



**Rutherford
Appleton
Laboratory**

**COMBINED DECLARED MATERIALS
LIST**

**PRODUCT ASSURANCE
Space Science and
Technology Department**

Spacecraft/Project:	HERSHCEL	Document No:	SPIRE RAL PRJ 0001092		
Instrument/Model:	SPIRE	Issue No:	1	REV:	0
Subsystem:		Date:	25 Jan 2002		

SUBJECT: COMBINED DECLARED MATERIALS LIST

PREPARED BY: E A Clark

DOCUMENT No: SPIRE-RAL-PRJ-0001092

ISSUE: Issue 1 Date: 25 January 2002

APPROVED BY: Name Date: Signature
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DOCUMENT LIST

Note

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. However only the applicable pages are included in this document .

Sub-System	Document	
Institute	Title	Number
ATC	DECLARED MATERIALS LIST	SPIRE-ATC-PRJ-0000710
CDF (QMW)		
CEA/SAp		
CEA/SBT	SPIRE & PACS Sorption Coolers Declared Materials List	HSO-SBT-LI-004 Iss 1.1
CSA/USK		
IFS (IFSI)	DPU DCL + DML+ DPL	SPIRE-IFS-Doc-001031 Issue 1
JPL	BDA Declared Materials List	Not Numbered
LAM (LAS)	Materials List	SPI.PFM.00.LM.01A
MSSL	SPIRE – DECLARED MATERIALS	MSSL/SPIRE/PA 002.1



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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
CDF (QMW)	Department of Physics and Astronomy, University of Wales, Cardiff,	No
CEA/SAp	CEA, Service d'Astrophysique Saclay	No
CEA/SBT	(CEA) Service du Basse Temperatures Grenoble	Yes
CSA/USK	Canadian Space Agency (CSA) University of Saskatchewan Canada	No
IFS (IFSI)	Instituto di Fisica dello spazio Interplanetario, Rome	Yes
JPL	JPL/Caltech, Pasadena	Yes
LAM (LAS)	Laboratoire d'Astronomie Spatiale, Marseille	Yes
MSSL	Mullard Space Science Lab Surrey	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
			Sheet No:	Page 1 of 4
SYSTEM / EXPERIMENT		SPIRE	Issue/Rev:	0.3
SUB-SYSTEM:		BSM	Date:	20.Jul.01

BSM Material List ID	Component ID	Name & Type of Product, Form and Condition	Specification	Size Code	Processing Parameters	Outgassing SCC-Res. Data and Refer	OK to bake at 80°C?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference
1.	Structure, Jiggle frame, Interface shoe, baffle	Aluminium plate, cold rolled. bar	6082	TBD	T6 (TBC)	TBD	Y	Y	Y	TBD	
2.	Baffle	Aluminium Sheet, welded.	6082	TBD	T6 (TBC)	TBD	Y	Y	Y	TBD	
3.	Mirror	Aluminium	6061	TBD	-T651 or T6511	MSFC-HDBK-527F p88 Corrosion rating 'B'.	Y	Y	Y	TBD	Intermediate cycling per ATC Spec to provide stability.
4.	Fasteners	stainless steel,	austenitic	N/A	TBD	TBD	Y	Y	Y	TBD	
5.	Locking inserts	stainless steel,	TBD	N/A	TBD	TBD	Y	Y	Y	TBD	
6.	Flex pivots	Inconel	718	N/A	TBD	TBD	Y	Y	Y	TBD	Austenitic stainless steel (304 grade) an alternative.
7.	Flex pivot sleeves	stainless steel, aluminium or inconel	TBD	TBD	TBD	TBD	Y	Y	Y	TBD	
8.	Sensor targets	Mild steel (Soft iron grade preferred – TBD)	BS970 220M07	TBD	TBD	TBD	Y	Y	Y	TBD	Corrosion protection by thin layer of varnish, material ID 19

