



COMBINED DECLARED MATERIALS LIST


**PRODUCT ASSURANCE
Space Science and
Technology Department**

Spacecraft/Project:	HERSHCEL	Document No:	SPIRE RAL PRJ 001092		
Instrument/Model:	SPIRE	Issue No:	3	REV:	1
Subsystem:	FPU	Date:	10 November 2004		

SUBJECT:	COMBINED DECLARED MATERIALS LIST	
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DOCUMENT No:	SPIRE-RAL-PRJ-0001092	
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DOCUMENT LIST

Note 1

Where a Sub-Systems / Institutes has combined some or all of their Declared lists and / or EEE parts etc into one document, that documents details are recorded below. Only the applicable pages are included in this document.

Note 2

The IFSI combined List DPU: "DCL + DML+ DPL" updated to SPIRE-IFS-DOC-001031 Iss 2: has been sent to ESA for approval, however CGS have subsequently issued these as individual documents, and it is this Declared List that replace the IFSI one in this document

Sub-System	Document		
	Institute	Title	Number
ATC		DECLARED MATERIALS LIST	SPIRE-ATC-PRJ-0000710 Iss 1.5
CEA/SAp		DRCU DECLARED MATERIALS LIST	SPIRE-SAP-PRJ-001609 Iss 1.1
CEA/SBT		SPIRE & PACS Sorption Coolers Declared Materials List HSO-SBT-LI-004	SPIRE-SBT-PRJ-000687 Iss 2.0
CGS (IFSI)		DECLARED MATERIALS LIST	SPIRE-CGS-DOC-002198 Iss Draft
CSA/USK		NOT APPLICABLE	
JPL		BDA DECLARED MATERIALS LIST	SPIRE-JPL-DOC-002201 Iss1
LAM (LAS)		DECLARED MATERIALS LIST SMEC & Mirrors. LAS.PJT.SPI.DML030046 Iss 2.0	SPIRE-LAM-DOC-000939 Iss 2
MSSL		SPIRE – DECLARED MATERIALS MSSL/SPIRE/PA 002.1	SPIRE-MSS-PRJ-001129 Iss 6.0
UCF		DECLARED MATERIALS LIST	SPIRE-UCF-PRJ-002153 Iss 1.0

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INTRODUCTION


Materials used by RAL Space Science Technical Department (SSTD) and co-producers / sub-system suppliers are listed on spreadsheets,

SCOPE

This document lists the “Declared Materials” used in the provision of the supplied parts of the **Spire** Instrument from the following sub system suppliers. See Table 1.

Table 1


Sub-System / Institute		List Supplied
Acronym	Name	Yes / No / NA
ATC	Astronomy Technology Centre	Yes
CEA/SAp	CEA, Service d'Astrophysique Saclay	Yes
CEA/SBT	(CEA) Service du Basse Temperatures Grenoble	Yes
CSA/USK	Canadian Space Agency (CSA) University of Saskatchewan Canada	N/A
CGS (IFSI)	Carlo	Yes
JPL	JPL/Caltech, Pasadena	Yes
LAM (LAS)	Laboratoire d'Astronomie Spatiale, Marseille	Yes
MSSL	Mullard Space Science Lab Surrey	Yes
UCF)	Department of Physics and Astronomy, University of Wales, Cardiff,	Yes

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Appendix A to this document is a printout from that spreadsheet showing the materials used on the hardware provided for **Spire** by the above sub-system suppliers

The spreadsheet printout is compliant with **ESA: PSS-01-700 Issue 2**, each material has an individual identification number, the first digit being the group type as follows.

1. Aluminium and Aluminium Alloys
2. Copper and Copper Alloys
3. Nickel and Nickel Alloys
4. Titanium and Titanium Alloys
5. Steels
6. Stainless Steels
7. Filler Metals: Welding, Brazing, and Soldering
8. Miscellaneous Metallic Materials
9. Optical Materials
10. Adhesives, Coatings, Varnishes
11. Adhesive Tapes
12. Paints and Inks
13. Lubricants
14. Potting Compounds, Sealants, Foams
15. Reinforced Plastics
16. Rubbers and Elastomers
17. Thermoplastics (Non Adhesive Tapes, Foils (MLI)....)
18. Thermoset Plastics
19. Wires and Cables (For Materials Aspects Only)
20. Miscellaneous Non-Metallic Materials (Ceramics....)

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CONTENT OF THE DECLARED MATERIALS LIST

Extract from **ESA PSS -01-700 Issue 2 (August 1993) ANNEX B**

The materials list consists of 10 columns, which shall be completed as indicated below. Furthermore, similar materials shall be grouped together as specified above.

- **COLUMN 1** : Item Number

Identification number in each group. One only per material type. Does not change during the life of the material list (sub-items permitted when deemed necessary).

- **COLUMN 2** : Commercial Identification

Trade name and number (to be completed in full) e.g. "ARALDITE AV 100". Correct and standard designation.

ESA has chosen:

- Trade name + number. For example "ARALDITE AY 105"
- If no trade name exists, then the manufacture's name plus number are entered: e.g. "SCHOTT BK7"
- In the case of the AISI system for steel: for other metals or alloys, the main consistent will be entered first except in the case of a traditional name (e.g. brass or bronze).
- For each material as designated above, a unique item number shall be given. If several lines are used for different applications and /or processing, sub item numbers shall be added.

- **COLUMN 3** : Chemical Nature And Type Of Product

Example: epoxy resin, polyurethane adhesive, or Ti, 6Al, 4 alloy.

- **COLUMN 4** : Procurement Information

Manufacturer/supplier: name of the manufacture and the name of the supplier if different. Specification: reference of the procurement specification with, if considered useful, issue and revision. It may be replaced by a national specification number if it exists and make source of procurement irrelevant.


- **COLUMN 5** : Processing Parameters (Summary):

Give as relevant: mixture proportions, cure temperature, special-cleaning agents, surface treatment, thermal treatment, temperature, etc.

NOTE: Specification number is required, but not sufficient for ESA purposes.

- **COLUMN 6** : Use and Location

Indicate in what subsystem, box or item the material is used and whether it acts as structural element, thermal control, electrical insulation etc. as relevant.

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- **COLUMN 7 : Environmental Code**

Radiation /UV/ATAXIA (1) (R)		Ambience (A)	Temperature (2) (T)
G = Geostationary L = Low Orbit B = Radiation Belts I = Interplanetary	S = Outside Shadow L = Outside Light	V = Vacuum H = Hermetic M = Manned E = Elevated Pressure	1 = 0 to 100 2 = 101 to 200K 3 = 201 to 300 K “ etc.

(1) For materials inside the spacecraft, choose a letter from the left-hand side column. For materials on the surface of the spacecraft, combined this letter with “L” or “S”.

(2) Thermal cycle to be indicated by two values, e.g. 3/5.


(3) “RT” can be accepted as a code between 238 K (10°C) and 313 K (40°C).

Materials which are at a boundary between environments shall be described by two sets of codes.

- **COLUMN 8 : Size Code**

AREA	A (cm ²)	0 = 0 < 1
VOLUME	V (cm ³)	1 = 1 < 10
MASS	W (g)	2 = 10 < 100
		3 = 100 < 1000
		etc.....

Choose an alphanumeric combination from the above mentioned table, e.g. A5 or V2 or W3

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- **COLUMN 9** : All the codes of Column 9 shall be relevant for the project concerned, which implies that they refer to validated data applicable to this project (not too old, same processing, same composition, QC tests run on the same procured lot, etc.).

Reference of test report and relevant test result code to be given in Subcolumn 9.1

- **SUBCOLUMN 9.1** :

Outgassing (OUT):

P - The material passed the Outgassing test detailed in [ECSS-Q-70-02A](#). Reference of test report to be given in Subcolumn 9.2.

F - The material failed. Waiver reference in Subcolumn 9.2.

U - Materials of which Outgassing characteristics are unknown.

Stress Corrosion Cracking (SCC):

A - The material is known to have a high resistance to SCC. (Table I document [ECSS-Q-70-36A](#)).

B - Table II and III document [ECSS-Q-70-36A](#).

Justification for approval (test reference) stated in Subcolumn 9.2 (generally making reference to [ECSS-Q-70-36A](#)).

U - Materials and / or *weldments* for which SCC characteristics are unknown: A SCC evaluation form is required, based if necessary on tests (see [ECSS-Q-70-37A](#)).

Corrosion (Corr.):

A - The material does not require a surface treatment or coating for its intended application, otherwise it shall be rated B.


B - Details of the surface treatment to be given in Column 5.

Flammability (Flamm.) (If applicable):

P - The material passes the requirements of document [ECSS-Q-70-21A](#).

F - The material failed the test of document [ECSS-Q-70-21A](#) in the applicable atmosphere. Waiver reference in Subcolumn 9.2.

U - Materials of which offgassing characteristics are unknown.

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Offgassing (OFF) (if applicable):

P - The material passes the requirements of document [ECSS-Q-70-29A](#).

F - The material failed: waiver reference in Subcolumn 9.2

U - Materials of which offgassing characteristics are unknown.

- **SUBCOLUMN 9.2** : Justification for Approval

The purpose of this sub column is to enter any additional information that may be necessary in order to achieve customer approval. This information is reference of the Requests For Approval; reference of justificatory file for materials approved for other space or aeronautical programmes meeting the specific needs of the programme, reference of the evaluation report or waivers etc. These documents must be made available to ESA on request.

- **SUBCOLUMN 9.3** : Approval Status of the Contractor

A - Approved = All materials classified "A" may be used without restriction.

Y - Approved with restriction = These materials require the preparation of QC test specimens or a treatment before use: potting, coating, test specimens...

W - Approved with a waiver = These materials do not meet the requirements but are used for functional reasons. The use of such materials shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.2.

P - Pending a decision = Materials for which an evaluation report or a waiver is awaiting the contractor's provisional or definitive approval.

O - Open = New materials or materials for which investigations and qualification are in progress.

D - Deleted = This clarification is used for a material, which is no longer used.

- **COLUMN 10** : ESA approval and comments

This column will be completed by ESA in accordance with the standard comments list in Annex E.



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APPENDIX A

DECLARED MATERIALS LIST				ORIGINATOR:				UK ATC							
SPACECRAFT / PROJECT				Herschel				Doc. Number:				SPIRE-ATC-PRJ-710			
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SYSTEM / EXPERIMENT				SPIRE				Issue/Rev: (last CTD #0325)				1.5			
SUB-SYSTEM:				BSM				Date:				15-Jun-04			

BSM MatL ID	Part ID	Name & Type of Product, Form & Condition	Spec	Size Code	Processing Parameters	Corr	SCC	Flamm	Off-gas	Out-gas	OK to bake at 80°C ?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference	Project approval	ESA approval
1.	Structure, Jiggle frame, Interface shoe, baffle	Aluminium SQUARE BAR	6082	To suit manuf	T6 BS L111 T6 Bar /BSL113 T6 Sheet / BS L114 T6 Tube / BSL 115 T6 Sheet	B	A	N/A	N/A	N/A	Y	Y	Y	ALCOA Extrusions	RAL DML list 1.01 composition Si 0.7-1.3, Fe 0.5, Cu 0.1, Mn 0.4-1, Mg 0.5-1.2, Cr 0.25, Ni 0.1, Zn 0.2, Ti 0.2		
2.	Baffle	Aluminium Sheet, welded.	6082	N/A	T6	B	A	N/A	N/A	N/A	Y	Y	Y	N/A	NOT USED : Baffle now machined as per material ID 1		
3.	Mirror	Aluminium, Bar	6061	To suit manuf	-T651	B	A	N/A	N/A	N/A	Y	Y	Y	British Al. Extrusions	Intermediate cycling per ATC Spec to provide stability. MSFC-HDBK-527F p88 ASTMB211 or ISO/UK equivalent		
4.	Fasteners	stainless steel, austenitic	A2-70 to DIN 267	N/A	clean	A	A	A	N/A	N/A	Y	Y	Y	Reliance	Exact material within A2-70 per varies : ATC batch is traceable as AISI type 321		

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BSM MatL ID	Part ID	Name & Type of Product, Form & Condition	Spec	Size Code	Processing Parameters	Corr	SCC	Flamm	Off-gas	Out-gas	OK to bake at 80°C ?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference	Project approval	ESA approval
															MAPTIS code: (10351, 10334, 10098) CRES 321)		
5.	Locking inserts	stainless steel,	A2-70 to DIN 267	N/A	clean	A	A	A (GOX 500psi)	N/A	N/A	Y	Y	Y	Reliance	Exact material within A2-70 per varies : will be AISI type 304, 305 or 321. MAPTIS code: (10351, 10334, 10098) CRES 304, 321)		
6.	Deleted	INCONEL	718	To suit manuf	TBD	A	A	A	N/A	N/A	Y	Y	Y	SPECIAL METALS CORP / INCO ALLOYS INTL	Inconel not baselined - see material 4, 28, 29 for replacement. MAPTIS 55750, 10406 REFERS		
7.	Flex pivot sleeves	Aluminum plate, cold rolled. bar	6082	To suit manuf	T6 BS L111 T6 Bar /BSL113 T6 Sheet / BS L114 T6 Tube / BSL 115 T6 Sheet	B	A	N/A	U	N/A	Y	Y	Y	ALCOA or British Al. Extrusions	Baseline is Al 6082. As an option, may use matched grade material to flex pivots.		
8.	Sensor targets	Soft iron	R Fe 120 TO DIN	To suit manuf	ANNEAL	B?	B?	N/A	N/A	N/A	Y	Y	Y	VACUUM SCHMELZ E GmbH	USED ON ISOPHOT CHOPPER		

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			17405												Corrosion protection GOLD PLATING,		
9.	Sensor mount, motor housing	Glass fibre epoxy	G10/40	Sheet, 1/4" thick	Machined	N/A	N/A	A	A	A	Y	Y	Y	TUFNOL	MAPTIS 02776 TML 0.51, CVCm 0.015 Note: A cryogenic grade material consisting of 7628 fabric woven with continuous e-glass fiber in an amine-cure		
10. a	Potting compound/ Adhesive	Eccobond	285	N/A	with Catalyst 11	N/A	N/A	A	A TML <0.3	A cvcm <0.03	Y	Y	Y	Emerson & Cuming	MAPTIS 05475 NB - LIMITED LIFE MATERIAL		
10. b	Potting compound	Stycast	2850FT	N/A	with Catalyst 9	N/A	N/A	A	A TML <0.5	A cvcm <0.02	Y	Y	Y	Via TekData	Used in BSM cryoharness, supplied via RAL		
11.	Adhesive, cable run	Eccobond	285	N/A	with catalyst 11	N/A	N/A	A	A TML <0.3	A cvcm <0.03	Y	Y	Y	Emerson & Cuming	MAPTIS 05475 NB - LIMITED LIFE MATERIAL		
12.	Deleted	Mu-metal, sheet 0.125mm thick	N/A	N/A	N/A	A	A	N/A	N/A	N/A	N/A	Y	N/A	Goodfellow	Deleted from Baseline design - MAPTIS code 10118 MSFC-HDBK-		

