHASING THIS ITEM SEPARATELY.

CRISTEK INTERCONNECTS, INC.  
www.cristek.com  
1301 S. Lewis St.  
Anaheim, CA 92805  
Phone: (714) 618-2000  
FAX: (714) 535-4897

TITLE

MICRO-D  
INTERFACIAL SEAL

FILENAME

ADS-MDIS-1

DWG. NO.

MDIS

CODE/IDENT NO

67720

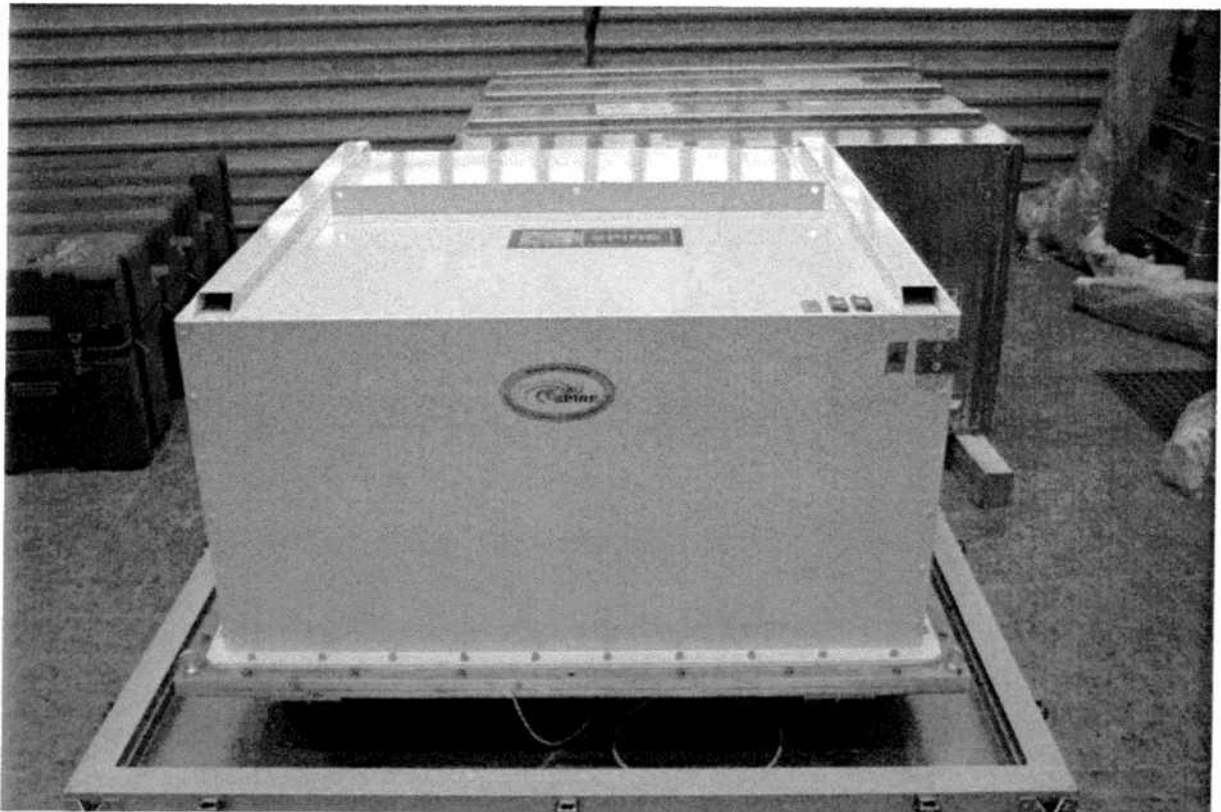
REV

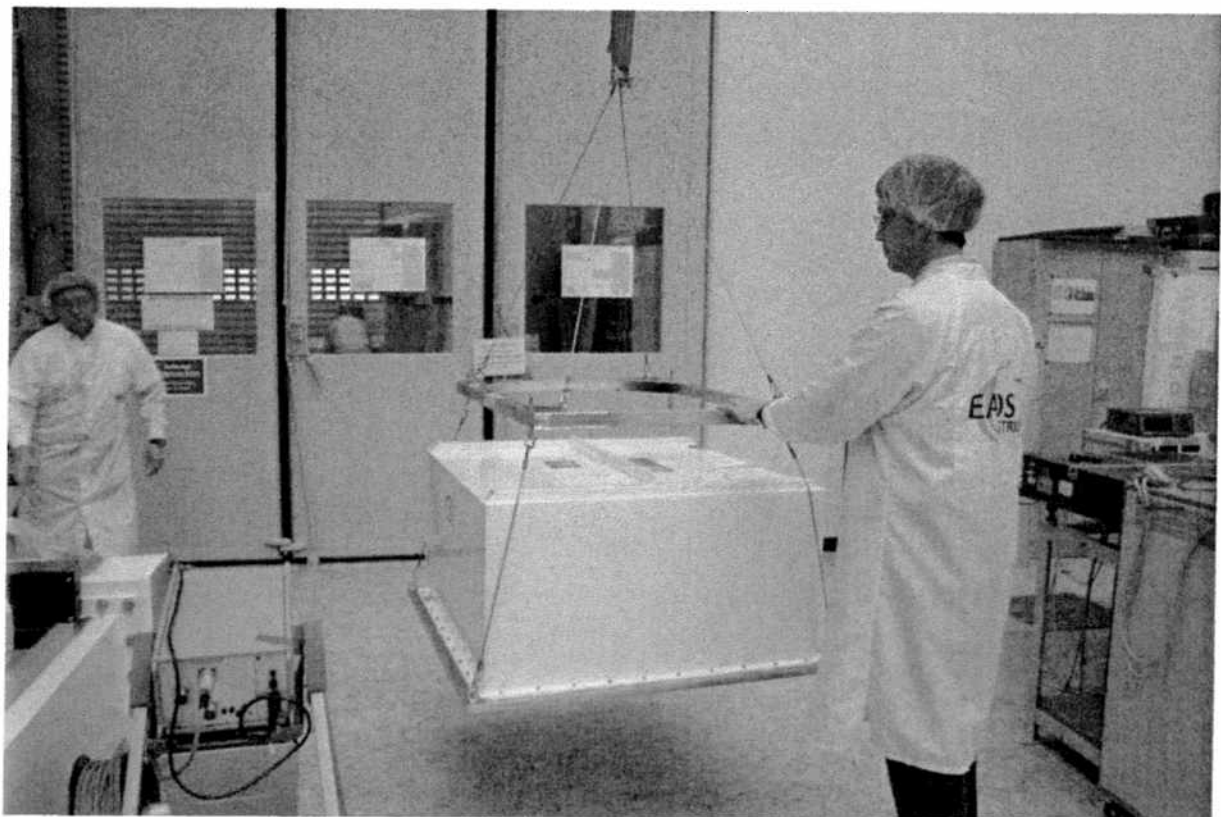
SHT 1 OF 1 A

TOLERANCE: XXX ± .005 XX ± .01 ANGLE ± 1°



<b>EADS Astrium GmbH</b>		<b>Incoming Inspection</b>		Doc.-No.: HP-2-ASED-II-0195	
				Issue: 1	Date: 05.04.07
Item:		<b>SPIRE FPU PFM</b>		Sheet: 1 of 1	
				Received Date: <b>03.04.07</b>	
Supplier: <b>RAL</b>		Model: <b>PFM</b>		Project: <b>Herschel</b>	
Drwg.-No.:		Serial-No.:		Subsystem: <b>SPIRE Instrument</b>	
No.	Item	Yes	No	Remarks	
<b>1</b>	<b>Transportation Container, Outer Packing</b>				
	a Packing undamaged ?	X			
	b Seals and straps intact ?	X			
	c Correct Labelling ?	X			
<b>2</b>	<b>Transportation Container, Inner Packing</b>				
	a Correct Identification (see heading) ?	X			
	b Equipment correctly and safely packed ?	X			
	c Equipment hermetically sealed ?	X			
	d Packed with desiccants ?	X			
	e Packed with humidity-indicators ?	X			
	f Packed with shock-indicators ?	X			
	g Packed with temperature-indicators?		X		
	h Container reusable and stackable ?	X			
<b>3</b>	<b>Equipment</b>			Part 2 II to be performed	