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SYSTEM / EXPERIMENT		SPIRE		Issue/Rev:	
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BSM Material List ID	Component ID	Name & Type of Product, Form and Condition	Specification	Size Code	Processing Parameters	Outgassing SCC-Res. Data and Refer	OK to bake at 80°C?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference
9.	Sensor mount, motor housing	Glass fibre epoxy	G-10CR Or G10/40 (TBC)	TBD	TBD	TBD	Y	Y	Y	TUFNOL	TBC if required , may use aluminium instead. Note: A cryogenic grade material consisting of 7628 fabric woven with continuous e-glass fiber in an amine-cure
10.	Potting compound/ Adhesive	Stycast	2850FT	N/A	with Catalyst 11	MAPTIS material 06451	Y	Y	TBC	TBD	Various grades in MAPTIS, MSFC-HDBK. Select correct one NB - LIMITED LIFE MATERIAL
11.	Adhesive, cable run	Eccobond	285	N/A	with catalyst 11	MAPTIS database material 05475	Y	Y	TBC	TBD	ATC practice is to use 286 - NB - LIMITED LIFE MATERIAL
12.	Motor screening	Mu-metal, sheet 0.125mm thick	TBD	TBD	TBD	MSFC-HDBK-527F p181 (spec AMS 7701) Corrosion rating 'B'	TBC	TBC	TBC	Goodfellow	In MSFC HDBK as 'MAGNET HI-PERM-MUMETAL'. TBC if required
13.	Harness - wire core	TBD	TBD	N/A	TBD	TBD	Y	Y	Y	TBD	Get space rated cable from RAL
14.	Harness - insulation	TBD	TBD	N/A	TBD	TBD	Y	Y	TBC	TBD	Get space rated cable from RAL
15.	Harness P-Clips	Brass	TBD	TBD	TBD	TBD	Y	Y	Y	TBD	TBC if required
16.	Solder	Solder	TBD	N/A	TBD	TBD	Y	Y	Y	TBD	Space rated soldering certificate required

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BSM Material List ID	Component ID	Name & Type of Product, Form and Condition	Specification	Size Code	Processing Parameters	Outgassing SCC-Res. Data and Refer	OK to bake at 80°C?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference
17.	Motor Core	NiFe Soft magnetics Laminated sheets	ULTRA PERM 250 or CryoPerm 10	TBD	TBD	TBD	Y (PACS)	Y (PACS)	Y (PACS)	TBD	Latest PACS paper says CryoPerm 10
18.	Motor Winding	Aluminium, high purity	5N	TBD	TBD	TBD	Y (PACS)	Y (PACS)	Y (PACS)	California Fine Wires	TBC , may be 6N copper
19.	Motor insulation	Varnish?	TBD	N/A	TBD	TBD	Y (PACS)	Y (PACS)	Y (PACS)	TBD	Zeiss, PACS approved
20.	Motor winding frames	Vespel	SP-1	TBD	TBD	TBD	Y	Y	Y	DuPont	
21.	Motor Permanent Magnet	NdFeB Permanent magnets	VACODYM 344	TBD	TBD	TBD	TBC	Y (PACS)	Y (PACS)	TBD	
22.	Finish	QMW Black	Mk2	N/A	TBD	TBD	TBC	Y	Y	TBD	TBD if required
23.	Unfinished aluminium parts	Finish - anodize	TBD	N/A	TBD	TBD	Y	Y	Y	TBD	TBC if required
24.	Thermal end stops	Copper (TBD)	TBD	TBD	TBD	TBD	Y	Y	Y	TBD	TBC if required
25.	Surface plating	Copper flashing, Nickel Plate (TBD), Gold plate	TBD	N/A	TBD	TBD	Y	Y	Y	TBD	

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SUB-SYSTEM:		BSM	Date:	20.Jul.01

BSM Material List ID	Component ID	Name & Type of Product, Form and Condition	Specification	Size Code	Processing Parameters	Outgassing SCC-Res. Data and Refer	OK to bake at 80°C?	Thermal & Vacuum stable?	OK at 4°K?	Manufacturer	Remarks, Approval Reference
26.	Motor Thermal shields	Copper	TBD	N/A	Electroformed	TBD	Y	Y	Y	TBD	Check electroformed Cu is OK
27.	Magnetic Shielding	Niobium plate	TBD		plated	TBD	TBC	TBC	Y	TBD	Use as superconducting magnetic shield



SPIRE & PACS
Sorption Coolers
Declared Material List

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

SPIRE & PACS Sorption 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.



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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)



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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.



