

TESTING GROUP
Telecoms & EMC

TEST METHOD

DOCUMENT TITLE : Radiated Emissions for **Information Technology Equipment (ITE)** at the 3m/10m OATS & 10m ANC test facilities.

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DOCUMENT CONTROL
STATUS

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Document title: Radiated Emissions for **Information Technology Equipment (ITE)** at the 3m/10m OATS & 10m ANC test facilities.

A. PURPOSE

This document describes the techniques to be used for measuring radiated emissions of ITE at the 3m/10m OATS & 10m ANC test facilities.

B. SCOPE

This document is for use with the following specifications:

CISPR 22:1997	(30MHz-1GHz)	230V 50Hz
EN 55022:1994	(30MHz-1GHz)	230V 50Hz
EN 55022:1998	(30MHz-1GHz)	230V 50Hz
AS/NZS:1997	(30MHz-1GHz)	230V 50Hz
IDA RS EMC:2000	(30MHz-1GHz)	230V 50Hz
CNS 13438:86	(30MHz-1GHz)	110V 60Hz & 230V 50Hz
FCC Part 15J : 1997	(30MHz-1GHz)	110V 60Hz
FCC Part 15B : 1999	(30MHz-40GHz)	110V 60Hz

C. DEFINITIONS

EUT	-	Equipment Under Test.
EUT System	-	The system under test, which comprises the EUT and necessary supporting devices to exercise all functions of the EUT in normal operation.
EUT System Boundary	-	The boundary defined by an imaginary straight-line periphery describing a simple geometric configuration encompassing the EUT & all inter-connecting cables.
EUT Characterisation	-	Measurement of radiated emissions from the EUT in a shielded room, in order to identify the EUT frequencies that will be measured at the OATS.

D PRECAUTION (FOR OATS TESTING ONLY)

All testing to cease immediately in the presence of heavy rain, lightning and/or thunder. The measuring receiver RF input cable is to be disconnected, the EUT and supporting devices are to be switched off at the mains supply in the control room, and where safely possible, the antenna removed to the EUT shelter.

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E. DETAILS OF PROCEDURE

1. TEST SETUP

- 1.1 Check and note the environmental conditions (i.e. temperature, relative humidity and atmospheric pressure) of the measuring receiver in the control room.
- 1.2 For table-top equipment, place the EUT system on a 0.8m high, non-conductive table/turntable. The rear of the EUT and the supporting devices shall be flush with the rear of the table/turntable. The EUT layout shall be as close to that used during EUT characterisation. Typical setups are as shown in Annex A. **Note that indicated distances between peripherals (i.e. 10cm) are to be maintained.**
- 1.3 For floor-standing equipment, the EUT system shall be subject to the same provisions as per table-top equipment, except that it shall be placed on the floor with points of contact consistent with normal use and not in metallic contact with the ground plane. A typical setup is shown in Annex B.
- 1.4 The EUT system shall be configured and loaded in a manner typical of normal operation. As a minimum test configuration, each different type of interface port shall be loaded with a typical device or simulator and representative cabling. Where multiple interface ports of the same type are present, connecting a cable to just one of that type of port is sufficient provided it has been shown that the additional cables would not significantly affect the results.
- 1.5 For a PC or peripheral intended to be used with a PC, the minimum test configuration shall be:
 - a. Personal Computer (PC)
 - b. Keyboard
 - c. Video Display Unit (i.e. Monitor)
 - d. One Serial Device (e.g. Modem)
 - e. One Parallel Device (e.g. Printer)

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- f. Mouse, Joystick, etc. (if dedicated ports for these devices are present)
- 1.6 Excess lengths of interconnecting cables, that hang closer than **0.4m** from the ground plane, shall be bundled at the approximate centre of the cable with bundles of 0.3m to 0.4m in length. Cables of hand-operated devices (e.g. keyboard, mouse, etc.) shall be placed as close to the EUT as possible.
- 1.7 I/O cables **connected to supporting devices but not connected to the EUT** can be left hanging with one end free. These may be terminated if required with the correct terminating impedance. These cables shall be bundled (0.3m to 0.4m bundles) in the centre so that the total length does not exceed 1m in length.
- 1.8 The EUT system shall be powered from the correct mains supply. The power cables **shall not be bundled**, but allowed to drape to the ground plane and routed to the mains supply socket (see [Annex A](#)). Where specified by the manufacturer, the type of power cable used shall be as specified.
- 1.9 Power cables of supporting devices shall be left unbundled. The power cables shall be draped over the edge of the table and routed down along the floor to the mains supply socket.
- 1.10 The antenna shall be set at the required test distance (i.e. 3m or 10m) away from the EUT system boundary.