	a Identification correct ?				
	b Screw sealings not broken ?				
	c Surface finish undamaged and clean ?				
	d Connector identification correct ?				
	e Connector with protective caps ?				
	f Connector pins clean and undamaged ?				
	g Mounting area clean and undamaged ?				
	h Accessories ? Bonding points ? Covers ?				
<b>4</b>	<b>Documentation</b>				
	a Shipping documentation ?	X			
	b Log Sheets / Historical Records ?	X			
	c Handling, Packing, Transport. Procedures ?	X			
	d End Item Data Package (ICD) ?	X		SPIRE-RAL-PRJ-002017 Iss 2.0 with H/W	
	e Other Documentation	X		Integration procedures in EIDP	
<b>5</b>	<b>Other notable defects ?</b>			None	
<b>6</b>	<b>Released for : Storage in CL 1000000</b>			Part 2 II including bench test in CW 15	
<b>Remarks / Actions : II preliminary, Check for transport damage and shock indicators.  Removal of outer transport container and store.  Inner container moved to CL 1000000 storage room.  Part 2 II will be performed CW 15 and cover unpacking of inner container,transfer to CL 100 removal of foil bags , visual inspection (NCR 171) , Cleanliness verification and Bench test.</b>					
Distribution : See attached list			Inspector :D.Hendry		Date :04.04.07
			Department :		

ANNEX Photos





Use One Sheet For Each Item Of Hardware (Box, Harness, MLI)