SPIRE & PACS

Sorption Coolers

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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					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	
1-1	EN-AW 2017A T451	Cu: 4.35 % Mg: 0.80 % Mn: 0.75 % Si: 0.51% Fe: 0.21% Zn: 0.23% Al: rem.	1- ANFI 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		Coulée # 4-01-5664
1-2	EN-AW 2017A	Cu: 4.20 % Mg: 0.66 % Mn: 0.85 % Si: 0.60% Fe: 0.40% Zn: 0.01% Al: rem.	1- KUMW 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		



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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 CuC1	Cu: 99.99% O < 0.0005%	1 – OUTOKUMPU/SISO 2 -	1- Machined 2- Gold plated	Strap (138) 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	NA	P	ESA PSS-01-701		FI 007
2-2	CuA1	Copper alloy															



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Group 4 – Titanium & Titanium 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	
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					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	
6-1	AISI 304L	Ni: 8.51% Cr: 18.29% C: 0.018% Mn: 1.87% Si: 0.44% S: 0.025%	1 – IMCO 2 –	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					Screws, nuts, washers, spring, helicoil		V	1		N/A	N/A	N/A					



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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		1 – SBT/ 2	HSO-SBT-PR-034	Soldering of manganin wires into connectors		V	1	W1								
7-2	ARGECO 1441	Silver alloy Ag: 72% Cu: 28%	1 – SNLS/PROTECHNO 2 –	Subcontractor procedure CI-92.01	Brazing		V	1	W1								



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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	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	
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						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								



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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								FI 005
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						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						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									Batch # AA-97084
20-5	PTFE housing		1- TECHNOFLUOR 2-				V	1	W1								

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Herschel

~~**DPU Declared Components List**~~
Materials List
~~**Processes List**~~

Document Ref.: SPIRE-IFS-DOC-001031

Issue: 1.0

Prepared by: R. Orfei

Date: 21 November 2001

SPIRE_DPU_DCL-ML-PL_Issue1.doc



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1 INTRODUCTION

1.1 Scope of the document

This document is the preliminary Declared Components List, Materials List and Processes List in terms of selection and approval for the SPIRE-DPU subsystem. It has to be noted that all DPU electronic components will be purchased through the Coordinated Parts Procurement Agency set up by ESA and contracted to Tecnologica (Sevilla, Spain) and TOP-REL (Rome, Italy).

Acronyms and Abbreviations

1.1.1 Acronyms

AD	Architectural Design
ATP	Acceptance Test Plan
AVM	Avionic Model
CIDL	Configuration Identification Document List
CSL	Configuration Status List
CNR	Consiglio Nazionale delle Ricerche
CPP	Coordinated Parts Procurement
CPP	Coordinated Parts Procurement Board
CPU	Control Processing Unit
CDMS	Central Data Management System
CDMU	Central Data Management Unit
CQM	Cryogenic Qualification Model
DCU	Detector Control Unit
DDD	Detailed Design Document
DPU	Digital Processing Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
ESA	European Space Agency
FIRST	Far InfraRed and Submillimeter Telescope
HK	HouseKeeping
HW	HardWare
IBDR	Instrument Baseline Design Review
ICD	Interface Control Document
ICDR	Instrument Critical Design Review
ICU	Instrument Control Unit
IHDR	Instrument Hardware Design Review
IFSI	Istituto di Fisica dello Spazio Interplanetario
ISVR	Instrument Science Verification Review

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MCU	Mechanism Control Unit
NA	Not Applicable
OBS	On-Board Software
PA	Product Assurance
PDU	Power Distribution Unit
PROM	Programmable Read Only Memory
S/C	SpaceCraft
SCC	SpaceCraft Components
SCU	S..... Control Unit
SEU	Single Event Upset
SPIRE	Spectral and Photometric Imaging Receiver
S/S	SubSystem
SVM	Service Module
SW	Software
TBC	To Be Confirmed
TBD	To Be Defined
TBW	To Be Written
TV	Thermal Vacuum
WBS	Work Breakdown Structure

1.2 References

1.2.1 Applicable Documents

Document Reference	Name
AD1	SPIRE Instrument Specification
AD2	FIRST/Planck Instrument Interface Document Part A
AD3	FIRST/Planck Instrument Interface Document Part B Instrument "SPIRE"
AD4	Product Assurance Plan for the FIRST-SPIRE Instrument
AD5	SPIRE Product Tree
AD6	FIRST SPIRE DPU Subsystem Specification Document
AD7	ESA Preferred Parts List. ESA PSS-01-603

1.2.2 Reference Documents

Document Reference	Name
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Reference	
RD1	SPIRE Design Description
RD2	SPIRE Preliminary EEE Parts List
RD3	Carlo Gavazzi Space: DPU Preliminary Declared Components List

2 Status of the lists

This is the first issue of the DPU Declared Components List, Materials List and Processes List prepared for the DDR.