2. TEST PROCEDURE

- 2.1 Prior to the test, carry out the confidence check for the test system as per the test method [TGTM-056-159](#). The test shall only proceed if the confidence check is within the agreed limits, otherwise the Technical Manager or Dy Technical Manager shall be informed immediately.
- 2.2 The frequency range for radiated emissions generally range from 30MHz to 1GHz (or greater in some cases). Please refer to the

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standards listed in the Scope above for the specific ranges for each standard. The bandwidths to be used are shown below:-

FREQUENCY RANGE	BANDWIDTHS	
	Peak	CISPR
30MHz - 1GHz	120kHz	120kHz
> 1GHz	120kHz	120kHz

2.3 Type of antennas to be used for particular frequency ranges are as follows:

ANTENNA TYPE	FREQUENCY RANGE
Biconical	30MHz – 200MHz
Log-Periodic	200MHz – 1GHz
BiLog	30MHz – 3GHz
Horn	1GHz – 18GHz

2.4 When radiated emission measurements are done at the indicated measurement distance, the antenna height must be varied as follows:

MEASUREMENT DISTANCE	ANTENNA HEIGHT VARIATION
3m	1 - 4m
10m	1 - 4m

When the antenna is vertically polarised, the bottom of the antenna should not be closer than 25cm from the ground plane.

2.5 The EUT shall be representatively operated in its worst case operating condition. Use of a test software or other means, where applicable, to operate the EUT continuously during the test is allowed provided it is representative of typical operation. **Where a test software is used, the source code or the function of the software shall be noted in the job logbook.**

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- 2.6 Frequencies to be measured are:
- a. Those obtained from the EUT characterisation.
 - b. Operating clock frequencies & associated harmonics.
- 2.7 For radiated emission tests at the OATS or 10m ANC, please refer to TGTM-056-150 for operating steps.
- 2.8 If the signal falls within high ambient signals, carry out the test as per TGTM-056-163 (the test method for radiated emissions measurements in high ambient noise environment).

3. RESULTS

- 3.1 The signal amplitude is corrected with the following information once the correct transducer/specification file has been selected:-
- a. Cable correction factor
 - b. Antenna factor
- 3.2 The following minimum information shall be recorded in the job logbook and test report (if required):
- a. The results of confidence check.
 - b. The results of the measurements made, indicating test distance, emission frequency, antenna polarisation & height, turntable azimuth & QP level measured.
 - c. A full description of the EUT configuration, type and length of cables used, the number and type of supporting devices used during the test, any special grounding arrangements made (other than via the power cable), etc. which will enable the test setup to be faithfully reproduced if necessary.
 - d. The mode of operation of the EUT during the test, including details of any EUT test software used.
 - e. Any other relevant information.

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4. REQUIRED EQUIPMENT:

4.1 3m OATS

EQUIPMENT	MANUFACTURER	TYPE
Receiver	Rohde & Schwarz	ESVP
Biconical Antenna	EMCO	3109
Log-periodic Antenna	EMCO	3146
Horn Antenna	EMCO	3115
Cable		Andrews

4.2 10m OATS

EQUIPMENT	MANUFACTURER	TYPE
Receiver	Hewlett-Packard	HP8572A
Biconical Antenna	EMCO	3109
Log-periodic Antenna	EMCO	3146
Horn Antenna	EMCO	3115
Cable	-	Andrews

4.3 10m ANC

EQUIPMENT	MANUFACTURER	TYPE
Receivers	Rohde & Schwarz	ESMI
BiLog Antennas	Chase	CBL6112B
Horn Antenna	EMCO	3115
Cable	-	Andrews

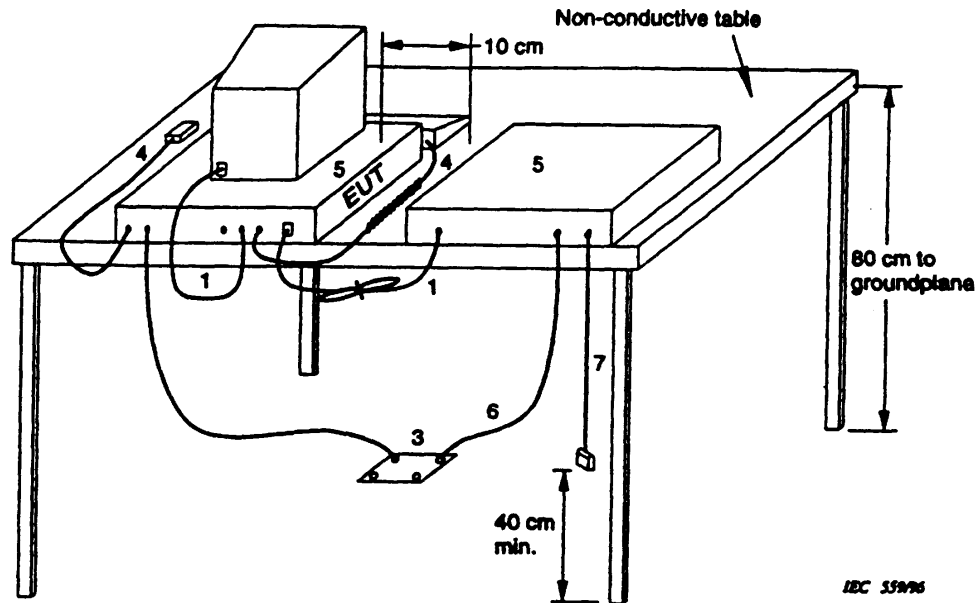
5 MEASUREMENT UNCERTAINTY

The measurement uncertainty associated with the use of the test equipment can be referred to in the Measurement Uncertainty file held by the Quality Manager.

