XMM Optical Monitor

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REQUEST FOR QUOTATION FOR FLIGHT IMAGE INTENSIFIERS

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CHANGE RECORD

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1. SCOPE

This Request For Quotation (RFQ), is for a total of 6 image intensifiers, complete with mountings. Three of these will be used for Qualification testing, 2 for flight and there will be1 flight spare. Flight intensifiers will be subjected only to Acceptance Levels of vibration testing.
These intensifiers will be part of the Blue Module of the Optical Monitor which is an experiment to be fitted on the ESA X-Ray Multi-Mirror Mission (XMM).

2. TIME TABLE

Bids to this RFQ should be submitted to MSSL by 23 September 1996. A purchase order on the selected supplier is anticipated to be placed by 4th October 1996.
Delivery of the 3 Qualification Models is required by 17th January 1997.
Following an assessment of these devices and a Qualification Review (expected by 28th March 1997), the go ahead will be given for the Flight and Flight Spare Models for delivery by 18th July 1997.

3. REQUIREMENTS

The intensifiers shall conform to the requirements detailed in the following paragraphs.

4. TECHNICAL SPECIFICATION

XMM OM Intensifier	Quality Level	
Parameter	**Qualification Model**	**Flight Model**
Photo-cathode Type	S20	S20
Input Window Material	Hereaus Suprasil. Selected for minimum fluorescence	Hereaus Suprasil. Selected for minimum fluorescence
Proximity Focusing Gap	150µm ± 50µm	150µm ± 50µm
First MCP Characteristics	8µm pores on 10µm centres ≥8° bias 40:1 aspect ratio Manufactured by Galileo (MSSL supplied)	8µm pores on 10µm centres ≥8° bias 40:1 aspect ratio Manufactured by Galileo (MSSL supplied)
Second MCP Characteristics	10µm pores on 12µm centres ≥8° bias 80:1 aspect ratio Manufactured by Galileo	10µm pores on 12µm centres ≥8° bias 80:1 aspect ratio Manufactured by Galileo
Third MCP Characteristics	10µm pores on 12µm centres ≤1° bias 80:1 aspect ratio Manufactured by Galileo	10µm pores on 12µm centres ≤1° bias 80:1 aspect ratio Manufactured by Galileo
MCP Configuration	Chevron in a Single Plane ±5°	Chevron in a Single Plane ±5°

MCP Orientation	Aligned to reference ±5° Drwg: SK 1062(Appendix)	Aligned to reference ±5° Drwg: SK 1062(Appendix)
Electrical Resistance of Second & Third MCP's	Matched to within 5%(TBC)	Matched to within 5%(TBC)
Phosphor Type	P20 (fast)	P20 (fast)
Output Window	Fibre-Optic Taper (MSSL Supplied)	Fibre-Optic Taper (MSSL Supplied)
Operating Voltage Distribution	See Table 1	See Table 1
Photo-cathode RQE @20°C	>15% @ 300nm >3% @ 550nm	>20% @ 300nm >6% @ 550nm
Photo-cathode Emission Defects (Defect if ≥0.1 counts/sec)	None at V_{max}	None at V_{max}
Photo-cathode Non-Uniformity	< 0.10 rms. of mean over any 50nm interval from 200nm to 550nm	< 0.05 rms. of mean over any 50nm interval from 200nm to 550nm
MCP Switched ON Channels (Def^n - switched on if dark current >0.05 counts/sec at nominal operating voltages)	< 10 within 19mm x 19mm central area orientated along ±Y and ±Z axes	none within 19mm x 19mm central area orientated along ±Y and ±Z axes
Dark Defects Measured at Phosphor (Def^n - local areas <70% gain)	<10 smaller than 80µm ≤1 between 80µm and 500µm none larger than 500µm	<3 smaller than 80µm none larger than 80µm
Analogue Mode Gain Non-Uniformity	<10% rms of mean	<10% rms of mean
Dark Counts @ 20°C	<100 counts/cm^2/sec excluding switched on channels	<50 counts/cm^2/sec excluding switched on channels
Photon Gain	>10^7 photons/photoelectron at peak of the pulse height distribution, tube operated at nominal voltages	>10^7 photons/photoelectron at peak of the pulse height distribution, tube operated at nominal voltages

Pulse Height Distribution Test area 2mm x 2mm.	<90% ΔG/G FWHM valley height <30% of peak spatial variation of the peak over the whole area of the detector <15% peak to peak tube operated at nominal voltages	<90% ΔG/G FWHM valley height <30% of peak spatial variation of the peak over the whole area of the detector <15% peak to peak tube operated at nominal voltages
Maximum Survival Voltage	PC to MCP1 : 400V Across MCP1 : 900V Across MCP2 & MCP3: 3200V Across anode gap : 6000V	PC to MCP1 : 400V Across MCP1 : 900V Across MCP2 & MCP3: 3200V Across anode gap : 6000V
Output Event Width Distribution	70µm ±20µm FWHM	70µm ±20µm FWHM
Signal Induced Background	≤0.3 per primary event for events of energy between 5% and 15% of the primary event ≤0.03 per primary event for events with energy >15% of the primary event	≤0.3 per primary event for events of energy between 5% and 15% of the primary event ≤0.03 per primary event for events with energy >15% of the primary event

