XMM Optical Monitor

MULLARD SPACE SCIENCE LABORATORY
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XMM-OM DECLARED MATERIALS LIST

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CHANGE RECORD

ISSUE	DATE	PAGES CHANGED	COMMENTS
01	23 March 1995	All New	
02	30 March 1995	2,5,11,12,17,18,19,21, 22	American information added
03	17 March 1997	All	Updated information on the telescope design and the inclusion of Sparnex declared materials.

CONTENTS

1. INTRODUCTION
This document identifies the material types that will be used in the XMM-OM instrument. The data is based on mature designs and is practically complete.
This document has been used to co-ordinate all the materials used by all the consortium members.

2. REFERENCE DOCUMENTS

XMM-OM/MSSL/SP/0031	Product Assurance Plan
XMM PX-RS-0017	Product Assurance Requirements for XMM Experiments
ESA PSS-01-70	Materials and Process Selection and Quality Control
ESA PSS-01-700	The Technical Reporting and Approval Procedure for Materials and Processes

3. QUALITY LEVELS
Material selection shall be as described in the PA Plan, XMM-OM/MSSL/SP/0031 paras 8.1 and 8.2.

4. TABLE DESCRIPTION FOR THE DECLARED MATERIALS
The format of the following table is broadly as described in ESA PSS-01-70, Materials and Process Selection and Quality Control for ESA Space Systems and Associated Equipment.

4.1 Categories
Only the following categories are applicable to the Optical Monitor:-

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 materials and solders
8. Miscellaneous metallic materials
9. Optical materials
10. Adhesives, coatings and varnishes
12. Paints, primers and inks
15. Reinforced plastics
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. ESA Comments

4.3 Abbreviations
N/A = Not applicable
TBA= To be advised

Issue No 3	**DECLARED MATERIALS LIST**	**XMM-OM/SP/0028**

PROJECT: X-RAY MULTIMISSION (XMM)
EXPERIMENT: OPTICAL MONITOR (OM)
EXPERIMENTERS: MULLARD SPACE SCIENCE LABORATORY (MSSL)
DEPT OF PHYSICS, UNIVERSITY OF CALIFORNIA, SANTA BARBARA (UCSB)
CENTRE SPATIAL DE LIEGE (CSL)
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 R	A	T	Size Code	Approval Status	ESA Comments
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	Various locations in Blue Module & Telescope	B	V	3/4	W4		
2.	Aluminium alloy 5083	5083-F Commercial product Extrusion	J Smith & Sons London UK BS 1474	Alocrom 1200 Chemglaze-Z306	Filter wheel structure	B	V	3/4	W3		
3.	Aluminium alloy	Commercial product Cast tooling plate	J Smith & Sons London UK Toplate C250	Alocrom 1200 Chemglaze-Z306	Bulkhead-Blue Module	B	V	3/4	W3		
4.	Aluminium bronze	Commercial product CA	J Smith & Sons London UK DTD 197A	N/A	Drive shaft dichroic assembly	B	V	3/4	W3		

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CATEGORY: 1. Aluminium and Aluminium Alloys continued

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	ESA Comments
5.	Aluminium alloy	Structural Alloy 6061-T6, 0.6% Si, 0.25%Cu, 1.0%Mg, 0.25% Cr Commercial product Extrusion & plate	QQ-A-250/12 US	Chromate - Alodine per Mil-C-5541 class 3	Box structure, covers, frames in DEM	B	V	3/4	W4		
6.	Aluminium zinc alloy	5.6%Zn, 2.5%Mg, 1.6%Cu, 0.3%Cr	Otto Fuchs	Anodised	Housing, front and back panels of TMPSU	B	V	3/4	W4		
7.	Aluminium alloy	6063 T5 or T6	Dynatherm Corp Maryland US	Alodyne 1200	Heat pipes	B	V	3/4	W3		
8	Aluminium alloy	Alusuisse “Alplan”. Commercial product	J Smith & Sons, London UK	Alocrom 1200, Chemglaze Z306	Spider	B	V	3/4	W3		
9.	Aluminium alloy	BS 1470 2014A Clad T4	J Smith & Sons, London UK	Alocrom 1200	Foil support	B	V	3/4	W2		

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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	T	Size Code	Approval Status	ESA Comments
1.	Beryllium copper	Commercial product	Anderton Bradford, UK N 1400-0018	N/A	Circlip-Blue Module	B	V	3/4	W0		
2	ARCAP	CuNi25Zn			Spacers on TMPSU	B	V	3/4	W2		
3..	MS63	62% copper, rest=Zn			Screws & nuts in TMPSU	B	V	3/4	W2		

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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	ESA Comments
1.	Invar-36	64Fe-36Ni alloy Commercial product Rod & forged disc	Imphy (UK) Ltd Bucks, UK	Annealed, Stress relieved Painted	Structural & metering parts in Telescope	B	V	3/4	W3		

