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Satellite Earth Stations and Systems (SES); Mobile Earth Stations (MESs) providing Low Bit Rate Data Communications (LBRDC) using satellites in Low Earth Orbits (LEO) and operating in frequency bands below 1 GHz

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Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Satellite Earth Stations and Systems (SES) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

Proposed transposition dates	
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1 Scope

This draft European Telecommunication Standard (ETS) provides specifications for the standardization of the characteristics of Mobile Earth Stations (MESs) with both transmit and receive capabilities in order to limit interference to radiocommunication services.

The Low Earth Orbiting (LEO) satellite networks referred to in this ETS operate under the Mobile Satellite Service (MSS). The MESs operate as part of a LEO satellite network providing Low Bit Rate Data Communications (LBRDC).

The frequency bands under which the MESs operate should be within the following bands:

MES Transmit frequencies	MES Receive frequencies
148 MHz to 150,05 MHz 235 MHz to 322 MHz 335,4 MHz to 399,9 MHz	137 MHz to 138 MHz 235 MHz to 322 MHz 335,4 MHz to 399,9 MHz 400,15 MHz to 401 MHz

These MESs generally have the following characteristics:

- the MESs could be either vehicle mounted or portable equipment;

- the MES could consist of a number of modules including suitable interfaces to the user.

The main specifications are contained in two categories related to:

- **unwanted emissions limitation:** to protect terrestrial and space radiocommunication services, and the radio astronomy services from harmful interference;

- **MES control and monitoring functions:** to specify a minimum set of Control and Monitoring Functions (CMFs) to be implemented on each MES in order to minimize the probability that they originate unwanted transmissions that may give rise to harmful interference to other systems.

2 Normative references

This ETS incorporates, by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ITU Radio Regulations.

[2] EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".

[3] IEC 510-2-1 (1978): "Methods of measurement for radio equipment used in satellite earth stations; Part 2: Measurement for sub-systems. Section One - General. Section Two - Antenna (including feed network)".

[4] Draft prETS 300 722: "Satellite Earth Stations and Systems (SES); Network Control Facilities (NCF) for Mobile Earth Stations (LMESs) using satellites in Low Earth Orbit (LEO) providing Low Bit Rate Data Communications (LBRDC) and operating in frequency bands below 1 GHz".

[5] CISPR Publication No 16 (1993): "Specification for radio disturbance and immunity measuring apparatus and methods".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

Installable Equipment (IE): Equipment which is intended to be installed in a vehicle. An IE may consist of one or several interconnected modules as follows:

Internally Mounted Equipment (IME) and Externally Mounted Equipment (EME): The manufacturer indicates which modules are intended to be EME; the remaining module(s) are then defined as IME. Where different specifications apply to IME and EME, this is noted in the relevant text.

Portable Equipment (PE): Portable equipment generally intended to be self-contained, free standing and portable. A PE would normally consist of a single module, but may consist of several interconnected modules. In some cases different specifications apply to PE and this is noted in the relevant text.

nominated bandwidth: The bandwidth of the MES radio frequency transmission is nominated by the terminal manufacturer and confirmed by the network operator. The nominated bandwidth is wide enough to encompass all spectral elements of the transmission which have a level greater than the specified unwanted emissions. The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability. The nominated bandwidth is within the MSS transmit frequency band within which the MES operates.

unwanted emissions: Unwanted emissions are those falling outside the nominated bandwidth.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CMF	Control and Monitoring Function
EIRP	Equivalent Isotropically Radiated Power
EME	Externally Mounted Equipment
EUT	Equipment Under Test
IE	Installable Equipment
IME	Internally Mounted Equipment
MES	Mobile Earth Station
MSS	Mobile Satellite Service
NCF	Network Control Facilities
PE	Portable Equipment
RF	Radio Frequency
rms	root mean square
STE	Special Test Equipment

4 Test Report

The test report shall contain:

- the value of the nominated bandwidth, declared by the manufacturer;
- the results of the tests;
- all parameters and operational conditions.