Blue Detector Image Intensifier - Electro-Optical Additional Goals

Parameter	Qualification Model	Flight Model
Lifetime (Flat field)	≤5% degradation in RQE @350nm after flat field exposure of 2x10^{12} detected events/cm^2	≤5% degradation in RQE @350nm after flat field exposure of 2x10^{12} detected events/cm^2
Lifetime (Point Image)	≤5% degradation in RQE @350nm after 1000 second exposure of 10^5 detected events in an image of diameter 50µm	≤5% degradation in RQE @350nm after 1000 second exposure of 10^5 detected events in an image of diameter 50µm

TABLE 1
Operating Voltage Distribution (Qualification & Flight)

	Photo-cathode Gap	Voltage across 1st MCP	Voltage across 2nd & 3rd MCP's	Anode Gap Voltage
Nominal	350V	670-800V	2700-2900V	4800V

5. PROCESS

The intensifiers shall be made to the Manufacturer's flight process and QA system which shall be defined in the quotation. These procedures will be assessed and will subsequently form a part of the purchase agreement.

6. TESTING

6.1 Performance Testing

Methods for testing the parameters detailed in par 4 shall be identified in the quotation.

6.2 Vibration Testing

The intensifiers must be capable of withstanding the rigours of a successful Ariane 5 launch and more particularly must not be degraded by the following levels of vibration, when supported by their mounting flanges:-

Qualification Sine Vibration Test Levels

Axis	Frequency (Hz)	Level	Sweep Rate
All	5-22	±11mm	2 Oct/min
	22-100	±22.5g	

Acceptance levels are derived by dividing the qualification levels by a factor of 1.5 and they are applied with a sweep rate of 4 Oct/min.

Qualification Random Vibration Test Levels

Axis	Frequency (Hz)	Level	g(RMS)	Duration
All	20-100	+6 dB/Oct		
	100-500	0.068 g^2/Hz	7.4	2 min per axis
	500-2000	-6 dB/Oct		

Acceptance levels are derived by dividing the qualification levels by a factor of 2.25 and they are applied for 1 minute per axis.

6.3. Thermal Vacuum Testing

6.3.1 Temperature Limits

The intensifiers must be capable of withstanding the following temperature conditions:-

Space Environment

Operating		Minimum switch-on	Non-Operating	
Min	Max		Min	Max
+16°C	+24°C	-25°C	-25°C	+55°C

Laboratory Environment

Operating		Minimum switch-on	Non-Operating	
Min	Max		Min	Max
0°C	+25°C	-25°C	-25°C	+55°C

6.3.2 Pressure Environment
The intensifiers shall survive operation at any pressure from ambient to space.
Launch: The slope of pressure variation is 2000 Pascal/sec.
Space: During orbital life, the equipment is exposed to a pressure of $1.3x10^{-8}$ Pascal.

7. MATERIALS

Materials shall be used that are consistent with the objectives of this specification They must have low outgassing(≤0.1% total material loss and ≤0.01% collected vapourised condensable material), high reliability and survive the vibration testing detailed in par 6. All materials used in the devices must capable of being identified and traced to their source documentation.
MSSL will free issue the first MCP for each device and also all the fibre tapers.

8. PHYSICAL SIZE

The intensifiers shall conform to the physical envelope detailed in drawing SK 1062, a copy of which is included as the Appendix.

9. HIGH VOLTAGE CABLE ASSEMBLIES

These shall be free issued by MSSL and shall be fitted as shown in the Appendix, SK 1062.

10. CLEANLINESS

On delivery, the contamination levels of the external surfaces of all the intensifier assemblies shall be not greater than $1.5x10^{-8}g/cm^2$(molecular) and not greater than 45 ppm (particulate). Evidence to support this shall be provided.

11. IN-PROCESS WITNESSING BY MSSL

MSSL reserves the right to witness key process steps and key tests, for any of these devices. These key points shall be identified and agreed with MSSL before manufacture begins and the supplier shall provide MSSL with a minimum of 3 working days notice of their occurrence.

12. MARKING

TBA

13. PACKING AND TRANSPORTATION

Each intensifier shall be individually packaged to maintain its cleanliness in material that is suitable for long term storage. Protection for transportation shall be provided and details of the packaging must be specified in the quotation.

14. DOCUMENTATION

The following documentation shall be provided with each delivery and for each intensifier:-

Details of materials used, including batch numbers, serial numbers etc., as appropriate.
A Certificate of Conformance that the agreed process has been adhered to.
A copy of all test results.
An overall Certificate of Conformance to this Specification.