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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 R	A	T	Size Code	Approval Status	ESA Comments
1.	Titanium TI-6Al-4V	TI-6Al-4V, Ti alloy Commercial product 6STA Rod	Dornier		Interface fixings	B	V	3/4	W2		

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CATEGORY: 5. Steels

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	ESA Comments
1.	Steel	Commercial product	SNFA Bearings Ltd, Charfield, Glos. UK SAE 52100	N/A	Bearings-dichroic assembly	B	V	3/4	W3		
2.	Spring steel	Commercial product Disc spring	Schnorr, Sindelfingen, Germany DIN 17 221 DIN 17 222	N/A	Position retainer	B	V	3/4	W1		

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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	ESA Comments
1.	Stainless steel AISI 321	Commercial product AISI 321 S12/S20	Various BS 1449	N/A	Fasteners in Blue Module	B	V	3/4	W2		
2.	Stainless steel AISI 321	Commercial product AISI 321 S31	Allco UK BS 1449	N/A	Bearing spindle in Filter Wheels	B	V	3/4	W3		
3.	Stainless steel AISI 440C	Commercial product AISI 440C	Barden Corp, Plymouth Devon, UK	N/A	Bearings in Blue Module	B	V	3/4	W2		
4.	Stainless steel	Commercial product 302 S26	Lee Spring Ltd, Wokingham, Berks, UK	N/A	Spring end loading. Blue Module	B	V	3/4	W1		
5.	Stainless steel	Commercial product AMS 5520	Anderton, Bradford, UK N1300-0037-AS	N/A	Circlip, Blue Module	B	V	3/4	W1		

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CATEGORY: 6. Stainless steels continued

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	ESA Comments
6.	Stainless steel AISI 303 & 21	Fe17-19,Cr8-10 Stainless steel Commercial product Rod	J Smith & Sons, London UK	N/A	Special Screws	B	V	3/4	W2		
7.	Stainless steel A2 BS 6015	Stainless steel Commercial product	J Smith & Sons, London UK	N/A	Screws, washers	B	V	3/4	W2		
8.	Stainless 300 Series	Non magnetic, Austenitic(18/8 series) <8%Ni	Barnhill Bolt ALBQ US	N/A	Screws in DEM	B	V	3/4	W1		
9.	Stainless steel AISI 316	Commercial product, wire mesh	GKN Bound Brook. Staffs. UK	N/A	Filter, telescope vent	B	V	3/4	W1		

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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 R	A	T	Size Code	Approval Status	ESA Comments
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 in OM 1	B	V	3/4	W2		
2.	KR-19RMA Solder	63/37 Sn/Pb eutectic per QQ-S-571E	NIHOW ALMIT Japan	Hand soldering per Mil-std-2000	PCB's in DEM	B	V	3/4	W1		

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CATEGORY: 8. Miscellaneous 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 R	A	T	Size Code	Approval Status	ESA Comments
1.	Magnet	Samarium/cobalt Commercial product B50 36A	Magnet Applications Ltd Bremag 26	N/A	Position retainer-dichroic assembly	B	V	3/4	W0		

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CATEGORY: 9. Optical 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 R	A	T	Size Code	Approval Status	ESA Comments
1.	Zerodur	Ceramic glass Commercial product	Schott, Mainz Germany	Aluminised & protective MgF coating	Mirrors & dichoic	B	V	3/4	W4		
2.	Silica	Optical glass Commercial product	Schott, Mainz Germany		Intensifier window	B	V	3/4	W2		
3.	Fibre taper	Optical glass SFO 32 AS Commercial product	Schott, Mainz Germany		Intensifier assembly	B	V	3/4	W2		
.											

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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	ESA Comments
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		
2.	Solithane 113	Polyurethane Commercial product Conformal coatings	Uniroyal Chemical Co or Thikol USA	2 part system, 100 parts resin to 75 of catalyst	Coating of PCB's and screw locking	B	V	3/4	W1		
3.	CV 1152	Controlled volatility RTV silicone conformal coating	Nusil Technology USA	1 part system	Coating of PCBs in Blue Module	B	V	3/4	W1		
4.	Electrodag 501	Fluorinated binder Conductive matt black paint Commercial product	Acheson Colloiden NL	Cure 24hrs @ 220 C	Thermo optical surfaces	B	V	3/4	W1		
5.	Chemglaze L300	Polyurethane Conductive matt black paint Commercial product	Lord-Hugson Chemicals USA	Cure 16 hrs @ 65 C	Structural surfaces	B	V	3/4	W2		

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CATEGORY: 10. Adhesives, coatings and varnishes continued