5 Radio Frequency (RF)

Whenever a change of limit between adjacent frequency bands occurs in this subclause, the lower of the two limits shall apply at the transition frequency.

5.1 Unwanted emission outside the bands 148 to 150,05 MHz, 235 to 322 MHz and 335,4 to 399,9 MHz

Purpose:

Protection of other terrestrial services, space radiocommunication services and the radio astronomy services from emissions caused by MESs outside the bands 148 to 150,05 MHz, 235 to 322 MHz and 335,4 to 399,9 MHz.

Specification:

The unwanted emission from the MES outside the bands 148 to 150,05 MHz, 235 to 322 MHz and 335,4 to 399,9 MHz, within which the MES is designed to operate, shall be below the limits shown in table 1.

For unwanted emissions below 960 MHz, the MESs shall not exceed the limits specified in table 1, with carrier on or off.

Table 1: Unwanted emissions outside the operational bands and below 960 MHz

Limits of unwanted emissions at a test distance of 10 m in any 120 kHz band	
Frequency	**Quasi-peak limits (dBµV/m)**
30 MHz to 148 MHz	30
150,05 MHz to 230 MHz	30
230 to 235 MHz	37
322 to 335,4 MHz	37
399,9 to 960 MHz	37

The unwanted emission Equivalent Isotropically Radiated Power (EIRP) above 960 MHz in the measurement bandwidth in all directions shall not exceed the limits in table 2.

Table 2: Unwanted emission EIRP outside the operational bands and above 960 MHz

Frequency range	Carrier on		Carrier off	
MHz	**EIRP limit (dBpW)**	**Measurement bandwidth (kHz)**	**EIRP limit (dBpW)**	**Measurement bandwidth (kHz)**
960 - 12 750	49	100	48	100

Verification:

By measurement of unwanted emissions generated by an operating MES.

All RF tests in this subclause shall be carried out at ambient environmental conditions of the test laboratory and for a nominal power supply voltage.

All tests with carrier on shall be undertaken with the transmitter operating at full power and with the maximum transmit burst rate where applicable.

To enable the performance tests to be carried out, the use of Special Test Equipment (STE), supplied by the manufacturer, may be necessary. Since this test equipment will be specific for the particular system, it is not possible to provide detailed specifications in the ETS.

However, the following baseline is provided:

- if the MES requires to receive a modulated carrier from the satellite in order to transmit, then special test arrangements are required to simulate the satellite signal, thus enabling the MES to transmit allowing measurement of transmission parameters;

- any specification of these special test arrangements which may have direct or indirect effects on any requirement or recommendation of this ETS shall be clearly stated by the manufacturer.

Test procedure:

Below 960 MHz, the test procedures set out in EN 55022 [2], paragraphs 6, 7, 8, 9 and 11 shall be used.

Above 960 MHz, the full system shall be tested according to the test procedure given in annex B.

5.2 Maximum unwanted emission within the bands 148 to 150,05 MHz, 235 to 322 MHz and 335,4 to 399,9 MHz

Purpose:

Protection of other terrestrial and space radiocommunication services operating in the above frequency bands.

Specification:

The unwanted emissions EIRP in any 4 kHz band within the bands 148 to 150,05 MHz, 235 to 322 MHz and 335,4 to 399,9 MHz in which the MES is designed to transmit, but outside the nominated bandwidth, shall not exceed the following limits:

- when the carrier is off: 19 dBpW;
- when the carrier is on: 40 dBpW and table 3.

Table 3: Unwanted emissions EIRP within the operational bands

Offset from the edge of the band of the nominated bandwidth (kHz)	Maximum EIRP (dBpW)
0 to 10	70
10 to 20	60
20 to 100	50
100 to 200	40

Verification:

Conformance shall be determined by direct measurement.

The conditions (environment, power, STE etc.) set out in the verification section of subclause 5.1 of this ETS shall apply.

5.3 Maximum EIRP emission density in the nominated bandwidth

Purpose:

Protection of other satellite systems which use the same frequency band.

Specification:

The EIRP density in any 4 kHz band radiated from the MES, shall not exceed the following limit:

- 103 dBpW.