The electronic components list presented (taken from RD3) has already been subjected to scrutiny by the Coordinated Parts Procurement Boards (CPPB) and it is still subject to be updated in just a few items, mainly for standardisation of packages and types.

2.1 Overview of the DPU

The DPU is the only subsystem that interfaces electrically with the spacecraft for telemetry and telecommand. It takes care of the command execution and synchronisation, it controls all the subsystems, packages the telemetry and takes care of the health-autonomous mode.

The DPU electronics will consist of a single box, positioned in the warm part of the S/C and as close as possible to the DCU, the MCU and SCU sub-systems.

3 Notes on Components Criticality

With the present EEE lists there are no criticalities implied.

4 Introduction to the Components and Materials Lists

It has to be stressed the point that IFSI is involved in the design and manufacturing of the DPU/ICU of the three Herschel instruments, so the lists will be nearly the same for the three instruments. In the following pages the components and Bill of Materials are reported. The components are corresponding to the ones actually shown in the electrical schematics and soldered in the related printed boards and are reported for each printed board:

- CPU,
- CPU PIGGY-BACK;
- PL-IF,
- DC/DC Converter and Motherboard.



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6 Preliminary Materials List

6.1 GROUP 1 - Paints and Adhesives

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)	
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X			
Conformal Coating of PCBs	9	1	PCBs Conformal Coating	89131	SILICON POLYMER CV 1152	Mc GHAN NUSIL CORP.	Tech. Bulletin of Manufact.	GROUP :4 ITEM N°1 GROUP :16 N°3 GROUP :17 N°1	1000	1	110	A					A	K		ESA-PSS-01-701 GD-PR-CGS-033
Potting of electrical components	10	2	Potting Compound	03484	RTV 566A/B	GENERAL ELECTRIC	MB0130-85 STM0706-02 STM0051-02	GROUP :3 ITEM N°1 GROUP :16 N°3 GROUP :17 N°1	2	10	100	A					A	K		MSFC-HDBK-527F ESA-PSS-01-701 GD-PR-CGS-011
Adhesion of identification label	10	3	General purpose glue	05475	ECCOBOND 285 cat. 11	EMERSON & CUMING	Tech. Bulletin of manufacturer	GROUP :1 ITEM N°1 GROUP :16 N°3 GROUP :17 N°1	1	1	10	A					A	K		MSFC-HDBK-527F PA 072
Adhesion of non structural parts	15	4	General purpose glue	05066	SCOTCH WELD 2216 B/A	3M	MB-0120-086 MIL-A-46864	GROUP :1 ITEM N°2 GROUP :16 N°3 GROUP :17 N°1	4	0,01	10	A					B	K		MSFC-HDBK-527F ESA-PSS-01-701 Tech. Bulletin of manufacturer
Adhesion of non structural parts	70	5	Screw locking compound	06354	Loctite 222	LOCTITE	MIL-S-46163A. Tech. Bulletin of Manufact.	GROUP: 1 ITEM N° 3 GROUP :16 N°3 GROUP :17 N°1	<5	<0.1	NA	C					A			MAPTIS . Use for thread locking only.
Electrical isolation of connection	12	6	Heat shrinkable insulant sleeve	20021	THERMOFIT RT876	RAYCHEM	MIL-I-23053/5 MIL-R-46846	GROUP: 16 ITEM N° 4 GROUP :16 N°3 GROUP :17 N°1	15	0,41min 0,89max	1000	X					A	K		MSFC-HDBK-527F ESA-PSS-01-701



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6.2 GROUP 4 - Non-metallic Materials