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															527F p181 (spec AMS 7701) Corrosion rating 'B'		
13.	Harness - wire core	Copper Alloy wire	ESA/SCC No.3901/013	21, 46	See spec	N/A	N/A	See Spec			Y	Y	Y	TekData	Supply via RAL, dpec SPIRE-RAL DOC-001362		
14.	Harness - insulation	PTFE insulated wire	ESA/SCC No.3901/013	21, 46	See spec	N/A	N/A				Y	Y	Y				
15. a	Harness P-Clips, Motor shims	Brass shim,	CZ108 to BS2870, BSEN 1652:1998 CW508L	Sheet,	rotary sheared.	A	A	N/A	N/A	N/A	Y	Y	Y	RS Components	MAPTIS 10234		
15.b	Jiggle frame Ballast mass,	Bar stock	CZ108 to BS2870, BSEN 1652:1998 CW508L	Bar	Annealed state	B	B	N/A	N/A	N/A	Y	Y	Y	TBC (via distributor)	MAPTIS 10321		
16.	Solder	60 Tin Solder	ECSS-Q-70-08A	N/A	N/A	A	A	N/A	U	N/A	Y	Y	Y	Multicore	ESA Space rated soldering certification available. Multicore Alloy SN60 TIN/LEAD 22 SWG		
17.	Motor Core	NiFe Soft magnetics Laminated sheets	ULTRA PERM 250 or CryoPerm 10	Sheet	Annealed	A	U	N/A	N/A	TBD	Y	Y	Y	Zeiss	All details with Zeiss/ PACS programme. DML V1.2:		

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															CryoPerm10 confirmed as selected. MAPTIS 10118 refers to similar material		
18.	Motor Winding	Aluminium, high purity	5N	N/A	Per Zeiss/PACS processes						Y	Y	Y	California Fine Wires	All details with Zeiss/ PACS programme.		
19.	Motor insulation	Polyimide (sic) : Polyimide insulation	Per Zeiss/PACS processes	N/A	Per Zeiss/PACS processes						Y	Y	Y	Zeiss (may be Dupont Kapton ?)	Grade and application technique not known (see Zeiss, PACS QA documents).		
20.	Motor winding frames	Vespel	SP-1	N/A	Per Zeiss/PACS processes						Y	Y	Y	Zeiss, DuPont	Weight loss <10e-10 gm/cm²/s in - vacuum <500°F		
21.	Motor Permanent Magnet	NdFeB Permanent magnets	Grade 42	10mm dia	Ni Coated all faces						80°C MAX	Y	Y	Magnet Sales UK	Ni plate for corrosion resistance, 15 microns thick all sides. Handle with care - powerful magnet.		
22.	deleted	QMW Black	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not used		
23.	deleted	Anodize	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Alochrom added to DPL, deleted from DML		

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24.	Deleted	Copper	OHFC	N/A	Sheet BS 2875 C 103	A	U	N/A	N/A	TBC	Y	Y	Y	TBC	Not used		
25.	Surface plating	Copper flashing, Nickel Plate,	See DPL	N/A	See DPL	A	U	TBC	N/A	N/A	Y	Y	Y	MB Aerospace	SEE DECLARED PROCESS LISTS. MAPTIS 50141, 10311, 10328		
26.	Motor Thermal shields	Copper	manufact procedure EP/003-C Iss2	N/A	Electroformed	A	U	N/A	N/A	TBD	Y	Y	Y	Waveform Electro-forming	MAPTIS 10311.		
27.	Deleted	Niobium plate	N/A	N/A	plating	A	U	N/A	N/A	N/A	N/A	Y	Y	N/A	not baseline Potential use as superconducting magnetic shield, only if required by subsequent test . MAPTIS 50701 (wire)		
28.	Flex Pivots Jiggle (baseline)	Martensitic Stainless Steel	AISI 420 & 429	To suit manufacture	TBC	B	U	A (GOX 750psi)	N/A	N/A	Y	Y	Y	Lucas TRW	Included in Flex pivots (standard Lucas parts) - see Declared Component List. MAPTIS code 30136 (CRES 420)		
29.	Flex Pivots Chop (baseline)	Beryllium Copper	Uns 17200	Variou s bar, sheet	Induction brazed, heat treated 600°F	A	U	N/A	N/A	N/A	Y	Y	Y	C-FLEX	Included in flex pivots (special C-Flex parts). MAPTIS 10271		

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30.	Plating, misc	Gold	See DPL	N/A	SEE DPL	A	A	N/A	N/A	N/A	Y	Y	Y	MB Aerosace. UK	MAPTIS 10328. SEE DPL FOR PLATING SPEC		
31.	Washer, Thermal compensation	INVAR 36, BAR (UNS K93601)	ASTM B753 Alloy T36	1/2" bar	Obtain in annealed state.	B	A	N/A	N/A	N/A	Y	Y	Y	Carpenter Techn. Corp. or Equiv	MAPTIS 10314. Gold plate for corrosion resistance		
32.	Deleted	Apiezon Grease	Grade N	25g tube	N/A	N/A	N/A	N/A	Vapour pressure <10 ⁻⁹ mbar a	N/A	N/A	Y	Y	Oxford Instruments or equiv.	Not Used		
33.	Motor lamination end terminations	Titanium	Per Zeiss/PACS processes		Per Zeiss/PACS processes	A	A				Y	Y	Y	Zeiss	All details with Zeiss/ PACS programme.		
34.	Lacing Tape	Dacron (unwaxed)		N/A	Clean before use	A	N/A	U	CVCM 0.02%	TML 0.35%	Y	Y	Y	Gudebrod Inc. 22DPTH NATURAL GUDE-SPACE PT	RAL DML ITEM 20.44 ESA-RD: 01 REV. 1		
35.	Staking compound	Scotch-Weld	2216 B/A	N/A	Mix two parts	N/A	N/A	U	U	P	Y	Y	Y	3M Bracknell UK	Previous use PSS-01-701S-2		

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HERSCHEL/SPIRE

DRCU Declared Material List (DML)

Reference: SAp-SPIRE-NC-0060-02
Issue: 1.1
Date: 24/03/03

	Function	Name	Date	Visa
Prepared by	Mechanics Product Assurance	Nathalie Colombel	24/03/03	
Verified by	Mechanical Engineer	Thierry Tourrette		
Approved by	PA Manager			
Authorized by	Project Manager	Jean-Louis Auguères		

DOCUMENT STATUS and CHANGE RECORD

Date	Issue	Affected pages
26/10/01	0.0	Draft
14/11/01	0.1	Released for comments and verification
13/02/03	1.0	5 Purpose 9 Material groups Group 2 “Copper and copper alloys” used 10 Column 8 filled Addition of item 1-3 11 Group 2 table
24/03/03	1.1	11 Justification, approval status of item 2-1

List of acronyms

AD / RD	Applicable / Reference Document
ADP	Acceptance Data Package
CDR	Critical Design Review
CEA	Commissariat à l'Energie Atomique
DCU	Detector Control Unit
DML	Declared Material List
DMPL	Declared Mechanical Part List
DPL	Declared Processes List
DRCU	Detector Readout and Control Unit
EIDP	End Item Data Package
FCU	FPU Control Unit
FIRST	Far InfraRed and Sub millimeter Telescope
FM	Flight Model
FMECA	Failures Modes Effects & Criticality Analysis
FPU	Focal Plane Unit
FS	Flight Spare
GSE	Ground Support Equipment
HIFI	Heterodyne Instrument for First
ICD	Interface Control Document
LAM	Laboratoire d'Astrophysique de Marseilles
MAIV	Manufacturing, Assembly, Integration Verification
MCU	Mechanisms Control Unit
MGSE	Mechanical Ground Support Equipment
N/A	Not Applicable
PA / QA	Product / Quality Assurance
PACS	Photoconductor Array Camera & Spectrometer
PCB	Printed Circuit Board
PDR	Preliminary Design Review
PSU	Power Supply Unit
QM	Qualification Model
RFA	Request For Approval
RT	Room Temperature
S/C	SpaceCraft
SAP	Service d'Astrophysique
SCU	Subsystems Control Unit
SPIRE	Spectral & Photometric Imaging Receiver
TBC	To Be Confirmed
TBD	To Be Defined

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1 Purpose

This document lists the materials expecting to be used in the SPIRE/DRCU QM2, FM, FS.

2 Documentation

2.1 Applicable documents

The following documents will describe subsystems physically contained in the DRCU. These documents are to be written.

MCU DML	Subsystem under LAM responsibility but physically contained in the FCU box.
PSU DML	Subsystem to be furnished by a subcontractor (with spatial experience) under SAP responsibility

2.2 Reference documents

ECSS-Q-70A	Materials, mechanical parts and processes
PSS-01-700 2.0	The technical reporting and approval procedure for materials and processes
PSS-01-701 1.3	Data for selection of space materials
PSS-01-703 1.0	The black-anodising of aluminium with inorganic dyes
ECSS-Q-70-36A	Material selection for controlling stress-corrosion cracking

CNES Guide for science projects EEE, Materials, and Processes Lists

3 Subassembly and equipment codes

Subassembly codes		Names	Responsibility	
DRCU		Detector Readout and Control Unit	SAP	
	FCU	FPU (Focal Plane Unit) Control Unit	SAP	
		MCU	Mechanisms Control Unit	LAM
		SCU	Subsystems Control Unit	SAP
		PSU	Power Supply Unit	SAP
	DCU	Detector Control Unit	SAP	

4 Codes used in the list

4.1 Environment codes

These codes are used to indicate the type of environment to which the material is subjected.

'Radiation' Code	
Code	Meaning
G	Geostationary orbit
L	Low Earth orbit
B	Radiation belt
I	Interplanetary
P	Planetary

For components, which are attached outside the satellite, 'S' is added for Shadow if the material is in the shade or 'L' for Light if the material is in the illuminated area.

'Environment' Code	
Code	Meaning
V	Vacuum
H	Hermetic
M	Manned
E	High pressure

'Temperature' Code	
Code	Meaning
1	$0 \leq 100$ K
2	$101 \leq 200$ K
3	$201 \leq 300$ K
etc.	etc.

The given temperature code correspond to the operating temperature. If needed, the thermal cycle is described by two values, e.g.: 3/5.

4.2 'Size' code

'Size' Code	
Code	Meaning
0	$0 \leq 1$
1	$1 \leq 10$
2	$10 \leq 100$
3	$100 \leq 1000$
4	$1000 \leq 10000$

The 'Size' code represents:

Surface area	A in cm ²
Volume	V in cm ³
Mass	W in (g)

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4.3 Test Code

'Outgassing' Code	
Code	Meaning
P	Material which has undergone the outgassing tests described in document ESA.ECSS-Q-70-02A
F	Material not included in specifications
U	Unknown characteristics

'Inflammability' Code	
Code	Meaning
P	Material which has undergone the inflammability tests described in document ESA.PSS.01.721
F	Material not included in specifications
U	Unknown characteristics

'Toxicity' Code	
Code	Meaning
P	Material which has undergone the toxicity tests described in document ESA.PSS.01.729
F	Material not included in specifications
U	Unknown characteristics

'Stress corrosion' Code	
Code	Meaning
1	The material is included in table I of document ESA.ECSS-Q-70-36A
2	The material is included in table II of document ESA.ECSS-Q-70-36A
3	The material is included in table III of document ESA.ECSS-Q-70-36A
P	Material complying with project requirements but not mentioned in the PSS (test ref. mandatory)
F	Material not included in specifications
U	Unknown characteristics

'Corrosion' Code	
Code	Meaning
P	Material complying with project requirements
F	Material not included in specifications
U	Unknown characteristics

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4.4 Approval codes

These codes refer to:

- Comments made by the user or sub-contractor laboratory on use of the material in question;
- Comments from the 'higher level' (the instrument manager in charge of drawing up the list).

'Approval' Code	
Code	Meaning
A	Approved: use without restriction.
Y	Approved with restriction: the material requires special treatment before use (protection, coating, etc.)
D	Approved with waiver: the material does not comply with requirements but no replacement is possible. Its use should be limited.
P	Decision pending: material for which an evaluation report or waiver is necessary.
O	Open: new material for which an examination or evaluation is under way.
C	Eliminated: material which is no longer used.