Verification:

Conformance shall be calculated from:

- measurement of maximum RF power entering the antenna feed;

- measurement of transmit antenna gain pattern.

The conditions (environment, power, STE etc.) set out in the verification section of subclause 5.1 shall apply.

Test procedure:

The test procedure for the measurement of the RF power shall be in accordance with that specified in annex D.

The gain pattern shall be measured in accordance with IEC 510-2-1 [3], subclause 8.2.2 for 3 frequencies:

- one frequency close to each of the ends of the transmit frequency band which could be used by the MES; and

- one frequency in the centre of this band. The gain profile to be used in the test procedure shall be the maximum envelope of the three profiles measured.

A knowledge of the measured RF power entering the antenna feed and the measured antenna gain profile will allow the EIRP profile to be determined. This shall be compared to the limits set in the specification of this subclause and if equal to or lower than these limits, the MES shall be in conformance with this subclause.

5.4 Protection of the radio astronomy service from emissions produced by the MES in the bands 150,05 to 153 MHz, 322 to 328,6 MHz and 406,1 to 410 MHz

Purpose:

Protection of the radio astronomy observations taking place in the frequency bands 150,05 to 153 MHz, 322 to 328,6 MHz and 406,1 to 410 MHz.

Specification:

The MES shall provide means of suppressing transmission in order to reduce unwanted emissions in the adjacent bands 150,05 to 153 MHz, 322 to 328,6 MHz and 406,1 to 410 MHz.

Verification:

By documentary evidence and demonstration.

It shall be demonstrated that the transmitting MES can suppress transmissions in the bands 150,05 to 153 MHz, 322 to 328,6 MHz and 406,1 to 410 MHz, when it has received a disable command or other indication that the radio astronomy service is required to be protected, and transmissions remain suppressed until an appropriate enable command or indication has been received.

6 MES Control and Monitoring Functions (CMFs)

This subclause defines a minimum set of CMFs which shall be implemented on MESs in order to minimize the probability that they originate unwanted emissions that may give rise to harmful interference to other systems.

There shall be a CMF at each MES, associated to separate NCFs as described in ETS 05018[4].

6.1 Monitoring functions

6.1.1 Processor monitoring

Purpose:

To ensure that the MES can suppress transmissions in the event of a processor sub-system failure.

Specification:

The MES shall incorporate a processor monitoring function for each of its processors involved in the manipulation of traffic and in CMFs.

The processor monitoring function shall detect any failure of the processor hardware and software.

No later than 1 second after any fault condition occurs, the transmissions shall be suppressed until the processor monitoring function has determined that the fault condition has been cleared.

Verification:

Compliance shall be verified by documentary evidence and demonstration.

The demonstration shall show that all transmissions are suppressed within 1 second following a controllable processor induced fault (e.g. processor board disconnected).

The manufacturer shall provide the test house with a test procedure to demonstrate this transmission shutdown.

6.1.2 Transmit frequency generation sub-system

Purpose:

To verify the correct operation of the transmit frequency generation sub-system and to inhibit transmissions should the sub-system fail.

Specification:

The MES shall monitor the operation of its transmit frequency generation sub-system.

The failure of the transmit frequency generation sub-system for a period longer than 5 seconds shall result in transmissions being suppressed until the fault condition has been cleared.

Verification:

Compliance shall be verified by documentary evidence and demonstration.

The demonstration shall show that all transmissions are suppressed within 6 seconds following a controllable transmit frequency generation sub-system fault (e.g. replacement of frequency reference).

The manufacturer shall provide the test house with a test procedure to demonstrate this transmission shutdown.

6.2 Power on/reset

Purpose:

To demonstrate that the MES achieves a controlled non-transmitting state following the POWER ON/RESET or restart of the unit.

Specification:

Following POWER ON/RESET the MES shall enter a controlled, non-transmitting state.

Verification:

Compliance shall be verified by documentary evidence and demonstration.

6.3 Network control reception and authorisation

6.3.1 Network control authorisation

Purpose:

To ensure that the MES cannot transmit unless it receives an appropriate enable indication.

