XMM Optical Monitor

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PROTECTION OF ELECTROSTATIC SENSITIVE DEVICES

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CONTENTS

1. INTRODUCTION

This document specifies the general requirements for the protection of electrostatic discharge sensitive devices (ESDs) from electrostatic discharges and fields. It applies only to electronic devices and assemblies. The BS specification referenced below has been used to help formulate this document.

2. REFERENCED DOCUMENTS

BS EN 100015-1 1992 Basic Specification: Protection of electrostatic sensitive devices.

3. DEFINITIONS

For the purpose of this document, the following definitions shall apply:

ESD Earth Facility - A common facility to which bonded elements in the ESD protected area are connected.

Earth Bonding Point - A dedicated point for the attachment of a wrist strap cord

Earth Grounding Point - A grounding point established on all work surfaces and non-permanent flooring, from which a secure connection can be made to the ESD Earth Facility

4. ELECTROSTATIC PROTECTED AREA (EPA)

4.1 General

The EPA shall be designed to ensure that ESDs can be handled with minimum risk of damage as a result of electrostatic fields or discharge.

The EPA shall be constructed to ensure that the equipment used to control static electricity does not create any additional risk of electric shock to personnel, should energised conductors up to the level of 250V ac (500V dc) be exposed.

The EPA could be any one of the following forms:-

- a bench
- a store
- an area of work
- a work station with equipment

Permanently designated EPAs shall be fitted with a device for validating the correct performance of wrist straps.

4.2 Equipment

4.2.1 Working Surfaces

All working surfaces shall be connected to ground potential and shall have a surface resistivity of between $1x10^4$ and $1x10^9$ ohm/sq.

4.2.2 Gloves and Finger Cots

Gloves and finger cots shall be made of volume conductive materials having a maximum surface resistivity of $1x10^6$ ohm/sq. and maximum volume resistivity of $1x10^5$ ohm x cm.

4.2.3 Wrist straps

A wrist strap shall consist of a conducting band that fits snugly around the wrist and a cord to connect the band to an earth bonding point. Suitable wrist straps are available from RS and Farnell.

The total resistance from the hand to the remote end of the cord (including the wrist band and cord) shall be a minimum of 7.5×10^5 ohm and a maximum of 3.6×10^7 ohm.

4.2.4 ESD Earth Facility

Every form of EPA shall be provided with a designated ESD earth facility. The ESD earth facility shall be constructed in such a way as to ensure that no sudden changes in potential occur within the EPA that could cause unacceptable voltages or discharges to be applied to ESDs.

When available, the mains earth shall be the ESD earth facility.

The ESD earth shall be connected to and provide a low resistance (<1Mohm) path to earth.

The provision of a low resistance path to earth may be distributed by a dedicated earth facility, so that it is accessible at various points in the EPA.

A distributed ESD earth facility shall, where visible, be provided in an insulated conductor.

A dedicated point of accessing the ESD earth facility shall be suitably labelled.

NB All forms of EPA shall be constructed such that the materials used can be bonded together. They shall have a minimum value of resistance to ground that limits the current to ground produced by voltages accessible to the operator to 0.5mA nominal, 0.67mA maximum.

4.2.5 Earth Bonding Points

A dedicated earth bonding point for the wrist strap cord shall be established adjacent to each working area, or working surface, such that it is easily accessible without obstructing the work in hand nor presenting a possible hazard in the working environment.

The wrist band cord may be connected to earth via the work surface conductive element, provided that the total resistance to ground does not exceed 3.6×10^7 ohm.

The earth bonding point may be connected to ground via the working surface earth grounding point.

Each wearer shall be provided with an earth bonding point. No more than two earth bonding points for wrist band cords shall be connected via the working surface earth grounding point.

The connecting system interface between the wrist band cord and the subsequent path to the ESD earth facility shall be such that the mating parts of the wrist band cord connection and the earth bonding point connection are totally mechanically compatible by design and intention.

The connecting interface shall be of sufficient mechanical pull strength to minimise the possibility of inadvertent disconnection.

NB The use of mating snap connectors and specialised miniature sockets is recommended, whereas the use of crocodile clips is not.

4.2.6 Earth Grounding Points

An earth grounding point shall be established on all work surfaces and non-permanent flooring.

Where materials for work surfaces or flooring contain an inner or sub-surface layer which is more conductive than the surface layer, the earth grounding point shall be connected to the more conductive layer.

Where the material for work surfaces or flooring is homogeneous in its resistive attributes, the ground cord shall be connected to and through the body of the material.

When materials that possess a more conductive inner or sub-surface layer are used, this layer shall not contact any furnishings and fittings in the EPA that have a direct path to ground. Such a contact may short out any additional resistance that may be required within the grounding system.

4.2.7 Ground Cords

An electrical connection shall be effected between the earth grounding point, the ground cords and the ESD earth facility.
The ground cord connections from work surfaces or floors to the ESD earth facility, whether containing a discrete resistor or not, shall be continuous and may be permanent or detachable.
Any discrete resistance required in the ground cord shall be located on or near the point of contact with the work surface or flooring.
When the ground cord is connected to the earth grounding point, the electrical conducting parts of the connecting interface shall be shrouded by insulating material.
All the connecting interfaces shall be of sufficient mechanical pull strength to minimise the possibility of inadvertent disconnection.

4.3 Field Work

Where an EPA with a permanently controlled boundary is not available, all work necessitating the handling of unprotected ESDs shall be considered as field work. Field work in this context shall include such activities as the service and maintenance, installation, site inspections and commissioning of components and assemblies classified as ESDs, together with the packing and unpacking activities associated with such functions.
All field work shall adhere to the requirements specified for permanent EPA with respect to the material quality and personal responsibilities, training, labelling and packaging.
Where necessary, temporary work surfaces and flooring shall be used. A means of equipotentially bonding the operator and any work surface and flooring to ground shall be used.
The work surface and wrist bands shall be bonded either to the earth bonding point or the equipment being serviced.

If work is being done on the metal structure of an assembly, then it is not essential that the person is grounded provided the following conditions apply:-

The structure itself is grounded.
No electrical contacts are accessible.
Contact is only made with the grounded metal work.

5. LABELLING

All packaging containing ESDs shall be labelled or marked with the appropriate warning notice.
Signs for an EPA shall be clearly visible to personnel before they enter. At least one sign shall be visible from all normal working positions within an EPA.
All earth bonding points, earth grounding points and all ESD earth facilities designated for use within the EPA shall be marked or labelled.
NB Suitable labels are defined in BS EN 100015-1 1992.

6. TRANSPORTATION

Packaging materials that are in intimate contact with ESDs (unpowered), shall be antistatic and electrostatic dissipative with surface resistivity values of 10^3 to 10^{12} ohm/sq.
For transportation, electronic assemblies that are housed in a metal box, must have any external connector covered with a custom designed, conducting cover. They should be physically protected in a box that will not generate an electrostatic charge.
NB On unpacking, it is essential that such a metal assembly is grounded before being connected to any other electrical device.