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	ESA Comments
6.	Pyrolac P123	Primer Commercial product	AKSO France	Surface treatment	All painted surfaces	B	V	3/4	W2		
7.	Hysol PC-18M	Urethane coating	Dexter Corp US	Thinned with ethyl acetate	Coating of PCB's and markings in OM2	B	V	3/4	A4		
8.	Epon 828/ Versamid 140	2 part epoxy adhesive	Ablestik Labs US	Pre-mixed by manufacturer	Staking of electronic compnts	B	V	3/4	A1		
9.	Araldite AV138M/ HV998	2 part epoxy adhesive	CIBA		Fixing of compnts in TMPSU	B	V	3/4	W2		
10.	Apiezon AP100	Space grease. Commercial product	Edwards High Vacuum UK	N/A	Threads	B	V	3/4	W1		

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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 R	A	T	Size Code	Approval Status	ESA Comments
1.	Chemglaze Z 306	Black paint, Polyurethane, non-conductive Commercial product	C Y Finishes. RGS-MSSL-SE-013	N/A	Various locations	B	V	3/4	A2		
2.	Anodising	Commercial product Chromic acid process	Ingram & Glass, Godalming, UK DEF STN 0324	N/A	Gear in dichroic assembly	B	V	3/4	A3		
3.	Alocrom 1200	Chromating Commercial product	MSSL	N/A	Various in Blue Module	B	V	3/4	A3		
4.	Chemglaze 9924	Polyvinyl butyral resin - Primer	Hughson Chemicals US	N/A	Primer under Z-306	B	V	3/4	A4		
5.	Pelican #17 Ink	Black ink	Pelican W Germany	Coat with PC-18M	PCB's and frames	B	V	3/4	A1		
6.	Pelican #18 Ink	White ink	Pelican W Germany	Coat with PC-18M	PCB's and frames	B	V	3/4	A1		
7.	Chemglaze Z307	As 1, only conductive	C Y Finishes	N/A	Telescope structure	B	V	3/4	A4		

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CATEGORY: 15. Reinforced plastics

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	ESA Comments
1.	Multilayer and double sided PCB's	Glass fibre reinforced epoxy resin	Intercole (UK) RGS-MSSL-SE-014 also to Mil-P-55110 Class 4 in US	PTH and multilayer technology	All electronics	B	V	3/4	W3		
2.	Double sided PCB's	Glass fibre epoxy or polyimide resin	Systronic	PTH technology	PCB's in TMPSU	B	V	3/4	W3		
3.	Ryton R4	Polyphenylene sulfide, 40% glass filled	Phillips 66 Engineering Plastics US	Injection mould	PCB frame guides in DEM	B	V	3/4	W2		

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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	ESA Comments
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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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 R	A	T	Size Code	Approval Status	ESA Comments
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	Internal & external harnesses	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	Blue Module & TMPSU	B	V	3/4	W2		
3.	Co-axial 50 ohm	TBA	TBA	N/A	TBA	B	V	3/4	W1		
4.	Be Cu 25um	TBA	TBA	N/A	TBA	B	V	3/4	W1		
5.	Thomrex 165 Emafil wire	TBA	TBA	N/A	TBA	B	V	3/4	W1		
6.	Raychem wire	Spec 44 Series Rad crosslinked polyalkene and modified $PVDF_2$	Raychem Products US	N/A	DEM	B	V	3/4	W1		

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CATEGORY: 19. Wires and cables continued

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	ESA Comments
7.	Thermofoil heater	Copper conductor, Kapton/FEP insulation. Commercial product	Minco Products Inc. Minn. US	N/A	Telescope tube & metering rods	B	V	3/4	W1		

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EXPERIMENTERS: **MULLARD SPACE SCIENCE LABORATORY (MSSL)**
DEPT OF PHYSICS, UNIVERSITY OF CALIFORNIA, SANTA BARBARA (UCSB)
CENTRE SPATIAL DE LIEGE (CSL)
PREPARED BY: **A P Dibbens**

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 R	A	T	Size Code	Approval Status	ESA Comments
1.	Barden patented matl. Bartemp Bearings	Teflon coated glass fibres impregnated with MoS_2	Barden Corp Plymouth Devon UK	N/A	Ball cages for Blue Module bearings	B	V	3/4	W1		
2.	Duroid material	Duroid	SNFA Bearings, Glos. UK	N/A	Ball cages for Blue Module bearings	B	V	3/4	W1		
3.	Gudebrod 450X	Lacing cord	Gudebrod Inc US	N/A	DEM	B	V	3/4	W1		
4.	MAPSIL 210	Thermally conductive compound	MAP France	N/A	Devices mounted on heat sinks in TMPSU	B	V	3/4	W1		
5.	Viton A	Fluorocarbon	Ceetak Ltd	N/A	Gasket &						

Issue No 3	**DECLARED MATERIALS LIST**	**XMM-OM/MSSL/SP/0028**

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CATEGORY: 20. Miscellaneous non-metallic materials continued

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	ESA Comments
5.	Viton A	Fluorocarbon elastomer	Ceetak Ltd Bedford, UK	N/A	Gasket & ‘O’ seals in interface flange	B	V	3/4	W1		
6. .	6-1104	Thermal filler	Dow Corning	N/A	Heat pipes Telescope tube	B	V	3/4	W1		