Specification:

1) Without reception of an appropriate enable to the MES via an authorised control channel, it shall not be possible to initiate message transmission.

2) Transmissions shall not continue for longer than 30 seconds unless further enables are received.

Verification:

By documentary evidence and demonstration.

It shall be demonstrated that a transmitting MES suppresses transmissions when it has not received a suitable enable for a period of time longer than 30 seconds, and the MES transmissions shall remain suppressed until a further enable is received.

It shall be demonstrated that after POWER ON/RESET of the MES, it is not possible to initiate message transmission until an appropriate enable signal is received by the MES.

6.3.2 Network control reception

Purpose:

These requirements ensure that the MES shall be capable of:

- receiving and implementing commands from the NCF through its correct reception of the appropriate control channel(s);

- retaining a unique identification in the network and transmitting it upon reception of an appropriate request.

Specification:

The MES shall hold, in non-volatile memory, the unique identification codes of the terminal itself.

The MES shall be enabled or disabled through its control channels.

Message transmission shall be inhibited for any failure to receive an authorised control channel (either a command or a signal) lasting 30 seconds or more.

The MES shall be capable of receiving and acting upon the control messages that are addressed to it which contain transmitter enabling and disabling information. The MES shall be capable of transmitting its identification code upon reception of an appropriate control message addressed to the MES.

Verification:

The method of setting and storing the MES identification codes shall be verified by documentary evidence.

The other requirements shall be verified by documentary evidence and demonstration showing that the MES is capable of receiving appropriate signals from the NCF to implement enables, disables and identification functions.

The manufacturer shall provide the test house with a test procedure to demonstrate the implementation of enables, disables and identification functions.

7 Compliance with RF specifications under conditions of shock and vibration

Purpose:

To ensure that in-band unwanted emission parameters of the MES remain within specification when the MES is subjected to mechanical shock or vibration.

Specification:

This specification applies, if required by the manufacturer.

The manufacturer shall design the MES so that the in-band unwanted emission specifications set out in subclause 5.2 are met after the MES has been subjected to the mechanical shocks and vibrations set out in annex A, clause A.1.

Verification:

After the MES has been subjected to the specified mechanical shocks and vibrations, the verification procedure given in subclause 5.2 shall be applied. The tests in subclause 5.2 may be performed after mechanical shocks and vibrations, if the manufacturer requests. The test configurations given in annex A shall apply.

8 NCFs for MES networks

Relevant information is contained in ETS 300 722 [4].

Annex A (normative): Environmental and test conditions

A.1 Environmental conditions

The following requirements specify various environmental conditions to which this ETS refers:

a) wind loading: relative wind speeds up to 200 km/h;

b) vibration: random vibration, 5 to 20 Hz at 0,005 g^2/Hz;
20 to 150 Hz at - 3 dB/octave (0,5 g rms);

c) mechanical shock: half sine wave shock with a peak of 20 g and a duration of 11 ms;

d) induced acceleration: maximum tangential of linear acceleration of up to 2 g;

e) rate of turn: 10°/s.

All requirements are applicable to Installable Equipment (IE).

Requirements a), d) and e) do not apply to PE.

Requirement a) does not apply to the IME of IE.

A.2 Test conditions

The following requirements specify various test conditions to which this ETS refers:

a) wind loading: relative wind speeds up to 200 km/h;

b) vibration: random vibration; 5 to 20 Hz at 0,005 g^2/Hz;
20 to 150 Hz at - 3 dB/octave (0,5 g rms).

Vibration is to be performed for a period of 2 hours in each of 3 mutually perpendicular axes;

c) mechanical shock: half sine wave shock with a peak of 20 g and a duration of 11 ms. A total of 18 shocks shall be performed (6 shocks in each of 3 mutually perpendicular axes);

d) induced acceleration: maximum tangential of linear acceleration of up to 2 g;

e) rate of turn: 10°/s.

All requirements are applicable to IE.

Requirements a), d) and e) do not apply to PE.

Requirement a) does not apply to the IME of IE.