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X		
PCBs	9	1	Printed Circuit Boards	05543	FR4	- VIASYSTEMS division C.S.I. PRINTCA	MIL-P-18177 MC8024-1	GROUP : 5 N°1 GROUP : 8 N°1,2 GROUP:16 N°1,2,3 GROUP:17 N°1,2,3	1000	1.6	110	A					A	K	MSFC-HDBK -527F ESA -PSS-01-710 CNES/QFT/SP-0117 NASA Ref. Pub. 1124 rev.2
PCBs	9	2	Printed wiring board rigid	00153 MAPTIS	Polymide impregnated woven fiberglass fabric, heat resistant (GI), base materia l: GIN0016CH/CHB2X	- ISOLA - VIASYSTEMS division C.S.I. - PRINTCA	MIL-P-13949G/10 CANCELLED ref. only	GROUP: 5 N°1 GROUP: 8 N°1,2 GROUP:16 N°1,2,3 GROUP:17 N°1,2,3	1000	1.6	110	A					A	K	ESA PSS-01-710 CNES/QFT/SP,0117
Thermal interface for electronic components	200	3	Thermal interface material	64178	Cho-Therm 1671	CHOMERICS	Tech. Bulletin of Manufact.	GROUP :16 N°3 GROUP :17 N°1	1	0.3	100	A					A	K	MSFC-HDBK -527F Tech. Bulletin of Manufact.
Thermal interface filler		4	THERM-A-GAP A274	04617 MAPTIS	Silicone rubber with aluminum oxide filler on aluminum carrier adhered to substrate with acrylic adhesive	CHOMERICS	Tech. Bulletin of Manufact.	GROUP: 5 N°4 GROUP :16 N°3 GROUP :17 N°1	132	2,54	22,7K	A						K	Maptis
Mechanical parts		5	PEEK	02166	Polyetheretherketone	POLYPENCO / FURON / LNP Eng.	MIL-P-46183	GROUP :16 N°3 GROUP :17 N°1	10	3	200	A					A	K	ESA tests 718, M205 NASA REF. PUB. 1124 rev.2 (GSC14250)
Mechanical parts		12	PTFE	00016	Polytetrafluoroethylene	DUPONT / FURON	AMS 3651	GROUP :16 N°3 GROUP :17 N°1	90	5	100	A					A	K	Maptis



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6.3 GROUP 5 - Metallic Materials

6.3.1 Aluminum Materials

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X		

Board Stiffener	25	1	Aluminum Alloy	50669	AL-7075-T7351 PLATE	COPPER & BRASS / BENJAMIN	QQ-A-250/12 AMS4078 ASTMB209 MB0170-078	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000						A	B					MSFC-HDBK-527F ESA-PSS-01-701 coated in according to MIL-C-5541C and/or MIL-A-8625
Mechanical parts		2	Aluminum Alloy	10047	AL-7075-T7351 BAR	COPPER & BRASS / BENJAMIN	QQ-A-225/9 AMS4124 ASTM B211	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000						A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625
Mechanical parts		3	Aluminum Alloy	50669	AL-3.4364-T7351 PLATE	ALIMEX	DIN 29546 LN 9073 DAN 26 DAN 422 EN 10204/3.1B	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000						A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625
Mechanical parts		4	Aluminum Alloy	10047	AL-3.4364-T7351 ROUND BAR	ALIMEX	DIN 65113 LN 1799 LN 29765/A EN 10204/3.1B	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000						A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625
Mechanical parts		5	Aluminum Alloy	50646	AL-6061-T651 PLATE	COPPER & BRASS / BENJAMIN	QQ-A-250/11 ASTM B209	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000						A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625



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Mechanical parts		6	Aluminum Alloy	50648	AL-6061-T6511 ROD EXTRUDED	COPPER & BRASS / BENJAMIN	QQ-A-200/8 ASTM B221 AMS 4173	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000								A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625	
Mechanical parts		7	Aluminum Alloy	50646	AL-3.3214-T651 PLATE	COPPER & BRASS / BENJAMIN	DIN 29546 LN 9073 DAN 26 DAN 422 EN 10204/3.1B	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000									A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625
Mechanical parts		8	Aluminum Alloy	50648	AL-3.3214- T6511 ROD EXTRUDED	COPPER & BRASS / BENJAMIN	DIN 65113 LN 1799 EN 10204/3.1B	GROUP 9 N° 1,2 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	3000									A	B					Maptis coated in according to MIL-C-5541C and/or MIL-A-8625



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6.3.2 Stainless Steels Materials

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)			
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X					
Mechanical parts		9	Stainless Steels	10370	AISI 316 PLATE, BAR	COPPER & BRASS / BENJAMIN	QQ-S-763 AMS 5524 MIL-S-5059 ASTM A182 ASTM A276 ASTM A479	GROUP 9 N° 3 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	2000						A	A						Maptis Surface passivation treatment in according to QQ-P-35



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6.3.3 Copper Alloy Materials