5 Material groups

Code	Group	Used
1	Aluminium and aluminium alloys	<input checked="" type="checkbox"/>
2	Copper and copper alloys	<input checked="" type="checkbox"/>
3	Nickel and nickel alloys	<input type="checkbox"/>
4	Titanium and titanium alloys	<input type="checkbox"/>
5	Steels	<input type="checkbox"/>
6	Stainless steels	<input type="checkbox"/>
7	Metals for soldering	<input checked="" type="checkbox"/>
8	Miscellaneous metallic material	<input type="checkbox"/>
9	Optical materials	<input type="checkbox"/>
10	Adhesives, coatings, varnishes	<input checked="" type="checkbox"/>
11	Adhesive tapes	<input type="checkbox"/>
12	Paints, primers and inks	<input type="checkbox"/>
13	Lubricants	<input type="checkbox"/>
14	Coating resins and foam	<input type="checkbox"/>
15	Reinforced plastic	<input type="checkbox"/>
16	Rubber and elastomers	<input type="checkbox"/>
17	Thermoplastic resins	<input type="checkbox"/>
18	Duroplastic resins	<input type="checkbox"/>
19	Wires and cables	<input checked="" type="checkbox"/>
20	Sundry non-metallic materials	<input type="checkbox"/>

Group 1 - Aluminium and aluminium alloys

1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ¹ 2. Justification 3. Subcontractor comments	Approval status	Comments ESA Approval
1-1	EN AW-6082-T6	Aluminium alloy Al rem Si 0,7-1,3 Mg 0,6-1,2 Mn 0,40-1,0 Fe <0,50 Cr <0,25 Zn <0,20 Ti <0,10 Cu <0,10 Others <0,15	1. TBD 2. TBD 3. EN 573-1,3 EN 515	o Alodine 1200 o Black-anodising with inorganic dyes following PSS-01-703 issue 1	1. DRCU 2. DCU, FCU/(MCU+SCU) 3. Salt bath brazed structures of electronic boxes	R I A E V V T 3/4 W4		1. N/A 2. N/A 3. N/A 4. 1 High resistance ECSS-Q-70-36A 5. P	1. Not critical 2. PSS-01-703 1.0 ECSS-Q-70-36A 3.	A	
1-2	EN AW-2618A-T851	Aluminium Alloy Al rem Cu 1,8-2,7 Mg 1,2-1,8 Fe 0,9-1,4 Ni 0,8-1,4 Si 0,15-0,25 Mn <0,25 Ti <0,2 Zn <0,15 Others <0,15	1. TBD 2. TBD 3. EN 573-1,3 EN 515	o Alodine 1200 o Black-anodising with inorganic dyes following PSS-01-703 issue 1	1. DRCU 2. DCU, FCU/(MCU+SCU) 3. Support structures and front panel of electronic board Screwed cover and base of the electronic box	R I A E V V T 3/4 W4		1. N/A 2. N/A 3. N/A 4. 1 High resistance ECSS-Q-70-36A 5. P	1. Not critical 2. PSS-01-703 1.0 ECSS-Q-70-36A 3.	A	
1-3	EN AW-6061	Aluminium alloy Al rem Mg 0,8-1,2 Si 0,40-0,8 Cu 0,15-0,40 Cr 0,04-0,35 Fe <0,7 Mn <0,15 Zn <0,25 Ti <0,15 Others <0,15	1. TBD 2. TBD 4. EN 573-1,3 EN 515	o Black-anodising o Glued with Scotchweld EC 2216 B/A Gray (10-2)	1. DRCU 2. DCU, FCU/(MCU+SCU) 3. Identification labels	R I A E V V T 3/4 W1		1. N/A 5. N/A 6. N/A 7. 1 High resistance ECSS-Q-70-36A 5. P	1. Not critical 2. PSS-01-703 1.0 ECSS-Q-70-36A 3.	A	

¹ As defined in ECSS-Q-70A §3.1.4 Criticality analysis



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Group 2 – Copper and copper alloys

1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ¹ 2. Justification 3. Subcontractor comments	Approval status	Comments ESA Approval
2-1	Beryllium copper alloy C17200	Copper alloy Cu rem Be 1,8-2,0 Al 0,20 Si 0,20 Co 0,20	1. TBD 2. APITEC 3. ASTM B 194 QQ-C-533 SAE J463 AMS 4530,4532	<ul style="list-style-type: none"> o Satin Tin finish following ASTM B-545 o Glued STYCAST 2850 FT / catalyst9 (10-1) 	1. DRCU 2. DCU, FCU/(MCU+SCU) 3. Copper beryllium finger strips used for thermal contact between the front panel of the electronic boards and the box top	R I A E V V T 3/4 W2		1. N/A 2. N/A 3. N/A 6. 1 High resistance ECSS-Q-70-36A 4. P	1. Not critical 2. Used for Integral ECSS-Q-70-36A 3.	A	

¹ As defined in ECSS-Q-70A §3.1.4 Criticality analysis



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Group 7 – Metals for soldering

1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ¹ 2. Justification 3. Subcontractor comments	Approval status	Comments ESA Approval
7-1	EN AW-4047A	Aluminium alloy Al rem Si 11-13 Fe <0,6 Cu <0,30 Zn <0,20 Mn <0,15 Mg <0,10 Ti <0,15 Others <0,15	1. TBD 2. TBD 3. EN 573	o Alodine 1200 o Black-anodising with inorganic dyes following PSS-01-703 issue 1	1. DRCU 2. DCU FCU/(MCU+SCU) 3. Salt bath brazing of EN AW-6082-T6 (Item 1-1)	R I A E V V T 3/4 W		1. N/A 2. N/A 3. N/A 4. U 5. P	1. Not critical 2. Used for SOHO/GOLF XMM/EPIC 3. The surface treatment (column 5) is done on the brazed structures.	A	
7-2	S-Sn60Pb40E	Brazing alloy Sn 59,5-60,5 Pb rem	1. TBD 2. TBD 3. ISO 9453	o RMA Flux (precise type TBD) o Protected by conformal coating	1. DRCU 2. DCU, SCU 3. Soldering of electronic components on PCB	R I A E V V T 3/4 W		1. N/A 2. N/A 3. N/A 4. N/A 5. P	1. Not critical 2. ESA PSS-01-701 1.3 S-12 3. Could be used at SAP for corrective action.	A	
7-3	S-Sn62Pb36Ag2	Brazing alloy Sn 61,5-62,5 Pb rem Ag 1,8-2,2	1. TBD 2. TBD 3. ISO 9453	o RMA Flux (precise type TBD) o Protected by conformal coating	1. DRCU 2. DCU, SCU 3. Soldering of SMC on PCB	R I A E V V T 3/4 W		1. N/A 2. N/A 3. N/A 4. N/A 5. P	1. Not critical 2. ESA PSS-01-701 1.3 S-14 3.	A	
7-4	S-Sn63Pb37E	Brazing alloy Sn 62,5-63,5 Pb rem	1. TBD 2. TBD 3. ISO 9453	o RMA Flux (precise type TBD) o Protected by conformal coating	1. DRCU 2. DCU, SCU 3. Soldering of electronic components on PCB	R I A E V V T 3/4 W		1. N/A 2. N/A 3. N/A 4. N/A 5. P	1. Not critical 2. ESA PSS-01-701 1.3 S-13 3.	A	

¹ As defined in ECSS-Q-70A §3.1.4 Criticality analysis



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Group 10 – Adhesives, coatings, varnishes

1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ⁱ 2. Justification 3. Subcontractor comments	Approval status	Comments ESA Approval
10-1	STYCAST 2850 FT / catalyst9	Two-part epoxy encapsulant	1. Emerson & Cuming	<ul style="list-style-type: none"> o Base 100 o Catalyst 9 3 o 16 hours at 25°C 	1. DRCU 2. DCU FCU/(MCU+SCU) 3. Reinforcement of the soldered joint of heavy components	R I A E V V T 3/4 W		1. P 2. N/A 3. N/A 4. N/A 5. N/A	1. Not critical 2. ESA PSS-01-701 1.3 S-19 3.	A	
10-2	Scotchweld EC 2216 B/A Gray	Two-part epoxy structural adhesive	1. Minnesota Mining & Manufacturing (3M)	<ul style="list-style-type: none"> o Base 100 o Accelerator Gray 140 o 24 hours at RT 	1. DRCU 2. DCU, FCU 3. Component sticking Seals ⁱⁱ on fasteners	R I A E V V T 3/4 W		1. P 2. N/A 3. N/A 4. N/A 5. N/A	1. Not critical 2. ESA PSS-01-701 1.3 S-7 3.	A	
10-3	Nusil CV-1152	Dimethyl diphenyl silicone polymer	1. McGhan-Nusil Corp	<ul style="list-style-type: none"> o 7 days at RT 	1. DRCU 2. DCU FCU/(MCU+SCU) 3. Thin & Thick layer conformal coating on electronic board	R I A E V V T 3/4 W		1. P 2. N/A 3. N/A 4. N/A 5. N/A	1. Not critical 2. ESA PSS-01-701 1.3 C-10 3.	A	
10-4 (1)	Solithane 113	Polyurethane two part coating resin	1. Uniroyal Chemical Company Inc	<ul style="list-style-type: none"> o Solithane 113 100 o C 300 100 o 6 hours at 60°C o Thin layer 	1. DRCU 2. DCU FCU/(MCU+SCU) 3. Thin layer conformal coating on electronic board	R I A E V V T 3/4 W		1. P 2. N/A 3. N/A 4. N/A 5. N/A	1. Not critical 2. ESA PSS-01-701 1.3 S-16 3. Traditionally used by Sap but should be replaced by item 10-3 TBC	A	

ⁱ As defined in ECSS-Q-70A §3.1.4 Criticality analysis
ⁱⁱ Used to identify the element tightened with defined torque



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Group 10 – Adhesives, coatings, varnishes

1	2	3	4	5	6	7	8	9			10
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	9.1	9.2	9.3	Comments ESA Approval
								1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ¹ 2. Justification 3. Subcontractor comments	Approval status	
10-4 (2)	Solithane 113	Polyurethane two part coating resin	1. Uniroyal Chemical Company Inc	<ul style="list-style-type: none"> o Solithane 113 100 o C 300 74 o 6 hours at 60°C o Thick layer 	1. 2. 3. Thick layer conformal coating on electronic board	R I E V T 3/4	A V W	1. P 2. N/A 3. N/A 4. N/A 5. N/A	1. Not critical 2. ESA PSS-01-701 1.3 S-16 3. Traditionally used by Sap but should be replaced by item 10-3 TBC		



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Group 19 – Wires and cables

1	2	3	4	5	6	7	8	9			10
								9.1	9.2	9.3	
Item no.	Trade identification or standard description	Chemical nature and type of product	1. Manufacturer 2. Distributor 3. Proc. Spec. no. Issue / Revision	Process parameters	1. Sub-system code 2. Equipment code 3. Use	1. Rad 2. Env 3. Temp	1. A 2. V 3. W	1. Outgassing 2. Inflammability 3. Toxicity 4. Stress corrosion 5. Corrosion	1. Criticality ¹ 2. Justification 3. Subcontractor comments	Approval status	Comments ESA Approval
19-1	KT 26	High purity copper silver plated + PTFE insulation	1. FILECA TBC 2. TBD 3.	°	1. 2. 3.	R I E V T 3/4	A V W	1. 2. 3. 4. 5.	1. 2. 3.		
19-2	MTV	High purity copper silver plated	1.FILOTEX TBC 2. TBD 3.	°	1. 2. 3.	R I E V T 3/4	A V W	1. 2. 3. 4. 5.	1. 2. 3.		
19-3	BTV 1/26 AQ	High purity copper silver plated	1.FILOTEX TBC 2. TBD 3.	°	1. 2. 3.	R I E V T 3/4	A V W	1. 2. 3. 4. 5.	1. 2. 3.		

The choice of the type of wire used for the QM2, FM, FS is depending on the choice of the subcontractor cabling the electronic boards (not done yet).

¹ As defined in ECSS-Q-70A §3.1.4 Criticality analysis



**SPIRE & PACS
Sorpton Coolers
Declared Material List**

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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

***SPIRE & PACS Sorpton Coolers
DECLARED MATERIAL LIST
(D.M.L.)***

SBT internal ref : SBT/CT/2001-19

	Name & Function	Date	Signature
Prepared	P. Dupont – Cooler PA manager		
SBT PA Check	P. Dupont – Cooler PA manager		
SPIRE Approval			
PACS Approval			
PA Approval	F. Loubere – PA manager		
Project Approval	J.L Augueres - SAp HSO project manager		
Project Approval	L. Duband - Cooler project manager		

Service des Basses Températures (SBT)
Département de Recherche Fondamentale sur la Matière Condensée (DRFMC)
COMMISSARIAT A L'ENERGIE ATOMIQUE - GRENOBLE (CEA-Grenoble)
17, rue des Martyrs 38054 GRENOBLE Cédex 9, France.



SPIRE & PACS
Sorption Coolers
Declared Material List

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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Document Status

Issue	Revision	Date	Nb of Pages	Modifications
Draft		April 4 th , 2001		First draft – released for comments
0	0	April 25 th , 2001	16	First Issue
1	0	October 29 th , 2001	16	Update of the document (see marking bar on the right)
1	1	December 12 th , 2001	16	Update of the document (released after SAp comments)
1	2	February 28 th , 2002	16	Update of doc wrt to IBDR RIDs Nota: marking bar removed – not convenient !
2	0	October 18 th , 2002	16	Information modification for items # 1-1, 1-2, 2-1, 6-2, 10-1, 20-5. Addition of item # 20-6



SPIRE & PACS
Sorption Coolers
Declared Material List

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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

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SPIRE & PACS Sorption Coolers *Declared Material List*

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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

List of Acronyms

AD / RD	Applicable / Reference Document		
ADP (EIDP)	Acceptance (End Item) Data Package		
AIT / (M)AIV	(Manufacturing,) Assembly, Integration & Test / Verification		
CADM	Configuration and Data Management		
CDR (DDR)	Critical (Detailed) Design Review	Revue de conception détaillée	RCD
CEA	Commissariat à l' Energie Atomique		
CIDL / ABCL	(As Built) Configuration Items Data List		
CN	Change Notice	Demande de Modification	DM
CQM	Cryogenic Qualification Model		
DML / DPL	Declared Material / Process List		
DRB	Delivery Review Board	Revue de Qualification	RQ
EM / (P)FM / FS	Engineering / (Proto)Flight / Spare Model		
ETF	Environmental Test Facility		
EV	Evaporator		
FI	Fiche d'Inspection		
FIRST	Far Infrared and Submillimetre Telescope		
FMECA	Failure Mode Effects and Criticity Analysis		AMDEC
(M)GSE	(Mechanical) Ground Support Equipment		
H/W	Hardware		
HIFI	Heterodyne Instrument for First		
HSE	Heat Switch (on evaporator)		
HSP	Heat Switch (on sorption pump)		
ICD	Interface Control Document	Dossier de Contrôle des Interfaces	DCI
KIP / MIP	Key / Mandatory Inspection Point		
MRB	Material Review Board		
N/A	Not Applicable		
NCR	Non Conformance Report	Fiche d'Anomalie	FA
PACS	Photoconductor. Array Camera and Spectrometer		
PDR	Preliminary Design Review	Revue de Définition Préliminaire	RDP
PTR	Post Test Review	Comité de Revue et d'essai	CRE
PFM	ProtoFlight Model		



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

QA / PA	Quality / Product Assurance	Assurance Qualité / Produit	AQ / AP
RFA	Request For Approval		
SAP	Service d'Astrophysique		
SBT	Service des Basses Températures		
SCO	Sorption Cooler (full unit)		
S/C	SpaceCraft		
SNLS	Subcontractor for TiG welding & brazing		
SP	Sorption pump		
SPIRE	Spectral & Photometric Imaging Receiver		
TRR	Test Readiness Review	Bilan Technique	BT



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

1. SCOPE OF THE DOCUMENT

This document lists all the materials (machined items, end items) used on the SBT Sorption Coolers Project for the following models: CQM, FM & FS.



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

2. DOCUMENTS

2.1 Applicable documents

All Applicable Documents are listed in the AD chapter of the CIDL (HSO-SBT-LI-010).

