

TESTING GROUP
Telecoms & EMC

TEST METHOD

DOCUMENT TITLE : Characterisation (pre-scan) of radiated emissions from an EUT inside a shielded enclosure.

DOCUMENT NUMBER : TGTM-056-155

DATE : 9 May 2001

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**DOCUMENT CONTROL
STATUS**

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A PURPOSE

This document describes the technique to be used for carrying out EUT characterisation (pre-scanning) inside designated shielded enclosures, i.e. Shield Rooms 1 & 3, and the Anechoic Chamber.

B SCOPE

EUT characterisation (pre-scanning) is only meant for :

1. Identification of radiated emission signals to be measured at an Open Area Test Site (OATS).
2. Troubleshooting purposes.

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.

D DETAILS OF PROCEDURE

1 TEST SETUP

- 1.1 For table-top equipment, place the EUT system on either:
 - a. A 0.8m high, non-conductive table sitting on top of a low turn-table.

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- b. A low turn-table sitting on top of a 0.8m high, non-conductive table.

The EUT layout shall be as close to the intended layout to be used for the radiated emissions test.

- 1.2 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 a low turn-table in the shielded enclosure.
- 1.3 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.
- 1.4 The EUT system shall be powered from the 230V 50Hz mains (for CISPR & EN tests) or 115V 60Hz mains (for the FCC tests). The power cables **shall not be bundled**, but allowed to drape to the ground plane and routed to the mains supply socket. Where specified by the manufacturer, the type of power cable used shall be as specified.
- 1.5 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.
- 1.6 The antenna shall be set up on a tripod at **1m** distance from the EUT system boundary, and directly connected to a spectrum analyzer via a BNC cable. The antenna height shall be about **1.5m** from the floor.
- 1.7 A typical pre-scan setup is given in Annex A.

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2 TEST PROCEDURE

2.1 Pre-scans are generally done in the range from 30MHz to 1GHz (or greater in some cases). Please refer to the relevant standards for actual frequency range to be covered. The spectrum analyzer settings generally used are:

Recall State	Span	Ref Level	Vertical Scale	RBW	VBW	Sweep Rate	Atten	Detector
1	30-110 MHz					20 ms		
2	105-200 MHz					20 ms	10 dB	Peak
3	195-400 MHz	90	10	120 kHz	1 MHz	50 ms		
4	395-1000 MHz	dB μ V/m	dB/div			150 ms		

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

ANTENNA TYPE	FREQUENCY RANGE
Biconical	30MHz < 200MHz
Log-Periodic	200MHz - 1GHz
Horn	1GHz - 18GHz

2.3 **Ensure that the transducer factors for the antenna & cable used in the pre-scan are loaded into the spectrum analyzer.**

2.4 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.**

2.5 For each frequency span, the pre-scan shall be conducted as follows:

- a. With the antenna in a particular polarization, set the spectrum analyzer to **Max Hold**.

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- b. Rotate the EUT on top of the turn-table, for one rotation.
- c. Stop the spectrum analyzer from sweeping & then change the antenna polarization.
- d. Let the spectrum analyzer continue sweeping in the **Max Hold** mode, making sure that it continues on from the trace of the previous antenna polarization, i.e. it does not refresh the trace.
- e. Make another rotation of the EUT, in the opposite direction from the previous rotation.
- f. Plot the combined results of both polarisations & note down in writing the significant emission frequencies on the plot itself by hand, for measurement at the OATS.
- g. Steps "a" to "g" are repeated for the next frequency span, until the required frequency range is covered.

3 RESULTS

3.1 The plotted results obtained **are NOT valid** as results for radiated emission tests, and should not be used as such. To determine whether a product is passing, a formal measurement **MUST** still be done at an OATS. This is mainly due to the following factors:

- a. At 1m test distance, there is a danger that measurements were made in the near field.
- b. As the measurements were done in a shielded enclosure, standing waves caused by reflections can affect the levels measured.

3.2 **The results are only for signal frequency identification.**

4 REQUIRED EQUIPMENT

4.1 Spectrum Analyzer (at least 30-1000 MHz range)

4.2 Bicon Antenna (30-200 MHz)

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Log-periodic Antenna (200-1000 MHz)
Horn Antenna (>1 GHz)

4.3 BNC Cable

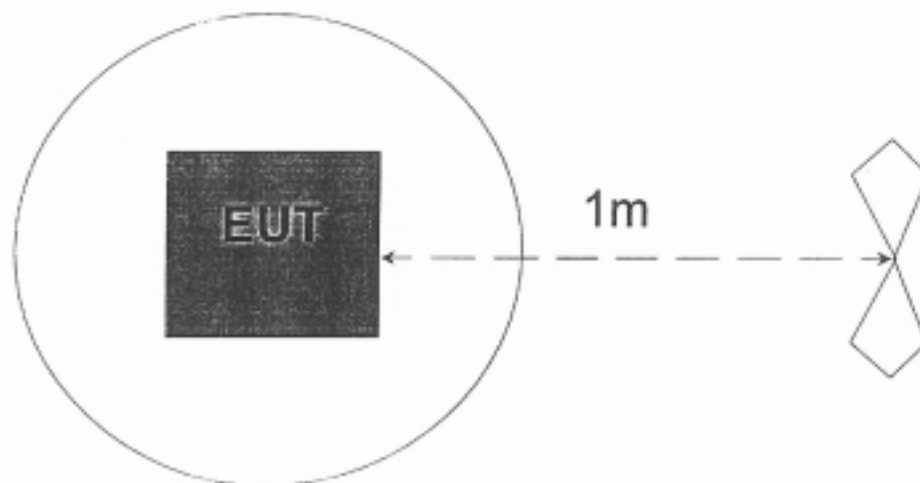
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5 MEASUREMENT UNCERTAINTY

This is not applicable as pre-scanning is not a formal measurement.

ANNEX A (TYPICAL PRE-SCAN SETUP)



Typical Pre-Scan Setup