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)		
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X				
Thermal dissipaters		10	Oxygen-Free Copper Alloy	10354	Cu 99,99% min. PLATE	COPPER & BRASS	ASTM B-170 ASTM B-179-93 ASTM F-68-93	GROUP 9 N° 4 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	2000						A	A					Maptis ESA-PSS-01-701(C-5) coated in according to QQ-N-290A (nickel plating)
Thermal dissipaters		11	Electrolytic Touch-Pitch (ETP) Copper Alloy	50827	Cu+Ag 99,90% min. PLATE	MIORINI	ASTM B5 ASTM B152	GROUP 9 N° 4 GROUP 11 N° 1 GROUP :16 N°3 GROUP :17 N°1	2000						A	A					Maptis coated in according to QQ-N-290A (nickel plating)



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6.3.4 Miscellaneous Metallic Materials

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X		

Inductor core	4	12	Magnetic core ferrites: B64290-K45-X38 B64290-K632-X35	50864	Ni-Fe alloy	SIEMENS	Tech. Bulletin of Manufact.		200							A	A						Maptis
Inductor core	4	13	Magnetic EFD core ferrite: B66417-160-K187	50864	Ni-Fe alloy	SIEMENS	Tech. Bulletin of Manufact.		300							A	A						Maptis
Transformer core	4	14	Magnetic EFD core ferrite: B66421-G-X187	50864	Ni-Fe alloy	SIEMENS	Tech. Bulletin of Manufact.		300							A	A						Maptis
Transformer core	4	15	Magnetic core ferrite: B64290-K44-X38	50864	Ni-Fe alloy	SIEMENS	Tech. Bulletin of Manufact.		200							A	A						Maptis

6.4 GROUP 6 - Mechanical Parts



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6.4.1 Semi-finished or Finished Mechanical Components

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)		
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X				
Card-lock Retainer	42	1	PCBs Locking Retainer MHA260-4.80ETM2 (black anodize per MIL-A-8625 type III class 2)	10024	AL6061-T6	CALMARK	QQ-A-200/8	GROUP : 9 ITEM N° 2 GROUP :16 N°3 GROUP :17 N°1	15	NA	NA				A	B					MSFC-HDBK -527F Housing: coated per MIL-A-8625 type III class 2



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6.4.2 GROUP 7 – Fasteners

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X		

Fastener		1	Helicoil	10268	AISI 304	BOLLHOFF	LN 9499	GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		2	Helicoil	10268	AISI 304	BOLLHOFF	LN 9039	GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		3	Grower	10268	AISI 316	BOSSARD	DIN 7991	GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		4	Cylinder head screw	10268	AISI 316	BOSSARD	DIN 912	GROUP 1 N°2.3 GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		5	Flat washer	10268	AISI 316	BOSSARD	DIN 433	GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		6	Nut	10268	AISI 316	BOSSARD	DIN 439B	GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		7	Countersunk screw	10268	AISI 316	BOSSARD	DIN 965A	GROUP 1 N°2.3 GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		8	Countersunk screw	10268	AISI 316	BOSSARD	DIN 7991	GROUP 1 N°2.3 GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS
Fastener		9	Low profile cylinder head screw	10268	AISI 316	BOSSARD	DIN 6912	GROUP 1 N°2.3 GROUP :16 N°3 GROUP :17 N°1								A	A						MAPTIS



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6.4.3 GROUP 8 – Wires

PART/DWG NUMBER	QTY	ITEM N°	NOMENCLATURE	MATERIAL IDENTIFICATION					NON METALLIC MATERIAL			USAGE EVAL.						MUA STAT	REMARKS (SPECIAL CURE, ETC)	
				MAT'L CODE	MATERIAL DESCRIPTION	MATERIAL MFGR	MATERIAL SPEC	PROCESS SPECIF.	WT (g)	THK (mm)	AREA (mm ²)	F L M	A G E	S C C	C O R	T V S	T O X			
Electrical connections		1	Wires for cables	01188	Wires AWG , 22,24, 24 tws, 26	GORE	ESA/SCC/3901/018	GROUP : 7 ITEM N° 1 GROUP : 8 ITEM N° 1				A					A	K		MAPTIS ESA SCC QPL
Inductor and Transformer		2	Copper wire for winding type (0.4 mm, 0.25 mm): Tenvex H	50827	Round copper wire (Cu ETP) enamelled with modified polyesterimide resins overcoated with amide-imide resins	INVEX (ITALY)	MIL-W-583C type H	GROUP : 8 ITEM N° 1						A	A					MAPTIS