2.2 Reference documents

	<i>Title</i>	<i>Reference</i>	<i>Iss</i>	<i>Rev</i>	<i>Date</i>
RD01	Data for Selection of Space Materials	ESA PSS-01-701	1	3	January 94
RD02	Materials, Mechanical Parts & Processes	ECSS-Q-70A			19/04/96
RD03	Guide pour les Projets Scientifiques				
RD04	Materials selection for controlling stress-corrosion cracking	ECSS-Q-70-36-A			



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

3. DECLARED MATERIAL LIST

The SCO Declared Material List, which consists of several arrays of 10 columns that shall be completed as indicated in doc. Ref. [RD02] & [RD03], is presented herebelow.

Furthermore, similar materials shall be grouped together, according to the following group definition:

<i>Group Type</i>	<i>Used</i>	<i>Item Id.</i>
1. Aluminum & Aluminum alloys,	✓	2017-A
2. Copper & Copper alloys,	✓	CuC1, Cu A1
3. Nickel & Nickel alloys,	N/A	
4. Titanium & Titanium alloys,	✓	TA6V-ELI
5. Steels,	N/A	
6. Stainless Steels,	✓	AISI 304L
7. Filler metals & solders,	✓	Tin, Silver
8. Miscellaneous metallic materials,	N/A	
9. Optical materials,	N/A	
10. Adhesives, coatings & varnishes,	✓	STYCAST 2850/FT9
11. Adhesive Tapes,	N/A	
12. Paints, primer & inks,	N/A	
13. Lubricants,	N/A	
14. Potting Compounds,	N/A	
15. Reinforced Plastics,	N/A	
16. Rubbers & Elastomers,	N/A	
17. Thermoplastics,	N/A	
18. Thermosets Plastics,	N/A	
19. Wires & Cables,	✓	Manganin Wires
20. Miscellaneous nonmetallic materials.	✓	Kevlar, Procelit P160, Vegetal Charcoal, He3, PTFE Housing



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 1 – Aluminum & Aluminum Alloys

1	2	3	4	5	6	7			8	9					9.2	9.3	10
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					Justification for Approval	Approval Status	Comment
		1- Chemical Products 2- Type of Product	1- Manuf / Supplier 2- Specification			R	A	T		Outg	Flam	Offg	SCC	Corr			
1-1	EN-AW 2017A	Cu: 4.35 % Mg: 0.80 % Mn: 0.75 % Si: 0.51% Fe: 0.21% Zn: 0.23% Al: rem.	1- ANFI 2- NF EN 485-2	Machined Anti corrosion treatment (Alodine 1200)	Guiding tubes (136)		V	1	W2	N/A	N/A	N/A	3	P	ESA PSS-01 701		No structural use
1-2	EN-AW 2017A (T451)	Cu: 4.20 % Mg: 0.66 % Mn: 0.85 % Si: 0.60% Fe: 0.40% Zn: 0.01% Al: rem.	1- KUMW 2- NF EN 485-2	Machined Anti corrosion treatment (Alodine 1200)	Evaporator cover (137) Pump cover (124)		V	1	W2	N/A	N/A	N/A	3	P	ESA PSS-01 701		No structural use



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 2 – Copper & Copper alloys

1	2	3	4	5	6	7			8	9					10		
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					9.2	9.3	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification			R	A	T		Outg	Flam	Offg	SCC	Corr	Justification for Approval	Approval Status	
2-1	High purity electrolytic copper CuCl	Cu: 99.99% O < 0.0005%	1 - OUTOKUMPU/SISO 2 - THERMOCOMPACT (FI 024)	1- Machined 2- Gold plated	Strap ends (531, 532, 541, 542) 1/2 female (203) & 1/2 male (204) evaporator cups Shunt (210) Charcoal casing (212) Evaporator (219) & Pump (220) Cold Tips Switch Heads (301) & Bases (302)		V	1	W3	N/A	N/A	N/A		P	ESA PSS-01-701		FI 007
2-2	CuAl	Copper alloy	1 – SOTELEM 2 -	1- Machined 2- Gold plated	Strap (138)		V	1	W1	N/A	N/A	N/A		P			



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 4 – Titanium & Titanium alloys

1 Item #	2 Commercial Id.	3 Chemical Nature	4 Procurement Information	5 Summary of Processing Parameters	6 Use & Location	7 Environment Code			8 Size Code	9 9.1					9.2 Justification for Approval	9.3 Approval Status	10 Comment
						R	A	T		Outg	Flam	Offg	SCC	Corr			
4-1	Ti-6Al-4V ELI, Diam. 200 mm	Al: 6.09 % V: 3.82 % C: 80 ppm Fe: 1402 ppm N: 20 ppm O2: 1095 ppm H2: 60 ppm	1 - FORTECH/TIMET 2 -	1- Machined 2- EB welding	Structural parts (401 to 407) Miscellaneous components Pump-tubing- Evaporator parts Heat Switches parts		V	1	W4	N/A	N/A	N/A	1	P	ESA PSS-01-701		Coulée # 293147C Lot # T03290
4-2	Ti-6Al-4V ELI, diam. 10 & 20 mm	Al: 5.9 % V: 3.8 % C: 0.029% Fe: 0.18 % H: 0.0016% N: 0.010 % O: 0.12% Y: <0.005%	1 - TIMET UK 2	1- Machined 2- EB Welding	Structural parts		V	1	W4	N/A	N/A	N/A	1	P	ESA PSS-01-701		Coulée # CU67913 Lot # SC1513 (10 mm) Lot # SC1421 (20 mm)



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Group 6 – Stainless Steels																	
1	2	3	4	5	6	7			8	9					9.2	9.3	10
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					Justification for Approval	Approval Status	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification			R	A	T		Outg	Flam	Offg	SCC	Corr			
6-1	AISI 304L	Ni: 8.51% Cr: 18.29% C: 0.018% Mn: 1.87% Si: 0.44% S: 0.025%	1 – COGNE 2 - EN 10088	Machined	Minipump (306), Minipump tube (305) & cap (307) Grid Mesh (218)		V	1	W1	N/A	N/A	N/A	1	P			Lot # 12470
6-2	A4-80 / A4-70		1 – FILA 2 – DIN 912, 915, 125 & 234		Screws Nuts Washers		V	1	W2	N/A	N/A	N/A	1	P			Titanium parts assembly
6-3			1 – VANEL 2 –		Springs		V	1	W1	N/A	N/A	N/A	1	P			
6-4			1 – 2 –		Helicoil		V	1	W2	N/A	N/A	N/A	1	P			



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 7 – Filler Metals & Solders

1	2	3	4	5	6	7			8	9					10		
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					9.2	9.3	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification			R	A	T		Outg	Flam	Offg	SCC	Corr	Justification for Approval	Approval Status	
7-1	Tin Sn60Pb40	Sn: 60.15% Pb: 39.79% Cu: 0.005%	1 – RADIEL/ RADIOSPARE 2 - NF EN 29453	HSO-SBT-PR-034	Soldering of manganin wires into connectors		V	1	W1	N/A	N/A	N/A	N/A	P			
7-2	ARGECO 1441	Silver alloy Ag: 72% Cu: 28%	1 – SNLS/PROTECHNO 2 – AFNOR A81362	Subcontractor procedure CI-92.01	Brazing		V	1	W1	N/A	N/A	N/A	N/A	P			



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 10 – Adhesives, Coatings & Varnishes

1	2	3	4	5	6	7			8	9					10		
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					9.2	9.3	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification			R	A	T		Outg	Flam	Offg	SCC	Corr	Justification for Approval	Approval Status	
10-1	Stycast 2850/FT9	Epoxy resin	1 – EMERSON & CUMING 2 -	HSO-SBT-PR-024 HSO-SBT-PR-033	Gluing of charcoal onto/into housing Gluing of heaters & thermometers		V	1	W1	P	P	P	N/A	N/A	ESA-PSS-01-701		



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 19 – Wires & Cables																	
1	2	3	4	5	6	7			8	9					10		
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	R	A	T	Size Code	9.1					9.2	9.3	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification							Outg	Flam	Offg	SCC	Corr	Justification for Approval	Approval Status	
19-1	Manganin Wires 2.1362	Cu: 86% Mn: 12% Ni: 2% Varnish insulator	1 – ISABELLENHUTTE/ TECHNICOME 2	HSO-SBT-PR-034	Heaters & thermometers wires		V	1	W1	N/A	N/A	N/A	N/A	P			



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SERVICE DES BASSES TEMPERATURES (CEA/DSM/DRFMC/SBT)

Group 20 – Miscellaneous Nonmetallic Materials																	
1	2	3	4	5	6	7			8	9					10		
Item #	Commercial Id.	Chemical Nature	Procurement Information	Summary of Processing Parameters	Use & Location	Environment Code			Size Code	9.1					9.2	9.3	Comment
		1- Chemical Products 2- Type of Product	1 - Manuf / Supplier 2 - Specification			R	A	T		Outg	Flam	Offg	SCC	Corr	Justification for Approval	Approval Status	
20-1	Kevlar cord 11T28 & 34T28		1- DuPONT/COUSIN 2-	HSO-SBT-PR-028	Suspension wires		V	1	W1				N/A	N/A			
20-2	Procelit P160	Al2O3: 91% SiO2: 9% impurities <0.1%	1- KAPYROK 2-		Evaporator Retention of liquid He by capillary attraction		V	1	W1				N/A	N/A	Located into sealed cooler heart		
20-3	Vegetal Charcoal	C	1- PROLABO 2-	HSO-SBT-PR-024	Pump Adsorption of gaseous He		V	1	W1				N/A	N/A	Located into sealed cooler heart		Lot # 97037
20-4	³ He	3He: 99.9965% 4He: 0.0035% N2, CO2, H2 < 1Vpm	1- EURISO-TOP 2-	HSO-SBT-PR-029	Filling of Cooler		V	1					N/A	N/A			Batch # AA-97084
20-5	PTFE housing		1 - TECHNOFLUOR 2 -				V	1	W1	P	P	P	N/A	N/A	ESA-PSS-01-701		
20-6	VespeI SP1	Polyimide	1 - GOODFELLOW		Insulating ring		V	1	W1				N/A	N/A			

List received: 6/27/01 from D. Crumb

Materials Identification and Usage List - Non-Metallic Materials

Item No.	Material Description/ Brand Name Supplier	Application	Material Specifications	Thermal Vacuum Stability (%)	JPL Rating ¹	Comments
1	Vespel, Dupont SP3	Pin		TML = 0.54 VCM= 0.01 WVR=	1	
2	Kevlar 29 3000 Denier Yarn, Dupont	Tension Member		TML =3.13 VCM=0.19 WVR=1.76	3	Reviewing with contamination control. Thermal vacuum bakeout may be required.
3	Miller Stevens 903	Adhesive		TML = VCM= WVR=	3	No outgassing data available. Material may need to be tested for vacuum stability. How much of this material will be used? Reviewing with contamination control.
4	EC2216	Adhesive		TML =0.97 VCM=0.02 WVR=0.32	2	Do not use material if hardware will be exposed to temperatures greater than 75°C in vacuum
5	Vespel, Dupont SP1	Spacer		TML =1.09 VCM=0.00 WVR=0.40	1	
6				TML = VCM= WVR=		
7				TML = VCM=		

Item No.	Material Description/ Brand Name Supplier	Application	Material Specifications	Thermal Vacuum Stability (%)	JPL Rating ¹	Comments
				WVR=		

1.) 1 - acceptable, 2 - qualified acceptable, 3 - provisionally acceptable, 4 - unacceptable

Materials Identification and Usage List - Metallic Materials

Item No.	Material Description/ Condition	Application	Material Specifications	Stress Corrosion Cracking Rating	JPL Rating¹	Comments
1	Invar 36	Structural Elements	ASTM B753-T36	A	1	
2	Al 7075 T73	Structural Elements	SAE-AMS-QQ-A-225/9	1	1	
3	Al 6061 T651	Structural Elements	SAE-AMS-QQ-A-250/11	1	1	
4	A286	Fasteners	AMS 5737	1	1	
5	303 CRES	Fasteners, Pins	AMS 5738	1	1	
6	Copper, 99.999% pure	Thermal Strap		A	1	
7	CDA 172	Clamps, Bushing	ASTM B194	1	1	
8						

1.) 1 - acceptable, 2 - qualified acceptable, 3 - provisionally acceptable, 4 - unacceptable

Materials Identification and Usage List - Processes

ITEM NO.	PROCESS	SPECIFICATION	MATERIALS PROCESSED	APPLICATION	JPL EVALUATION	
					Rating	COMMENTS
1	Gold Plating	MIL-G-45204, Class 3, Type 3	Invar 36	Corrosion Protection, Thermal Conduction	1	
2	Gold Plating	MIL-G-45204, Class 3, Type 3	Copper	Thermal Conduction	1	
3	Passivation	FS 505146	303 CRES	Passivation	1	
4	Bonding	D-8208, Section 3.17, FP513414	Solithane 113/C113-300 Filled Polyurethane	Spot Bonding of Component Parts	1	
5	Bonding	BS515871, D-8208, Section 3.17	Scotch Weld 2216 B/A with Filler	Spot Bonding of Component Parts	1	
6	Workmanship	FS504040		Workmanship Standards for Mechanical Parts and Material	1	

7	Torque	ES504255		Torque Requirements, Threaded Fasteners, Spacecraft Structural and Electronic Equipment	1	
8	Solder Joint	D-8208, Section 3.14, Fp513414		Solder Joint	1	
9	Installation	D-8208, Section 3.12, FP513414		Connector Installation – Rectangular – Miniature	1	



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HERSCHEL DPU_s/ICU

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N° DRD:
DRD N°:

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Title :

	Nome & Funzione <i>Name & Function</i>	Firma <i>Signature</i>	Data <i>Date</i>	LISTA DI DISTRIBUZIONE <i>DISTRIBUTION LIST</i>	N	A	I
Preparato da: <i>Prepared by:</i>				Interna / <i>Internal</i>			
Approvato da: <i>Approved by:</i>							
Applicazione autorizzata da: <i>Application authorized by:</i>							
Customer / Higher Level Contractor							
Accettato da: <i>Accepted by:</i>							
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REGISTRAZIONE DELLE MODIFICHE / CHANGE RECORD

EDIZIONE ISSUE	DATA DATE	AUTORIZZAZIONE CHANGE AUTHORITY	OGGETTO DELLA MODIFICA E SEZIONI AFFETTE REASON FOR CHANGE AND AFFECTED SECTIONS
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1. SCOPE

The scope of this document is to define all materials to be used in the SPIRE DPU Unit for HERSCHEL DPUs/ICU Program.

This document is based on the SPIRE DPU Unit architecture defined for the Critical Design Review.