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ANNEX A – TABLE-TOP EUT



EUT = Equipment under test

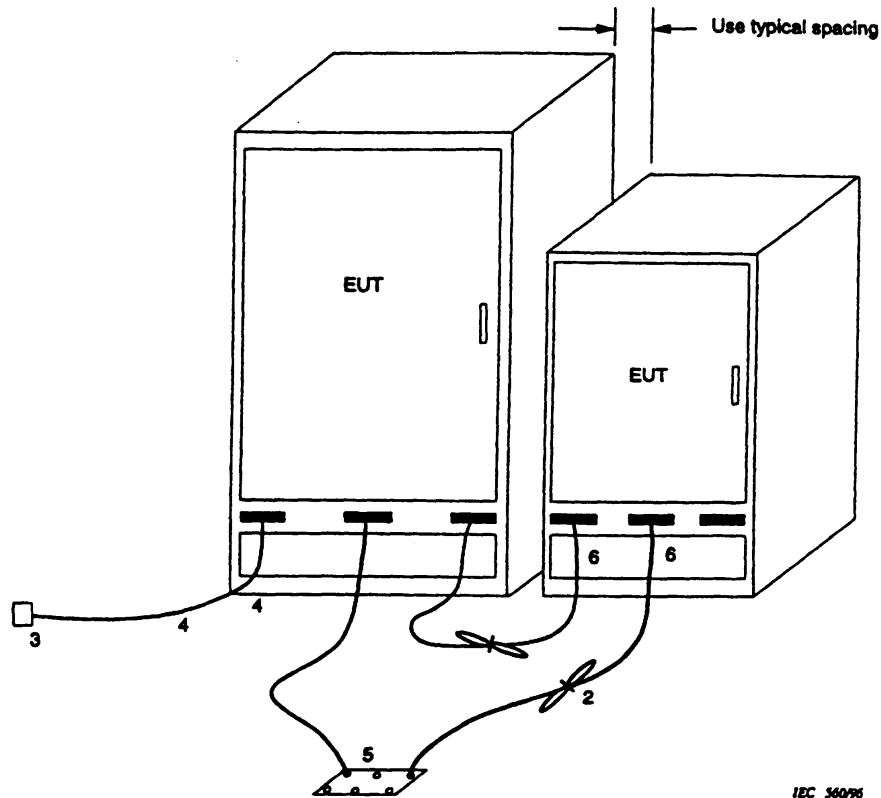
- 1) If cables, which hang closer than 40 cm to the horizontal metal groundplane, cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long.
- 2) The end of the I/O signal cables which are NOT connected to a peripheral may be terminated if required for proper operation using correct terminating impedance.
- 3) Mains junction box(s) shall be flush with and bonded directly to the metal groundplane.
NOTE – If used, the AMN shall be installed under the horizontal metal groundplane.
- 4) Cables of hand operated devices, such as keyboards, mouses, etc. shall be placed as for normal usage.
- 5) Peripherals shall be placed at a distance of 10 cm from each other and from the controller, except for the monitor which, if for an acceptable installation practice, shall be placed directly on the top of the controller.
- 6) Mains cables shall drape to the floor and then routed to receptacle. No extension cords shall be used to mains receptacle.

Test configuration: tabletop equipment (radiated measurement)

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ANNEX B – FLOOR-STANDING EUT



EUT = Equipment under test

- 1) If cables cannot be shortened to appropriate length, the excess shall be folded back and forth forming a bundle 30 cm to 40 cm long. If bundling is not possible the cables shall be arranged in a serpentine fashion.
- 2) Excess mains cords shall be bundled in the center or shortened to appropriate length.
- 3) The end of the I/O signal cables which are not connected to a peripheral may be terminated if required for proper operation using correct terminating impedance.
- 4) EUT and cables shall be insulated from the horizontal metal groundplane.
- 5) Mains junction box(s) shall be flush with and bonded directly to the horizontal metal groundplane.
NOTE – If used, the AMN should be installed under the horizontal metal groundplane.
- 6) Mains and signal cables shall drape to the floor. No extension cords shall be used to mains receptacle.

Test configuration: floor-standing equipment (radiated measurement)