L.A.M.	HERSCHEL	Ref : SPI.PFM.00.LM.01.A	Page : 1 / 3
UMR 6110	SPIRE	Author : P. Dargent	Date : 03 October 2001
	SMECm		
Liste des Matériaux			
Materials List			

Distribution List :

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	Pascal Dargent	X	Michel Jevaud	
	Didier Ferrand	X	Patrick Levacher	
	Dominique Pouliquen	X		

Material	Constitution (%)	Density (kg / m ³)	Modulus of Elasticity at 4K (Gpa)	Proof Strength (0.2%) at 4K (Mpa)	Mean C.T.E. [293K / 4K] (10 ⁻⁶ /K)	Main Use	Supplier
6061 - annealed	Al (98) Mg (0,8-1,2) Si (0,4-0,8) Fe (<0,7) Cu (0,15-0,4) Cr (0,04- 0,35) Zn (<0,25) Mn (<0,15) Ti (<0,15)	2700	76	70	18	Structure	
2017	Al (94,2) Cu (3,5-4,5) Mn (0,4-1) Mg(0,4-0,8) Si (0,2-0,8) Fe (< 0,7) Zn (<0,25) Cr (<0,1)	2790	81	370	18	Shim (TBC)	
7075 – T6	Al (90) Zn (5,1-6,1) Mg (2,1-2,9) Cu (1,2-2) Fe (<0,5) Si (<0,4) Mn (<0,3) Cr (0,18-0,28) Ti (<0,2)	2810	80	600	(18)	Belts	
AISI 304 - annealed	Fe (66,345-74) Cr (18-20) Ni (8- 10,5) Mn (<2) Si (<1) C (<0,08) P (<0,045) S (<0,03)	8000	201	340	10,24	Washers	
AISI 321	Fe (68) Cr (18) Ni (11) Mn (2) Si (1) Ti (0,15) P (0,045) C (0,08) S (0,03)	8000			(10,2)	Nuts and Screws	
AISI 316L	Fe (65) Cr (17) Ni (12) Mo (2,5) Mn (2) Si (1) P (<0,045) S (<0,03) C (<0,03)	8000			10,27	Flex-pivots structure	
AISI 431	Fe (82) Cr (15-17) Ni (1,25-2,5) Mn (<1) Si (<1) C (<0,2) P (<0,04) S (<0,03)					(magnetic cores ?)	
CuBe ₂	Cu (97,9) Be (1,9) Co (0,2)	8250	135	1000	10,9	Flex-pivot blades Spring washers	
TA5E (ILE)	Ti (92,5) Al (5) Sn (2,5) Fe (<0,25) O (<0,12)	4480	130	1550	6,6	Screws	
Invar 36	Fe (63) Ni (36) Mn (0,35) Si (0,2) C (0,02)	8120		850	(2,4)	Actuator clamp	Imphy S.A.

Herschel/SPIRE

MULLARD SPACE SCIENCE LABORATORY


UNIVERSITY COLLEGE LONDON Author: C BROCKLEY-BLATT

SPIRE – DECLARED MATERIALS

Document Number: MSSSL/SPIRE/PA002.1 29 November 2001


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	SPIRE	Project Document	Ref: MSSL/SPIRE/PA002.01
		Declared Materials List	Issue: 1.0
			Date: November 2001
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Change Record

ISSUE	Date	Brief description of change
0.1	September 2001	New document
1.0	November 2001	Issued and Updated

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1. INTRODUCTION

This document identifies the material types that will be used in the SPIRE structure, as designed and built by MSSL. The data is based on mature designs and is practically complete. This document has been used to identify all the materials used by MSSL only.



2. REFERENCE DOCUMENTS

All documents are listed in Figure 3.2 of the CIDL.