2. APPLICABLE & REFERENCE DOCUMENTS

2.1 APPLICABLE DOCUMENTS

AD	DOC. N.	ISSUE	TITLE
1	HERS-GEN-PL-CGS-002	DRAFT	HERSCHEL DPUs/ICU Product Assurance Plan

2.2 REFERENCE DOCUMENTS

RD	DOC. N.	ISSUE	TITLE
1	ESA PSS-01-700	2	The technical reporting and approval procedure for materials, mechanical parts and processes



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3. RESPONSIBILITY

CGS shall be responsible where applicable for the selection, procurement and acceptance of material, cable and mechanical parts which are in accordance with contractual specification.

4. METHODOLOGY FOR THE COMPILATION OF THE DML

The materials list consists of 12 columns which shall be completed as indicated below in according to [RD 1] document. Furthermore, similar materials shall be grouped as specified in table:

GROUP	MATERIALS
1	Aluminium and aluminium alloys
2	Copper and copper alloys
3	Nickel and nickel alloys
4	Titanium and titanium alloys
5	Steels
6	Stainless steels
7	Filler metals: welding, brazing, soldering
8	Miscellaneous metallic materials
9	Optical materials
10	Adhesives, coatings, varnishes
11	Adhesive tapes
12	Paints and inks
13	Lubricants
14	Potting compounds, sealants, foams
15	Reinforced plastics
16	Rubbers and elastomers
17	Thermoplastics (non adhesive tapes, foils)
18	Thermoset plastics
19	Wires and cables (for materials aspects only)
20	Miscellaneous nonmetallic materials (ceramics)

Column 1:Group number/Item number

Identified number relevant to each group and sequential item number in each group of the list (one only per material type).

Column 2:Commercial identification

Trade name and number (to be completed in full).

Correct and standard designation. If no trade name exists, then the manufacturer's name plus number are entered.

Column 3:Chemical nature and type of product e.g.: "epoxy adhesive".

Column 4:Procurement information


Manufacturer/supplier: this identifies the abbreviated name of the manufacturer and name of the supplier if different.

Specification: reference of the procurement specification whit issue and revision.

Column 5:Summary of processing parameters

Indicate as relevant: specification number, mixture proportions, cure temperature, special cleaning agent, surface treatment, temperature, etc..

Column 6:Use and location

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Indicate in what subsystems, box or item the material is used and whether it acts as structural element, thermal control, electrical insulation etc. as relevant.



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Column 7:Environmental code

R:Radiation/UV/ATOX(1)		A:Ambiance	T:Temperature
G=Geostationary	S=outside shadow	V=Vacuum	1=0 to 100 K
L=Low orbit	L=outside light	H=Hermetic	2=101 to 200 K
B=Radiation belts		M=Manned	3=201 to 300 K
I=Interplanetary		E=Elevated pressure	4=301 to 400 K etc.

(1) For materials inside the spacecraft, choose a letter from the left-hand column. For materials on the surface of the spacecraft, combine this letter with "L" or "S".

Column 8:Size code

AREA	A (cm ²)	0=0 to 1 1=1 to 10
VOLUME	V (cm ³)	2=10 to 100 3=100 to 1000
MASS	W (g)	4=1000 to 10000 etc.

Choose an alphanumeric combination from the above mentioned table.

Column 9

All the codes of column 9 shall be relevant for the project concerned, which implies that they refer to validated data applicable to this project, as detailed in the following table and the individual properties description below:

CORR Corrosion Resistance of metallic materials are rated per MSFC-SPEC-250, Class II requirements (as showed into NASA/MSFC MAPTIS databases) as follows:
A: meet the requirements, and do not require a coating
B: meet the requirements, if coated
X: materials fails requirements
U: property unknown/untested

SCC Stress Corrosion Cracking Susceptibility of metallic materials are rated per ESA PSS-01-736 or MSFC-SPEC-522 (as showed into NASA/MSFC MAPTIS databases) as follows:
A: having high resistance to stress corrosion cracking (listed in table I)
B: having moderate resistance to stress corrosion cracking (listed in table II)
C: having low resistance to stress corrosion cracking (listed in table III)
N: property not applicable within defined application constraints
U: property unknown/untested

FLAM

Flammability of non-metallic materials tested per ESA PSS-01-721 tests are rated as follows:
P: passed the test
F: failed the test
U: property unknown/untested

Flammability of non-metallic materials tested per NASA-STD-6001 tests are rated (as showed into NASA/MSFC MAPTIS databases)as follows:
A: material that has a burn length of 6 in. (15 cm) or less
B: material that has a burn length of more than 6 in. (15 cm) but less than 12 in. (30 cm)
C: material that burn totally with small or no burn dripping
X: material ignites K10 paper with small, moderate or large drip burning
S: special test conducted on material
I: less than 3 standard samples with less than 12 in. (30 cm) burn
U: unacceptable data



CARLO GAVAZZI SPACE SpA

HERSCHEL DPU_s/ICU

HERSCHEL SPIRE DPU UNIT DECLARED MATERIALS LIST

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Note: for flammability wire and cable ratings per NASA-STD-6001 tests (as showed into NASA/MSFC MAPTIS databases) see as follows:

A: wire that has no ignition (no visible flame) with current overloads up to or exceeding fusion current of conductor and self-extinguishes in less than 3 in. (7 cm) per test 1

B: wire that has ignition (visible flame) burns less than 10 seconds, damage to all other wire (excluding current carrying wire) is less than 3 in. (7 cm) total per test 4, and self-extinguishes in 6 in. (15 cm) or less when tested in test 1

C: wire that fails criteria for above ratings

X: wire that burns completely in test 1 and/or test 4/or has moderate or large burn dripping

I: wire with insufficient data

S: special test conducted on material

U: unacceptable data

OFFG

Offgassing and toxicity of materials tested per ESA PSS-01-729 tests are rated (as showed into NASA/MSFC MAPTIS databases) as follows:

P: passed the test

F: failed the test

U: property unknown/untested

Offgassing and toxicity of materials tested per NASA-STD-6001 tests are rated (as showed into NASA/MSFC MAPTIS databases) as follows:

K: maximum limit weight \geq 100 pounds (45400 grams)

H: maximum limit weight \geq 50 pounds (22700 grams) < 100 pounds (45400 grams)

A: maximum limit weight \geq 10 pounds (4540 grams) < 50 pounds (22700 grams)

V: maximum limit weight \geq 5 pounds (2270 grams) < 10 pounds (4540 grams)

X: maximum limit weight < 5 pounds (2270 grams)

B: data inconclusive, a special cure is requested

I: material with insufficient data

OUTG

Outgassing or thermal vacuum stability of materials tested per ESA PSS-01-702 tests are rated as follows:

P: passed the test (TML \leq 1.0 %, VCM \leq 0.1 %)

F: failed the test

U: property unknown/untested

Outgassing or thermal vacuum stability of materials tested per JSC SP-R-0022A tests are rated (as showed into NASA/MSFC MAPTIS databases) as follows:

A: passed the test (TML \leq 1.0, VCM \leq 0.1)

B: data inconclusive, material should be tested prior to use

C: material with TML less than 3 and VCM less than 1

X: material with TML more than 3 and/or VCM more than 1


I: material with insufficient data

S: special test conducted on material


U: unacceptable data

Column 10: Justification for approval

The scope of this column is to enter any additional information that may be necessary in order to achieve customer's approval. This information is reference of the Request For Approval, reference of justificatory file for materials approved

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for other space or aeronautical programmes meeting the specific needs of the programme, reference of the evaluation report or waivers, reference NASA/MSFC MAPTIS databases codes, etc..

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Column 11: Approval status of the Prime (Prime App.)

A=Approved. All materials classified A may be used without restriction.

Y=Approved with restriction. These materials require the preparation of QC test specimens or a treatment before use.

W=Approved with a waiver. These materials do not meet the requirements but are used for functional reasons. The use of such materials shall be reduced to a minimum. The waiver number shall be entered in column 10.

P=Pending a decision. Materials for which an evaluation report or a waiver is awaiting the Contractor's provisional or definitive approval.

O=Open. New materials or materials for which investigations and qualification are in progress.

D=Deleted. This classification is used for a material which is no longer used.

Column 12: Customer approval and comments (Customer App.)

This column will be completed by Customer in accordance with the standard comments listed in [RD 1] document annex E.

5. DECLARED MATERIALS LIST

In the following pages (ANNEX A) are listed the materials envisaged during the manufacturing phase.

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12	
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.	
						R	A	T										
Group 01: ALUMINIUM AND ALUMINIUM ALLOYS																		
01/01	Aluminium alloy	AL 7075-T7351 Plate	CNR-IFSI Italy, Specification AMS-QQ-A-250/12 or AMS 4078	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL-A-8625 class 2 type III	Box Walls - Structural Elements	I	V	3 4	W4	B	A					NASA/MSFC MAPTIS: 50669		
01/02	Aluminium alloy	AL 7075-T73510 Rod	CNR-IFSI Italy, Specification AMS-QQ-A-200/11 or ASTM B221	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL-A-8625 class 2 type III	Mechanical parts	I	V	3 4	W1	B	A					NASA/MSFC MAPTIS: 51436		

Declared Materials List

1 Group No / Item No:	2 Commercial identification	3 * Chemical nature and * type of product	4 * Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	5 Summary of processing parameters	6 Use and location	7 Environm. code R A T			8 Size code	9 C S F O O o s i f u r c a f t r c a m f g g					10 Justification for approval	11 Prime App.	12 Custo mer App.
01/03	Aluminium alloy	AL 7075-T73 Sheet	CNR-IFSI Italy, Specification AMS-QQ- A-250/12	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL- A-8625 class 2 type III	Mechanical parts	I	V	3 4	W1	B	A				NASA/MSFC MAPTIS: 50239		
01/04	Aluminium alloy	AL 6061- T651 Plate	CNR-IFSI Italy, Specification AMS-QQ- A-250/11 or ASTM B209	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL- A-8625 class 2 type III	Mechanical parts	I	V	3 4	W1	B	A				NASA/MSFC MAPTIS: 50646		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12	
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.	
						R	A	T										
01/05	Aluminium alloy	AL 6061-T6 Extruded rod, bar and shapes	CNR-IFSI Italy, Specification AMS-QQ-A-200/8	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL-A-8625 class 2 type III	Mechanical parts	I	V	3 4	W1	B	A					NASA/MSFC MAPTIS: 50643		
01/06	Aluminium alloy	AL 3.4364-T7351 Plate	CNR-IFSI Italy, DIN29546, LN9073, DAN26, DAN422, EN10204/3.1B	Chemical conversion coating on aluminium alloy MIL-C-5541class 3 and/or anodic coating on aluminum alloy MIL-A-8625 class 2 type III	Box Walls - Structural Elements	I	V	3 4	W4	B	A					NASA/MSFC MAPTIS: 50669		
Group 02: COPPER AND COPPER ALLOYS																		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
02/01	Oxygen-Free Copper alloy	Cu 99,99% min./plate	CNR-IFSI Italy / ASTM B-170, ASTM B-179-93, ASTM-F68-93	Nickel plating QQ-N-290A	Thermal dissipators on PCBs and/or conductor bridge on PCBs	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS: 10354, ESA PSS-01-701: C-5		
02/02	Electrolytic Touch Pitch (ETP) Copper alloy	Cu+Ag 99,90%min. plate	CNR-IFSI Italy / ASTM B5 ASTM B-152	Nickel plating QQ-N-290A	Thermal dissipators on PCBs and/or conductor bridge on PCBs	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS: 50827		
Group 03: NICKEL AND NICKEL ALLOYS																	
03/01	NONE																
Group 04: TITANIUM AND TITANIUM ALLOYS																	
04/01	NONE																
Group 05: STEELS																	
05/01	NONE																
Group 06: STAINLESS STEELS																	

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
						Environm. code				Size code	C	S	F	O			
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	R	A	T	r						C	a	F
06/01	Stainless steels AISI 316	AISI 316 Plate, Bar	CNR-IFSI Italy / Specification MIL-S-5059	Surface passivation treatment according to QQ-P-35	Bonding Stud	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:10370		
06/02	Stainless steels AISI 304	AISI 304 Plate, Bar	CNR-IFSI Italy / Specification MIL-S-5059, AMS 5639	Surface passivation treatment according to QQ-P-35	Mechanical parts	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:10351		
Group 07: FILLER METALS: WELDING, BRAZING, SOLDERING																	
07/01	NONE																
Group 08: MISCELLANEOUS METALLIC MATERIALS																	
08/01	Magnete core ferrites: B64290-L45-X38, B64290-K632-X35, B64290-K44-X38, B64290-K44-X830	Ni-Fe alloy	SIEMENS / Tech. Bulletin of Manufact.		Inductor and transformer core	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:50864		
08/02	Magnete EFD core ferrite: B66417-160-K187, B66417-G-X187	Ni-Fe alloy	SIEMENS / Tech. Bulletin of Manufact.		Inductor and transformer core	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:50864		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
08/03	Magnete EFD core ferrite: B66421-G-X187	Ni-Fe alloy	SIEMENS / Tech. Bulletin of Manufact.		Transformer core	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:50864		
08/04	Magnet MPP core: 55848-A2	Nikel-iron-molybdenum alloy	SIEMENS, Magnetics division of Spang&Company / Tech. Bulletin of Manufact.		Transformer core	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:10473		
08/05	Magnet MPP core: 55121-A2	Nikel-iron-molybdenum alloy	SIEMENS, Magnetics division of Spang&Company / Tech. Bulletin of Manufact.		Transformer core	I	V	3 4	W1	A	A				NASA/MSFC MAPTIS:10473		
Group 09: OPTICAL MATERIALS																	
09/01	NONE																
Group 10: ADHESIVES, COATING, VARNISHES																	

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
10/01	Adhesive Eccobond 285/11 Epoxy	See column 2	National Starch&Chemical (div. Emerson &Cuming) N.V. Belgium / Technical Bulletin of Manufacturer	Mixing ratios(by weight):4,5% of cat.11 Cured 8 h-82°C 50% R. H.	Adhes of non-structural parts	I	V	3 4	W1			A	K	A	NASA/MSFC MAPTIS: 05475		
10/02	Conformal coating ARATHANE (Uralane) 5750 A/B (LV) clear	See column 2	CIBA Specialty Chemicals MI-USA, HUNTSMAN CA-USA / Technical Bulletin of Manufacturer / MIL-I-46058C	Mixing ratios(by weight):18 parts of A and 100 parts of B (LV). Cured 7 days 25°C or 9 h 65°C 50% R.H.	Conformal coating of PCBs	I	V	3 4	W3			A	K	A	NASA/MSFC MAPTIS: 20209		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F l a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
Group 15: REINFORCED PLASTICS																	
15/01	NONE																
Group 16: RUBBERS AND ELASTOMERS																	
16/01	Rubber silicon sheet Cho-therm 1671	See column 2	Chomerics MA-USA / Technical Bulletin of Manufacturer		Thermal filler for enhanced conductivity for components on the boards and for the box-satellite I/F	I	V	3 4	A4			A	K	A	NASA/MSFC MAPTIS: 64178		
Group 17: THERMOPLASTICS																	
Group 18: THERMOSET PLASTICS																	
18/01	Thermofit RT876	Polyolefin/Heat-shrinkable insulant sleeve	Raychem Ltd. CA-USA / Technical Bulletin of Manufacturer		To isolate electrical connection in electronic box	I	V	3 4	W1			P	P	P	ESA PSS-01-701sheet n°:T-2, NASA/MSFC MAPTIS: 20021, the length is minor of 10 cm and the spacing is major of 5 cm, the used color is blue		
Group 19: WIRES AND CABLES																	