<b>Unit Identification (Instrument Box name and Model)</b>
<b>SPIRE FPU PFM</b>
<b>Harness Bakeout Conditions and Time</b>
All harness baked for min 24 hours at 80 degrees C
<b>MLI Bakeout Conditions and Time</b>
N/A
<b>Supplier / Materials List Reference</b>
SPIRE-RAL-PRJ-001092 Declared materials list
<b>Thermal Vacuum / Balance Test Dates and Report Number</b>
All items baked at subsystem level. No hot thermal vacuum test at FPU level.
<b>QCM and RGA Number</b>
N/A
<b>Results of Witness Plate Measurements from TV test</b>
N/A
<b>Results of Wipes from TV Test (Wipe Positions and Data)</b>
none
<b>Results of Wipes @ Acceptance (Wipe Positions and Data)</b>
<b>Particle Cleanliness (Positions and Data, e.g. Tape Lift)</b>
Cleaned and inspected prior to delivery
<b>Certified (PI Representative) and Date of Acceptance</b>
<div style="display: flex; justify-content: space-between; align-items: flex-end;"> <div style="text-align: center;">   <small>Validity unknown</small> </div> <div style="text-align: center;">  </div> <div style="text-align: right;"> <small>Digitally signed by Eric Sawyer Date: 2007.03.01 11:02:48 Z</small> </div> </div>



	Name	Dep./Comp.		Name	Dep./Comp.
	Alberti von Mathias Dr.	ASG22		Schweickert Gunn	ASG22
X	Barlage Bernhard	AED13		Steininger Eric	AED32
X	Bayer Thomas	ASA42	X	Stritter Rene	AED11
	Brune Holger	ASA45		Suess Rudi	OTN/ASA44
	Edelhoff Dirk	AED2		Thörmer Klaus-Horst Dr.	OTN/AED65
	Fehringer Alexander	ASG13		Wagner Klaus	ASG22
	Fricke Wolfgang Dr.	AED 65		Wietbrock Walter	AET12
	Geiger Hermann	ASA42		Wöhler Hans	ASG22
	Grasl Andreas	OTN/ASA44			
	Grasshoff Brigitte	AET12			
	Hartmann Hans	AED32	X	Alcatel Alenia Space Cannes	ASP
	Hauser Armin	ASG22	X	ESA/ESTEC	ESA
X	Hendry David	Terma			
	Hengstler Reinhold	ASA42		<b>Instruments:</b>	
	Hinger Jürgen	ASG22		MPE (PACS)	MPE
X	Hohn Rüdiger	AED65	X	RAL (SPIRE)	RAL
	Hölzle Edgar Dr.	AED32		SRON (HIFI)	SRON
	Huber Johann	ASA42		<b>Subcontractors:</b>	
	Hund Walter	ASE252		Air Liquide, Space Department	AIR
X	Idler Siegmund	AED312		Air Liquide, Space Department	AIRS
	Ilse Stijn	Terma		Air Liquide, Orbital System	AIRT
	Ivány von András	FAE12		Alcatel Alenia Space Antwerp	ABSP
	Jahn Gerd Dr.	ASG22		Austrian Aerospace	AAE
	Kalde Clemens	ASM2		Austrian Aerospace	AAEM
	Kameter Rudolf	OTN/ASA42		APCO Technologies S. A.	APCO
	Kettner Bernhard	AET42		Bieri Engineering B. V.	BIER
	Knoblauch August	AET32		BOC Edwards	BOCE
X	Koelle Markus	ASA43		Dutch Space Solar Arrays	DSSA
X	Koppe Axel	AED312		EADS Astrium Sub-Subsyst. & Equipment	ASSE
X	Kroeker Jürgen	AED65		EADS CASA Espacio	CASA
X	La Gioia Valentina	Terma		EADS CASA Espacio	ECAS
X	Lamprecht Ernst	OTN/ASQ22		EADS Space Transportation	ASIP
X	Lang Jürgen	ASE252		Eurocopter	ECD
X	Langenstein Rolf	AED15		European Test Services	ETS
X	Langfermann Michael	ASA41		HTS AG Zürich	HTSZ
	Much Christoph	ASA43		Linde	LIND
	Müller Jörg	ASA42		Patria New Technologies Oy	PANT
X	Müller Martin	ASA43		Phoenix, Volkmarsen	PHOE
	Peltz Heinz-Willi	ASG13		Prototech AS	PROT
	Pietroboni Karin	AED65		QMC Instruments Ltd.	QMC
	Platzer Wilhelm	AED2		Rembe, Brilon	REMB
X	Reichle Konrad	ASA42		Rosemount Aerospace GmbH	ROSE
	Runge Axel	OTN/ASA44		RYMSA, Radiación y Microondas S.A.	RYM
X	Schink Dietmar	AED32		SENER Ingeniería SA	SEN
	Schlosser Christian	OTN/ASA44		Stöhr, Königsbrunn	STOE
	Schmidt Rudolf	FAE12		Terma A/S, Herlev	TER