3. THE DECLARED MATERIALS LISTS

		Project Document		Ref:	MSSL/SPIRE/PA002.01
		Declared Materials List		Issue:	1.0
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Issue No 1		<u>DECLARED MATERIALS LIST</u>					MSSL/SPIRE/PA002.1				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
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	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 Chemglaze-Z306 Anodised-chromic acid		B	V	3/4	W4		

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Issue No 1		<u>DECLARED MATERIALS LIST</u>					MSSL/SPIRE/PA002				
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
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			Size Code	Approval Status	ESA Comments
						R	A	T			
1.	Beryllium copper	Commercial product	Anderton Bradford, UK N 1400-0018	N/A		B	V	3/4	W0		

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Issue No 1		<u>DECLARED MATERIALS LIST</u>						MSSL/SPIRE/PA002			
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
CATEGORY: 4. Titanium and titanium 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	ESA Comments
						R	A	T			
1.	Titanium TI-6Al-4V	TI-6Al-4V, Ti alloy Commercial product 6STA Rod	Dornier			B	V	3/4	W2		

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PROJECT: Herschel/SPIRE											
EXPERIMENT:											
EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
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			Size Code	Approval Status	ESA Comments
						R	A	T			
1.	Stainless steel AISI 321	Commercial product AISI 321 S12/S20	Various BS 1449 Barden Corp, Plymouth Devon, UK	N/A		B	V	3/4	W2		

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PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
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	ESA Comments
						R	A	T			
1.	Solder, Elsold	63/37 Sn/Pb eutectic Rosin cored Commercial product Extrusion	Bleiwerk Goslar 63 tin solder eutectic as in ESA PSS-01-708	Hand soldering of PCB's	All PCB's	B	V	3/4	W2		

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PROJECT: SWIFT EXPERIMENT: UVOT EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
CATEGORY: 10. Adhesives, coatings and varnishes											
Item 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	ESA Comments
						R	A	T			
1.	Scotch Weld 1838	Commercial product 2 part, epoxy adhesive	3 M's Adhesive Supplies	Mix 1:1 by mass Cure 4hrs @ 60°C	Secure magnets in dichroic assembly,	B	V	3/4	W1		

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Issue No 1		DECLARED MATERIALS LIST						MSSL/SPIRE/PA002			
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL) PREPARED BY: A P Dibbens											
CATEGORY: 12. Paints, primers and inks											
Item 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	ESA Comments
						R	A	T			
2.	Anodising	Commercial product Chromic acid process	Ingram & Glass, Godalming, UK DEF STN 0324	N/A		B	V	3/4	A3		
3.	Alocrom 1200	Chromating Commercial product	MSSL	N/A		B	V	3/4	A3		
4.	Chemglaze 9924	Polyvinyl butyral resin - Primer	Hughson Chemicals US	N/A		B	V	3/4	A4		
						BB	V	3/4			


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Issue No 1		<u>DECLARED MATERIALS LIST</u>							MSSL/SPIRE/PA002		
PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
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			Size Code	Approval Status	ESA Comments
						R	A	T			
1.	Vespel SP 1	Polyimide Commercial product Unfilled base resin Bar	Du Pont USA Vespel SP 1	N/A	High voltage xformer in Blue Module	B	V	3/4	W2		
2.	Kapton	Polyimide tape Y966 acrylic adhesive coated. Commercial product	Du Pont USA (HPC Stevenage, UK)	N/A	Over heaters for thermal control etc	B	V	3/4	W1		
3.	PTFE	PTFE Commercial product Plate	Du Pont USA	N/A	Spacers	B	V	3/4	W1		
4.	Kapton H	Polyimide adhesive coated film	Du Pont	N/A	Xformer insulation in TMPSU	B	V	3/4	W0		

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PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
CATEGORY: 19. Wires and cables											
Item 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	ESA Comments
						R	A	T			
1.	PTFE insulated copper wire	Pure PTFE coated, tin plated copper wire. Commercial product Single strand, shielded and twisted	Cabletec UK Filotex France ESA/SCC 3901/013	Hand soldering Crimping		B	V	3/4	W4		
2.	Enamelled conductor	Polyurethane coated copper wire	BICC Connollys UK BICOSOL, grade 2 also Alcatel-Copper	Fabrication of high voltage transformers & inductors		B	V	3/4	W2		

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PROJECT: Herschel/SPIRE EXPERIMENT: EXPERIMENTER: MULLARD SPACE SCIENCE LABORATORY (MSSL)											
PREPARED BY: A P Dibbens											
CATEGORY: 20. Miscellaneous non-metallic materials											
Item 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	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		B	V	3/4	W1		
2.	Duroid material	Duroid	SNFA Bearings, Glos. UK	N/A		B	V	3/4	W1		
3.	Gudebrod 450X	Lacing cord	Gudebrod Inc US	N/A		B	V	3/4	W1		

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	