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
						Environm. code				Size code	C o r r	S C C	F I a m	O F F G			
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	R	A	T									
19/01	SPM TYPE AWG 26 PAIR TWISTED WIRE P/N:390101813B	Polyimide/fluorothermoplast insulated wire, low freq., 600V, based on type SPM, single wire	W.L.Gore Germany / ESA/ESCC/3901/018 ESA-ESCC QPL	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			A 1)	K 2)	A 3)	1)NASA test n° M103462 2)NASA test n° M103465-A MAPTIS(01353) 3)MAPTIS(62528) ESA/ESCC Qualified Part List		
19/02	SPM TYPE AWG 20 PAIR TWISTED WIRE P/N:390101816B	Polyimide/fluorothermoplast insulated wire, low freq., 600V, based on type SPM, single wire	W.L.Gore Germany / ESA/ESCC/3901/018 ESA-ESCC QPL	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			A 1)	K 2)	A 3)	1)NASA test n° M103462 2)NASA test n° M103465-A MAPTIS(01353) 3)MAPTIS(62528) ESA/ESCC Qualified Part List		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
19/03	SPM TYPE AWG 12 SINGLE WIRE P/N:390101809B	Polyimide/fluorothermoplast insulated wire, low freq., 600V, based on type SPM, single wire	W.L.Gore Germany / ESA/ESCC/3901/018 ESA-ESCC QPL	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			A 1)	K 2)	A 3)	1)NASA test n° M103462 2)NASA test n° M103465-A 3)MAPTIS(01353) ESA/ESCC Qualified Part List		
19/04	Copper wire for winding type (0,2 mm, 0,25 mm, 0,4 mm, 0,5 mm): Tenvex H	Round copper wire (Cu ETP) enamelled with modified polyesterimide resins overcoated with amide-imide resins	INVEX ITALY / MIL-W-583C type H	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Copper wire for winding of inductors and transformers	I	V	3 4	W2	A	A				NASA/MSFC MAPTIS: 50827		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
						Environm. code				Size code	C	S	F	O			
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	R	A	T	orr						CC	am	FF
19/05	AWG 26 SINGLE WIRE KT 2607	Silver plated copper wire insulated with FEP	AXON FRANCE / ACCORDING TO MIL-W-16878	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			A	K	A	NASA/MSFC MAPTIS: 00578		
19/06	100 ohm +/-7 ohm characteristic impedance AWG 22 pair twisted & shielded wire P/N:390200221B	PTFE/PFA insulated wire	W.L.Gore Germany / ESA ESCC 3902/002 ESA-ESCC QPL	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			A 1)	K 2)	A 3)	1)NASA test n° M103462 2)NASA test n° M103465-A MAPTIS(01353) 3)MAPTIS(62528) ESA/ESCC Qualified Part List		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r r	S C C	F I a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
19/07	77 ohm +/-5 ohm characteristic impedance AWG 24 pair twisted & shielded wire P/N:10612-9	Modified ETEFE insulated wire	Raychem / Technical Bulletin of Manufacturer / according to MIL-C-27500	Crimping on connector contacts according to ECSS-Q-70-26A, Soldering according to ECSS-Q-70-08A, ESA PSS-01-738 Is.1	Electrical connections in electronic box	I	V	3 4	W2			P 1)	P 1)	P 2)	1) MIL-HDBK-17 2)NASA reference publication 1124		
Group 20: MISCELLANEOUS NONMETALLIC MATERIALS																	
20/01	PCBs FR4	See column 2	PRINTCA Denmark, ZINCOCELERE DIVISION CSI Italy / ECSS-Q-70-10A, ECSS-Q-70-11A, MIL-P-18177, ESA Approved, MIL QPL-55110		PCBs of electronic box	I	V	3 4	W3			A	K	A	NASA/MSFC MAPTIS: 05543, ECSS-Q-70-10A, ECSS-Q-70-11A, MIL-PRF-55110, NASA Ref. Pub. 1124 rev.2		

Declared Materials List

1	2	3	4	5	6	7			8	9					10	11	12
Group No / Item No:	Commercial identification	* Chemical nature and * type of product	* Procurement Information * Manufacturer / Supplier * Specification Issue/Rev	Summary of processing parameters	Use and location	Environm. code			Size code	C o r	S C C	F l a m	O F F G	O U T G	Justification for approval	Prime App.	Custo mer App.
						R	A	T									
20/02	DURAVER PD-CU	Printed wiring board rigid, glass base, woven, polyimide resin, heat resistant (GI)	PRINTCA Denmark, ZINCOCELERE DIVISION CSI Italy / ECSS-Q-70-10A, ECSS-Q-70-11A, base mat.: GIN0016CH/CHB2X (ISOLA) MIL-S-13949/10, ESA Approved,		PCBs of electronic box	I	V	3 4	W3			A	K	A	NASA/MSFC MAPTIS: 61428, ECSS-Q-70-10A, ECSS-Q-70-11A		
20/03	Temp-lace 231H	PTFE impregnated with synthetic rubber finish	Gudebrod Inc. Pennsylvania-USA / MIL-T-43435B type 3 finish C size 4		Lacing tape for fixing components and cables on PCBs and internal box	I	V	3 4	W1			A	A	A	NASA/MSFC MAPTIS: 05900		

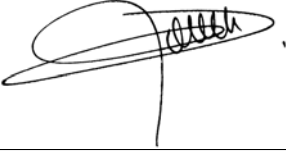




Herschel – SPIRE

Declared Material List (DML)

Mirrors and SMECm

Fichier: LAM.QUA.SPI.DML.030046_20_ SPIRE DML.doc

Prepared by :	Signature
Gérard Rousset PA / QA Date : 15/11/2004	
Checked by :	Signature
Pascal Dargent Date : 15/11/2004	
Approved by :	Signature
Dominique Pouliquen Date : 15/11/2004	



Document change record

Date	Edition	Révision	Modification	Pages concernées
30/04/03	1	0	First Release	
15/11/04	2	0	<ul style="list-style-type: none">▪ Added column Project approval status and ESA approval status▪ CuZn36 added in 4.2 page 8▪ Nickel plating added in 4.3 page 9▪ Solder "Ersin" added in 4.7 page 13▪ Parylene and Dow corning 93500 cancelled in 4.10 page 16▪ DP 490 added in 4.10 page 16▪ Aluminium adhesive tape 1170 in 4.11 page 17▪ NUFLON coating added in 4.17 page 23	

Distribution list

Institut	Nom	Issue/Révision									
		D-	1/0	2/0							
CNES	Blanc Y.										
CNES	Lorigny E										
RAL	Griffin M.J.										
RAL	King K.J.										
RAL	Sawyer E.		X	X							
RAL	Swinyard B.M.										
CEA	Auguères J.L.										
CEA	Cara C.										
CEA	Tourrette T.										
LAM	Baluteau J.P.										
LAM	Bergès J.C.										
LAM	Blanc J.C.										
LAM	Boit J.L.										
LAM	Bonnet D.										
LAM	Castinel L.										
LAM	Colin C.										
LAM	Dargent P.		X	X							
LAM	Dohlen K.										
LAM	Ferrand D.										
LAM	Jevaux M.										
LAM	Levacher P.										
LAM	Malina R.										
LAM	Moreaux Gabriel										
LAM	Origné A.										
LAM	Pouliquen D.		X	X							
LAM	Rousset G.		X	X							
LAM	Travers B.										



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1 Introduction

This document gives the list of material used by LAM for the SPIRE mirrors and SMECM. manufacture

2 Documents

2.1 Applicable Documents

no.	document name	document number, Iss./Rev.
AD1	Product Assurance requirement For First/Planck scientific instruments	PT-RQ-04410
AD2	The technical reporting and approval procedure for materials, mechanical parts and processes	PSS-01-700

2.2 Reference Documents

no.	document name	document number, Iss./Rev.
RD1	DATA for selection of Space material	PSS-01-701 Iss 1 Rev 3

3 Structure of the table

Material category

According to RD1 the material are classified according to the following categories :

1. Aluminium and aluminium alloys
2. Copper and copper alloys
3. Nickel and nickel alloys
4. Titanium and titanium alloys
5. Steels
6. Stainless steels
7. Filler metals and solder
8. Miscellaneous metallic material
9. Optical material
10. Adhesives, coatings, varnishes
11. Adhesive tapes
12. Paints, primers and inks
13. Lubricants
14. Potting compounds
15. Reinforced plastics
16. Rubbers and elastomers
17. Thermoplastics
18. Thermoset plastics
19. Wires and cables
20. Miscellaneous non metallic material

Column 1 : Item N°

Item number in the LAM DCL

Column 2 : Commercial identification

Column 3 : Chemical nature

Column 4 : Procurement information



Name of the manufacturer and/or vendor ; And if applicable the use national or international specification number of procurement specification.

Column 5 : Summary of processing parameters
I.e. mixture proportions, cure temperature, surface treatment, thermal treatment

Column 6 : Use and location
Indicates in which subsystem the material is used

Column 7 : Environmental code
Letter or digit are chosen from the following table

Radiation/UV/ATOX (R)		Ambience (A)	Temperature (T)
G = Geostat		V= Vacuum	1 = 0 to 100 K
L = Low orbit	Shadow	H= Hermetic	2 = 101 to 200 K
B= Radiation belt	Light	M= Manned	3 = 201 to 300 K
I= interplanet		E= elevated press	etc

Column 8 : Size code
An alphanumeric combination is chosen from the following table (Total quantity used in one model).

Criterion	Units	Size code
Area	A (cm ²)	0 = 0 < 1
Volume	V (cm ³)	1 = 1 < 10
Mass	W (g)	2 = 10 < 100
		3 = 100 < 1000
		4 = 1000 < 10000

Column 9 : Outgassing information
The outgassing values are listed in this column:
TML (total mass loss) and VCM (volatile condensable material) in % value

Column 10 : Stress corrosion status / Corrosion
Stress corrosion status according to RD2

Corrosion :
P : Conform to project requirement
F : No Conform
U : Performance unknow

Column 11 : Project approval status

Column 12 : ESA Approval status

4 Material list

See following sheets





4.1 Aluminium and aluminium alloys

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks													
1	Aluminium alloy	6061 T6	Pechiney	- Thermal cycling - Machining - Alodine 1200	- Mirrors - SMECm parts - Latch mechanism	R = I A = V T = 1	A = 3 V = 4 W = 4	N/A	T1																
2	Aluminium alloy	7075	Pechiney	- Machining - Alodine 1200	- Belts for SMEC	R = I A = V T = 1	A = 1 V = 0 W = 0	N/A	T1																

4.2 Copper and copper alloy

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature		Procurement information		Processing parameters		Use and location		Environ. code		Size code		Outgassing Information		SCS status Corrosion		Project Approval		ESA Approval		Remarks			
1	CuBe2	Cu (97.9) Be (1.9) Co (0.2)		Borelly		- Manufacture - Cleaning - Bake out		- -Spring washers		R = I A = V T= 1		A= 1 V=1 W=1		N/A		SCS = Unknow Cor = P									
2	CuZn36	Cu (64) Zn (36)		Luxalp		- Manufacture - Cleaning - Bake out		- -Guidance tube for the latch core		R = I A = V T= 1		A= 1 V=0 W=1		N/A		SCS = Unknow Cor = P									
						-		-																	
						-		-																	
						-		-																	
						-		-																	

4.3 Nickel and nickel alloys

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 3				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
1	2	3	4	5	6	7	8	9	10	11	12	13
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	INVAR 36	Fe(63) Ni (36) Mn (0.35) Si (0.2) C (0.02)	Metalimphy	- Machinig - Cleanning	- Actuator clamp - Washers	R = I A = V T= 1	A= 2 V= 2 W= 3	N/A	SCS = Unknow Cor = P			
2	Nickel	Ni	Protection des metaux	Chemical plating	- Motor mechanical parts - Latch mechanism	R = I A = V T= 1	A= 2 V= 1 W= 1	N/A	SCS = N/A Cor = P			

4.4 Titanium and titanium alloys

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks													
1	Ta6V	Ti (90) Al (6) V (4)	Gatien technique assemblage	- Machining - Cleaning - Bake out	- SMECm Screws	R = I A = V T = 1	A = 1 V = 1 W = 2	N/A	SCS = T1 Cor = P																

4.5 Steels

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks													
1	Pure Iron	Fe (99.89) Mn (0.1) C (0.01)	ARMCO	- Machining - Cleaning - Nickel plating	- Latch mechanism core - SMECm Motor mechanical parts	R = I A = V T = 1	A = 2 V = 2 W = 3	N/A	SCS = Unknow Cor = F			The parts in pure Iron will be Nickel plated to avoid any oxidisation													
				-	-																				
				-	-																				
				-	-																				

4.6 Stainless steels

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature		Procurement information		Processing parameters		Use and location		Environ. code		Size code		Outgassing Information		SCS status Corrosion		Project Approval		ESA Approval		Remarks			
1	304 L	Fe (66,3 - 74) Cr (18 - 20) Mn (0.4 - 1) Ni (8 - 10.5) Mn < 2 Si > 1		Aubert et Duval		- Machining - Cleaning		- Washers, screws and nuts - Mechanical Parts for SMECm and Latch mechanism		R = I A = V T = 1		A = 1 V = 1 W = 2		N/A		SCS = T1 Cor = P									
2	316 L	Fe (65) Cr (17) Ni (12) Mo (2.5) Mn (2) Mn (2) Si (1)		Aubert et Duval		- Machining - Cleaning		- Screws		R = I A = V T = 1		A = 1 V = 1 W = 2		N/A		SCS = T1 Cor = P									
3	XN 26 TW (A286 stainless steel)	Fe (55.7) C (0.05) Cr (15) Ni (26) Mo (1.25) Ti (2)		Aubert et Duval		- Machining - Cleaning		- Flexure pivots - Dowel pins		R = I A = V T = 1		A = 1 V = 1 W = 2		N/A		SCS = T1 Cor = P									





4.7 Filler metals and solder

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks													
1	WRMAP3	SN60/40PB	Ersin		Wire Brazing	R = I A = V T = 1	A = 1 V = 1 W = 2																		



4.8 Miscellaneous metallic materials

1		2		3		4		5		6		7		8		9		10		11		12		13	
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks													
1	SmCo	Sm ₂ Co ₁₇		- Mounting - Bonding - Cleaning	-Latch mechanism Smecs Actuator	R = I A = V T = 1	A= 2 V= 2 W= 3	N/A	SCS = Unknow Cor = P	1	SmCo														



4.9 Optical material

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 9				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
1	2	3	4	5	6	7	8	9	10	11	12	13
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Zero dur	Ceramic	Schott	- Manufacture - Chromium vapor deposit	- Optical incremental sensor	R = I A = V T = 1	A= 2 V=2 W=2	N/A	N/A			

4.10 Adhesives, coatings, varnishes

 		DECLARED MATERIAL LIST					ORIGINATOR : Laboratoire d'Astrophysique de Marseille					
Category of material : 9				PROGRAM : HERSCHEL			SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm					
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Parylene-C		Union Carbide	Vapor deposit under vacuum at Room temperature	Coating to protect against the corrosion for all the parts in Pure Iron	R=1 A=V T=1	A=3 V=0 W=1	Unknow	N/A			No longer used
2	93500-DC	Silicone	Dow corning	Cure at room T°	Stress relief potting for the wire exit	R=1 A=V T=1	A=1 V=1 W=1	TML=0.3% CVCm=0.03%	N/A			No longer used
3	DP 490	Epoxy resin	3M	2/1 1D at RT	- Screws securisation	R = 1 A = V T = 1	A= 1 V= 1 W= 1	TML < 1 %	N/A			

4.11 Adhesive tapes

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 10				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Adhesive tape Scotch tape 92	KAPTON (Polyimide)	3M	72h /RT Adhesive silicon		R = I A = V T= 1	A= 1 V=1 W=1	TML=0.78% CVCM=0.2%	N/A			
2	Aluminium Adhesive Tape 1170	Aluminium	3M	72h /RT Acrylic adhesive	Cable EMI shielding	R = I A = V T= 1	A= 2 V=1 W=1	TML=0.49% CVCM=0.2%	N/A			



4.12 Paints, primers and inks

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 11				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
<p style="font-size: 2em; color: magenta; opacity: 0.5;">No material in this category</p>												

4.13 Lubricants

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 12				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
<p style="font-size: 2em; color: magenta; opacity: 0.5;">No material in this category</p>												

4.14 Potting compounds

 		DECLARED MATERIAL LIST					ORIGINATOR : Laboratoire d'Astrophysique de Marseille					
Category of material : 13				PROGRAM : HERSCHEL			SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm					
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Stycast 3050 + hardener 23 LV	Epoxy resin	Emerson and cuming	Cure at 65° for 2h	- Potting for the encapsulation of the and motor coil Latch mechanism coil	R = I A = V T= 1	A= 2 V= 2 W= 2	TML= 1.47% CVCM= 0.07%	N/A			
2	Stycast 2850 FT + hardener 24 LV	Epoxy resin	Emerson and cuming	Cure at 25° for 16h	- encapsulation of the 3050 and potting for the latch mech. - bonding of the Hedenhaim ruler	R = I A = V T= 1	A= 2 V= 2 W= 2	TML= 0.45% CVCM=0.001%	N/A			
3												
4												



4.15 Reinforced plastics

				DECLARED MATERIAL LIST					ORIGINATOR : Laboratoire d'Astrophysique de Marseille			
Category of material : 14				PROGRAM : HERSCHEL					SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm			
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
No material in this category												



4.16 Rubbers and elastomers

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 15				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
No material in this category												

4.17 Thermoplastics

 		DECLARED MATERIAL LIST					ORIGINATOR : Laboratoire d'Astrophysique de Marseille					
Category of material : 16				PROGRAM : HERSCHEL			SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECM					
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Teflon	Polytetrafluoroethylene	Du Pont US	Machining, cleaning	- Actuators holds	R = I A = V T = 1	A= 2 V=2 W=2	TML= 0.05% CVCM=0.0%	N/A			
2	NUFLON	Polytetrafluoroethylene	APS	Vapour deposit	- Latch mechanism core - Motor mechanical parts	R = I A = V T = 1	A= 2 V=1 W=1	TML= 0.05% CVCM=0.0%	N/A			

4.18 Thermoset plastics

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 17				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
<h1 style="color: magenta; text-decoration: underline;">No material in this category</h1>												

4.19 Wires and cables

		DECLARED MATERIAL LIST					ORIGINATOR : Laboratoire d'Astrophysique de Marseille					
Category of material : 14				PROGRAM : HERSCHEL			SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm					
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
1	Copper Wire	Cu	EBA	- Coil manufacture - Potting	Coil for the latch mechanism and the SMECm motor	R = I A = V T= 1	A= 2 V=2 W=2	N/A	N/A			The coil are encapsulated in Stycast 3050 after manufacture
2	Electric Wires	Cu,Ag	Filotex ESA-3901-002-65-B1		- Harness for the SMEC mechanism	R = I A = V T= 1	A= 2 V=2 W=3	N/A	N/A			

4.20 Miscellaneous non metallic material

				DECLARED MATERIAL LIST				ORIGINATOR : Laboratoire d'Astrophysique de Marseille				
Category of material : 14				PROGRAM : HERSCHEL				SYSTEM / EXPERIMENT : SPIRE SUB-SYSTEM : Mirrors and SMECm				
Item N°	Commercial identification	Chemical nature	Procurement information	Processing parameters	Use and location	Environ. code	Size code	Outgassing Information	SCS status Corrosion	Project Approval	ESA Approval	Remarks
<p style="font-size: 2em; color: magenta; text-shadow: 2px 2px 4px blue;">No material in this category</p>												

Herschel/SPIRE

MULLARD SPACE SCIENCE LABORATORY
 UNIVERSITY COLLEGE LONDON Author: C BROCKLEY-BLATT

SPIRE – STRUCTURE DECLARED MATERIALS LIST

Document Number: MSSL/SPIRE/PA002.06 June 2004

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	Herschel.Planck@esa.int	<input type="checkbox"/>

Author:**Date:****Checked:****Date:****Approved:****Date:**

Change Record

ISSUE	Date	Brief description of change
0.1	September 2001	New document
1.0	November 2001	Issued and Updated
1.1	10 July 2002	Updated to reflect new design changes
2	22 November 2002	Updated to reflect comments from RAL
3	February 2003	Updated to include Silver Solder
4	March 2003	Updated to remove material that is not used
5	August 2003	Updated to include Torlon
6	June 2004	Updated to include 99.999% pure Copper, Super Invar, Carbon fibre and resin, added Project and ESA sign off columns. Minor additions/corrections made.

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1. INTRODUCTION

This document identifies the material types that will be used in the SPIRE structure. The data is based on mature designs and is practically complete.

2. REFERENCES

2.1 Normative References

NR1	MSSL/SPIRE/PA001	Product Assurance Plan
NR2	ECSS-Q-70A	Materials Mechanical Parts and Processes
NR3	ESA PSS-01-700	The Technical Reporting and Approval Procedure for Materials and Processes

3. QUALITY LEVELS

Material selection shall be as described in NR1, paras 8.1 and 8.2.

4. TABLE DESCRIPTION FOR THE DECLARED MATERIALS

The format of the materials table is as described in NR3.

4.1 Categories

The following list identifies all the categories of materials:-

1. Aluminium and Aluminium Alloys
2. Copper and Copper Alloys
3. Nickel and Nickel Alloys
4. Titanium and Titanium Alloys
5. Steels
6. Stainless Steels
7. Filler Metals and Solders
8. Miscellaneous Metallic Materials
9. Optical Materials
10. Adhesives, Coatings and Varnishes
11. Adhesive tapes
12. Paints, Primers and Inks
13. Lubricants
14. Potting Compounds, Sealants, Foams
15. Reinforced Plastics
16. Rubbers and Elastomers
17. Thermoplastics
18. Thermoset Plastics
19. Wires and Cables
20. Miscellaneous Non-metallic Materials

4.2 Column Description

1. Item number
2. Commercial Identification
3. Nature and Type of Product
4. Procurement Information
5. Summary of Processing Parameters
6. Use and Location
7. Environmental Code
8. Size Code
9. Approval Status
10. Project Sign Off
11. ESA Sign Off
12. ESA Comments

NOTES:

Column 7: Environmental Code

Radiation (R)		Ambiance (A)	Temperature (T)
G = Geostationary	S = Outside shadow	V = Vacuum	1 = 0 to 100K
L = Low orbit	L = Outside light	H = Hermetic	2 = 101 to 200K
B = Radiation belts		M = Manned	3 = 210 to 300K
I = Interplanetary		E = Elevated pressure	etc

Column 8: Size code

AREA	A (cm ²)	0 = 0<1
VOLUME	V (cm ³)	1 = 1<10
MASS	W (g)	2 = 10<100
		3 = 100<1000
		etc

4.3 Abbreviations

N/A = Not applicable

TBA= To be advised

Issue No 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 1. Aluminium and Aluminium Alloys													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
						R	A	T					
1.	Aluminium alloy 6082	6082-T6 Commercial product Extrusion/plate & rod	J Smith & Sons London UK BS 1470/1474	Alocrom 1200	Optical Bench, Mirror mounts, detector boxes, filter mounts, covers, MGSE	B	V	3/4	W4	ESA & NASA			

<u>Issue No</u> 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
<p>PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)</p> <p>PREPARED BY: C Brockley-Blatt</p>													
CATEGORY: 2. Copper and copper alloys													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Oxygen Free High Conductivity Copper	BS 3839 C103	J Smith & Sons London UK BS 1470/1474	N/A	Thermal Straps, Thermal Busbar	B	V	3/4	W1	ESA & NASA			
2.	99.999% Pure Copper	99.999% Pure	Electronic Space Products International, 1050 Benson way, Ashland, OR 97520 USA	N/A	Thermal Straps, Thermal Busbar	B	V	3/4	W1	ESA & NASA			

Issue No 6		<u>DECLARED MATERIALS LIST</u>						MSSL/SPIRE/PA002					
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 3. Nickel and Nickel alloys													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A T			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Super Invar	Maraging T 350	Mahler Limited SuperAlloys Edward Street Sheffied S3 7GD (supplied to B3 Technologies)	N/A	FPU A – Frames and Main mounting cone, Detector box supports	B	V	3/4	W3				

<u>Issue No</u> 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
<p>PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)</p> <p>PREPARED BY: C Brockley-Blatt</p>													
CATEGORY: 6. Stainless steels													
Item No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A T			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Stainless steel AISI 321	Commercial product AISI 321 S12/S20	Various BS 1449	N/A	Instrument supports, Detector box supports	B	V	3/4	W2	ESA & NASA			

Issue No 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 7. Filler metals and solders													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
						R	A	T					
1.	Silver Solder	55% Silver 45% made from Copper, Zinc, Tin	J & L Industrial Supplies	See DPL item 5	Thermal Busbar	B	V	3/4	W1	ESA & NASA			

Issue No 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 10. Adhesives, coatings and varnishes													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A T			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Stycast 2850FT Black	Commercial product 2 part, epoxy adhesive for cryogenics	Polymer Systems Ltd	See DPL item 1	Secure harness mounting points, FPU Mounts, Detector box mounts	B	V	3/4	W1	ESA & NASA			
2.	Gold Plate	British Telecom spec. M468A and MIL spec G45204B type 1C	Walton Plating	See DPL item 6	Thermal interfaces	B	V	1	W1				




Issue No 6		<u>DECLARED MATERIALS LIST</u>						MSSL/SPIRE/PA002					
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 12. Paints, primers and inks													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
						R	A	T					
3.	Alocrom 1200	Chromating Commercial product	MSSL	See DPL item 3	Optical bench, mounts, covers, detector boxes, MGSE	B	V	3/4	A3	ESA & NASA			

Issue No 6		<u>DECLARED MATERIALS LIST</u>						MSSL/SPIRE/PA002					
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 15. Reinforced Plastics													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A T			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Carbon Fibre PrePreg	M55J6K/RS-3 Unidirectional Prepreg	YLA Incorporated 2970 Bay Cista Court Bencia California 94510 (supplied to B3 Technologies)	In house procedures specified by B3.	FPU and detector box mounts	B	V	3/4	W3				

<u>Issue No</u> 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
<p>PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)</p> <p>PREPARED BY: C Brockley-Blatt</p>													
CATEGORY: 18. Thermoset plastics													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code R A T			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
1.	Vespel SP 1	Polyimide Commercial product Unfilled base resin Bar	Du Pont USA Vespel SP 1	N/A	Thermal insulation	B	V	3/4	W2	ESA & NASA			
2.	Kapton	Polyimide tape Y966 acrylic adhesive coated. Commercial product	Du Pont USA (HPC Stevenage, UK)	N/A	Electrical insulation	B	V	3/4	W1	ESA & NASA			
3.	Torlon	Polyamide-imide Grade 4203 Electrical Grade Commercial product Unfilled base resin Bar	(supply from Buck and Hickman)	N/A	Electrical Isolation	B	V	3/4	W2				

Issue No 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: C Brockley-Blatt													
CATEGORY: 19. Wires and cables													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
						R	A	T					
1	167 Tex Kevlar 29 cable	Part number AR305767. Polyaramid	Goodfellow Cambridge LTD, Huntingdon, PE29 6WR	N/A	300mkl Strap System Supports	B	V	3/4	W1				

Issue No 6		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)													
PREPARED BY: C Brockley-Blatt													
CATEGORY: 20. Miscellaneous non-metallic materials													
Itm No	Commercial Identification	Chemical Nature Type of Product Form & Condition	Procurement Info., Supplier Spec. Issue	Summary of Processing Parameters	Use & Location	Environmental Code			Size Code	Approval Status	Project Sign Off	ESA Sign Off	ESA Comments
						R	A	T					
1.	Barden patented matl. Bartemp Bearings	Teflon coated glass fibres impregnated with MoS ₂	Barden Corp Plymouth Devon UK	N/A	MGSE	B	V	3/4	W1				
2.	Duroid material	Duroid	SNFA Bearings, Glos. UK	N/A	MGSE	B	V	3/4	W1	ESA & NASA			
3.	Gudebrod 450X	Lacing cord	Gudebrod Inc US	N/A	Harness tie downs	B	V	3/4	W1				

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	Declared Materials List Cardiff Deliverables for SPIRE-PFM	

Declared Materials List
Cardiff Deliverables for SPIRE-PFM

SPIRE Ref.: SPIRE-UCF-PRJ-002153

Cardiff Ref.: HSO-CDF-LI-074

Issue: 1.0

1 October 2004

Prepared by:-	Peter Hargrave – Cardiff SPIRE technical manager		14 th September 2004
Approved by:-	Ian Walker – Cardiff AIG programme manager		

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Update history

Date	Version	Remarks
20 th September 2004	1.0	

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SCOPE

This document lists the declared materials used in the provision of the deliverables for the SPIRE-PFM and FS instrument from Cardiff University

INTRODUCTION

Materials used by Cardiff University are listed in the accompanying tables, which are compliant with ESA: PSS-01-700 Issue 2. Each material has an individual identification number, the first digit being the group type as follows:-

1. Aluminium and Aluminium Alloys
2. Copper and Copper Alloys
3. Nickel and Nickel Alloys
4. Titanium and Titanium Alloys
5. Steels
6. Stainless Steels
7. Filler Metals: Welding, Brazing, and Soldering
8. Miscellaneous Metallic Materials
9. Optical Materials
10. Adhesives, Coatings, Varnishes
11. Adhesive Tapes
12. Paints and Inks
13. Lubricants
14. Potting Compounds, Sealants, Foams
15. Reinforced Plastics
16. Rubbers and Elastomers
17. Thermoplastics (Non Adhesive Tapes, Foils (MLI)....)
18. Thermoset Plastics
19. Wires and Cables (For Materials Aspects Only)
20. Miscellaneous Non-Metallic Materials (Ceramics....)

CONTENT OF THE DECLARED MATERIALS LIST

Extract from ESA PSS -01-700 Issue 2 (August 1993) ANNEX B

The materials list consists of 10 columns, which shall be completed as indicated below. Furthermore, similar materials shall be grouped together as specified above. If a particular item does not apply, write N.A (Not Applicable).

COLUMN 1 : Item Number

Identification number in each group. One only per material type. Does not change during the life of the material list (sub-items permitted when deemed necessary).

COLUMN 2 : Commercial Identification

Trade name and number (to be completed in full) e.g. "ARALDITE AV 100".
Correct and standard designation.

ESA has chosen:

Trade name + number. For example "ARALDITE AY 105"

If no trade name exists, then the manufacture's name plus number are entered: e.g. "SCHOTT BK7"

In the case of the AISI system for steel: for other metals or alloys, the main consistent will be entered first except in the case of a traditional name (e.g. brass or bronze).

For each material as designated above, a unique item number shall be given. If several lines are used for different applications and /or processing, sub item numbers shall be added.

COLUMN 3 : Chemical Nature And Type Of Product

Example: epoxy resin, polyurethane adhesive, or Ti, 6Al, 4 alloy.

COLUMN 4 : Procurement Information

Manufacturer/supplier: name of the manufacture and the name of the supplier if different.

Specification: reference of the procurement specification with, if considered useful, issue and revision. It may be replaced by a national specification number if it exists and make source of procurement irrelevant.

COLUMN 5 : Processing Parameters (Summary):

Give as relevant: mixture proportions, cure temperature, special-cleaning agents, surface treatment, thermal treatment, temperature, etc.
 NOTE: Specification number is required, but not sufficient for ESA purposes.

COLUMN 6 : Use and Location

Indicate in what subsystem, box or item the material is used and whether it acts as structural element, thermal control, electrical insulation etc. as relevant.

COLUMN 7 : Environmental Code

Radiation /UV/ATAXIA (1) (R)		Ambience (A)	Temperature (2) (T)
G = Geostationary L = Low Orbit B = Radiation Belts I = Interplanetary	S = Outside Shadow L = Outside Light	V = Vacuum H = Hermetic M = Manned E = Elevated Pressure	1 = 0 to 100 2 = 101 to 200K 3 = 201 to 300 K “ etc.

(1) For materials inside the spacecraft, choose a letter from the left-hand side column. For materials on the surface of the spacecraft, combined this letter with “L” or “S”.

(2) Thermal cycle to be indicated by two values, e.g. 3/5.

(3) “RT” can be accepted as a code between 238 K (10°C) and 313 K (40°C).

Materials which are at a boundary between environments shall be described by two sets of codes.

COLUMN 8 : Size Code

AREA	A (cm ²)	0 = 0 < 1
VOLUME	V (cm ³)	1 = 1 < 10
MASS	W (g)	2 = 10 < 100
		3 = 100 < 1000
		etc.....

Choose an alphanumeric combination from the above mentioned table, e.g. A5 or V2 or W3

COLUMN 9 : All the codes of Column 9 shall be relevant for the project concerned, which implies that they refer to validated data applicable to this project (not too old, same processing, same composition, QC tests run on the same procured lot, etc.).
Reference of test report and relevant test result code to be given in Subcolumn 9.1

SUBCOLUMN 9.1 :

Outgassing (OUT):

P - The material passed the Outgassing test detailed in [ECSS-Q-70-02A](#). Reference of test report to be given in Subcolumn 9.2.

F - The material failed. Waiver reference in Subcolumn 9.2.

U - Materials of which Outgassing characteristics are unknown.

Stress Corrosion Cracking (SCC):

A - The material is known to have a high resistance to SCC.

(Table I document [ECSS-Q-70-36A](#)).

B - Table II and III document [ECSS-Q-70-36A](#).

Justification for approval (test reference) stated in Subcolumn 9.2 (generally making reference to [ECSS-Q-70-36A](#)).

U - Materials and / or *weldments* for which SCC characteristics are unknown: A SCC evaluation form is required, based if necessary on tests (see [ECSS-Q-70-37A](#)).

Corrosion (Corr.):

A - The material does not require a surface treatment or coating for its intended application, otherwise it shall be rated B.

B - Details of the surface treatment to be given in Column 5.

Flammability (Flamm.) (If applicable):

P - The material passes the requirements of document [ECSS-Q-70-21A](#).

F - The material failed the test of document [ECSS-Q-70-21A](#) in the applicable atmosphere. Waiver reference in Subcolumn 9.2.

U - Materials of which offgassing characteristics are unknown.

Offgassing (OFF) (if applicable):

P - The material passes the requirements of document [ECSS-Q-70-29A](#).

F - The material failed: waiver reference in Subcolumn 9.2

U - Materials of which offgassing characteristics are unknown.

SUBCOLUMN 9.2 : Justification for Approval

The purpose of this sub column is to enter any additional information that may be necessary in order to achieve customer approval. This information is reference of the Requests For Approval; reference of justificatory file for materials approved for other space or aeronautical programmes meeting the specific needs of the programme, reference of the evaluation report or waivers etc. These documents must be made available to ESA on request.

SUBCOLUMN 9.3 : Approval Status of the Contractor

A - Approved = All materials classified "A" may be used without restriction.

Y - Approved with restriction = These materials require the preparation of QC test specimens or a treatment before use: potting, coating, test specimens...

W - Approved with a waiver = These materials do not meet the requirements but are used for functional reasons. The use of such materials shall be reduced to a minimum. All the waivers shall be approved by ESA. The waiver number shall be entered in Subcolumn 9.2.

P - Pending a decision = Materials for which an evaluation report or a waiver is awaiting the contractor's provisional or definitive approval.

O - Open = New materials or materials for which investigations and qualification are in progress.

D - Deleted = This clarification is used for a material, which is no longer used.

COLUMN 10 : ESA approval and comments

This column will be completed by ESA in accordance with the standard comments list in Annex E.

COLUMN 11 : ESA sign-off

COLUMN 12 : Project sign-off

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		1	Aluminium & aluminium alloys															
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
1-1	Aluminium alloy 6082	6082-T6 Commercial product. Extrusion / plate / rod	Metalfast Ltd, Swindon www.metalfast.co.uk C of C# 187636 / 1 / 672545 187824 / 1 / 672972	Aluchrom 1200	300mK Photometer bus-bar supports. (LTS-PFM-100, LTS-PFM-200) 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W2							ISO9002		
			Orchard Materials Ltd, Unit 20, Cooper road, Thornbury industrial estate, Thornbury, Bristol BS35 3UW		Spectrometer calibration source SCAL-PFM-000 300mK filter clamps FILT-PFM-210, FILT-PFM-220, FILT-PFM-230, FILT-PFM-240, FILT-PFM-250	I	V	1	W3, W2							ISO9002		
			Aalco, test lane, Nursling, Southampton, SO16 9TA C of C# 0747194		Photometer calibration source PCAL-PFM-000	I	V	1	W1							ISO9000		

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		2		Copper & copper alloys														
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
2-1	OFHC Copper 99.99%	1" diameter copper bar BS3839 C110 C of C# L.41568	Columbia metals Ltd, Titley Bawk Avenue, Wellingborough road, Earls barton, Northampton, NN6 0LA	Machined, Gold plated In-house process E-59.	PCal source assembly PCAL-PFM-100	I	V	1	W1							ISO9002		

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		3		Nickel & nickel alloys													
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		4		Titanium & titanium alloys													
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		5		Steels													
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		6 Stainless steels																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
6-1	Stainless steel 304L	Commercial product. Extrusion / plate / rod	Durbin metal industries Ltd, Unit 0, Lawrence drive, Stover trading estate, Yate, Bristol BS37 5PG	Machined	300mK Photometer bus-bar supports. (LTS-PFM-100, LTS-PFM-200) 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W3							ISO9000		
			Metalfast Ltd, Swindon www.metalfast.co.uk													ISO9002		
			Orchard Materials Ltd, Unit 20, Cooper road, Thornbury industrial estate, Thornbury, Bristol BS35 3UW													ISO9002		
6-2	Sandvik SANMAC 304L	Hot finished Stainless steel 304L tube	TW Metals Ltd, Majestic road, Nursling Estate, Nursling, Southampton, SO16 0AF Cert. # A/02-124674 A/01-926414 A/02-950954	Machined	Dichroics FILT-PFM-310, FILT-PFM-320 Beam dividers FILT-PFM-410, FILT-PFM-420	I	V	1	W2							ISO9002		

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		7	Filler metals: Welding, brazing & soldering															
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
7-1	60/40 Tin/Lead solder	Tin/lead alloy Multicore rosin flux	RS components Ltd, PO box 99 Corby Northants NN17 9RS Part# 561-123		Soldering manganin wires into connectors - Spectrometer calibration source SCAL-PFM-000 Soldering copper source wires to insulated turret terminals - PCal source assembly PCAL-PFM-100	I	V	1	W0							ISO9001		

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		8 Miscellaneous metallic materials															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		9 Optical materials															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		10 Adhesives, coatings, varnishes																
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
10-1	Epotek-920FL	Two-part loaded thermally conductive epoxy. Cert. of analysis#90-3421/67-3421	Promatech Ltd, 2 Wilkinson Road, Cirencester, Gloucestershire, GL7 1YT	Mixed as per manufacturer's instructions. Cured at 80°C for 4 Hours.	Component of black coating BG1 and BG7B (see below) Encapsulation of Kevlar cord ends – 300mK photometer bus-bar supports & light baffles	I	V	1	W1						ESA approved epoxy			
10-2	Epotek-920	Two-part loaded thermally conductive epoxy. Cert. of analysis#45-3421/67-3421			SCal assembly (bonding heaters and thermometers to sources)	I	V	1	W0						ESA approved epoxy			
10-3	Cardiff black coating – BG1	High emissivity coating for stray light & thermal control. Based on Epotek-920FL with carbon loading.	In-house process	HSO-CDF-PR-050	SCal assembly. SCAL-PFM-000 PCal assembly. PCAL-PFM-000. General SPIRE use – ref. SPIRE-RAL-NOT-001816 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W2						Fully flight qualified Get qual report from RAL			
10-4	Cardiff black coating – BG7B	High emissivity coating for stray light & thermal control. Based on Epotek-920FL with carbon and SiC loading.	In-house process	HSO-CDF-PR-049	SCal assembly. SCAL-PFM-000 General SPIRE use – ref. SPIRE-RAL-NOT-001816	I	V	1	W3						Fully flight qualified Get qual report from RAL			

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		11	Adhesive tapes														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		12	Paint & inks														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		13	Lubricants														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		14 Potting compounds, sealants, foams															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

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Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		15 Reinforced plastics															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074					
Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		16 Rubbers & elastomers															
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

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Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		17	Thermoplastics (non-adhesive tapes, foils (MLI).....)														
Item#	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
					NONE												

Issue # 1		DECLARED MATERIALS LIST										HSO-CDF-LI-074						
Project:		Herschel-SPIRE																
Institute:		Cardiff University																
Prepared by:		Peter Hargrave																
Category:		18	Thermoset plastics															
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign	
						R	A	T		OUT	SCC	CORR	FLAMM	OFF				Justification
18-1	Torlon	Polyamide-imide	RS components Ltd, PO box 99 Corby Northants NN17 9RS Part# 257-7079	Machined	SCal sources SCAL-PFM-000 300mK light baffles (LTS-PFM-300, LTS-PFM-400)	I	V	1	W1						Flight qualified / approved Check....	ISO9001		
18-2	Polypropylene film	Polypropylene "PHD" material various thicknesses in range 3.7µm to 15µm "GND" material - 15µm to 50µm	Hoechst Trespaphan	Copper evaporation. Photolithography Hot-pressed. In-house process. Document ref... DPL....	Instrument filters, beam dividers, dichroics.	I	V	1	W2						Flight qualified. Heritage from ISO, Cassini, Spitzer...			
18-3	Polypropylene sheet	Polypropylene sheet – 2mm thick	North Sea Plastics Unit 2, 5 Campsie road, Kirkintilloch, Glasgow. G66 1SL	Hot-embossed. Processed by Cardiff MEC. Full address & contact info	Spectrometer detector lenses (300mK)	I	V	1	W1									

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Project:		Herschel-SPIRE															
Institute:		Cardiff University															
Prepared by:		Peter Hargrave															
Category:		19		Wires and cables													
Item #	Commercial ID	Chemical nature and type of product	Procurement information	Processing parameter	Use & location	Environment code			Size code	Approval status					ESA approval & comments	Project sign	ESA sign
						R	A	T		OUT	SCC	CORR	FLAMM	OFF			
19-1	42 SWG Manganin wire (enamelled)	Manganin wire. Polyimide insulation.	Scientific Wire Co., 18 Raven Road South Woodford London E18 1HW	As received	SCal assembly SCAL-PFM-000	I	V	1						Flight qualified / approved			