Annex B (normative): Test procedure for unwanted emissions outside the service frequency bands.

B.1 Introduction

This annex describes the measurement procedure of unwanted emissions above 960 MHz generated by an MES terminal under operating conditions (as specified in subclause 5.1).

B.2 Measuring apparatus

In order to carry out the test, the following elements are required, as a minimum:

- a set of calibrated reference antennas covering the frequency range of interest (above 960 MHz);
- the necessary post reference antenna pre-amplification and amplification devices;
- spectrum analyzer(s) with sweep/store capability covering the frequency range of interest (above 960 MHz).

For the apparatus utilised, it shall be verified that:

- the response of the apparatus, including any antenna and associated amplification system, to a constant amplitude sine wave signal remain within ± 1 dB of calibration across the frequency range of interest;
- the screening performance of the measuring apparatus shall be such that when the measuring antenna/post-antenna equipment is removed, and the input to the measuring apparatus is screened, the measured power density shall fall to a value at least 60 dB below the measured value (see CISPR Publication No. 16 [5], section 6.2).

B.3 Equipment Under Test

For the purpose of the test, the MES terminal comprises, for IE:

- the EME;
- the IME;
- a connection cable between IME and EME units;
- the necessary power supply cables and any other cable ensuring a proper functioning of the terminal.

For PE, the MES terminal comprises:

- for a single module PE, the module itself with any deployable parts in their normal operating configuration;
- for a multiple module PE, all such modules with all necessary interconnecting cables of lengths as normally supplied by the manufacturer; again any deployable parts should be in their normal operating configuration.

B.4 Special Test Equipment

In order to measure the system radiation under operation (transmitting) conditions, proper arrangements shall be made available (by the manufacturers) to put the MES terminal in its normal operating mode (in particular in the normal transmit mode with maximum transmit burst rate and with maximum transmitter power). This may require the use of STE provided by the manufacturer (see subclause 5.1).

B.5 Test set-up

The tests shall be carried out at ambient environmental conditions and for a nominal power supply voltage.

For IE, the EME and the IME shall be installed with a separation of about 0,5 m. Between the two pieces of equipment, the maximum length connection cable specified by the manufacturer shall be installed. The height of the cable shall be between 0,5 m and 1 m. The cable shall be maintained in that position by non-metallic means. The EME shall be set, in its normal operating configuration on a non-metallic table at a height between 0,5 m and 1 m. The IME shall be set on a non-metallic table at a height between 0,5 m and 1 m. Any associated equipment, e.g. portable computer or data terminal if required for operation of the MES, shall be placed next to, and at the same height as the IME.

For PE, the equipment shall be arranged in its normal operating configuration as recommended by the manufacturer on a non-metallic table at a height between 0,5 m and 1 m.

The measuring antenna shall be installed in the horizontal plane of the radiating part of the MES. Each antenna shall be positioned to be outside the near field of other antenna.

In addition, it shall be verified that the test site is suitable with respect to the ambient noise power density which shall be at least 6 dB lower than the lowest specification value being measured.

B.6 Measuring procedure

The EUT shall be switched on and the STE (if used) activated. The measuring equipment shall be set to an appropriate measuring bandwidth and the measured EIRP given in the specified bandwidth. Where an unwanted emission is detected that is near to the specification limits, a measuring bandwidth not exceeding twice the nominated bandwidth shall be used.

The measuring antenna shall be placed at an appropriate distance from the EUT. Measurements shall be made around the EUT to detect unwanted emissions. A suitable test procedure follows.

Testing should first be performed in angular steps of 90° while varying the height of the measuring antenna between 1 m and 4 m. For those directions and frequencies, or frequency bands, where unwanted emissions are detected that are near to the specified limits, additional tests shall be performed for each detected emission by varying the height of the measuring antenna between 1 m and 4 m and rotating the EUT through 360° to maximize the emission value.

These measurements shall be carried out with the measuring antenna in both planes (vertical and horizontal) of polarisation to ensure that the values of measured EIRP obtained are maximised.

The received power density shall be measured over the frequency range of interest above 960 MHz in measurement ranges appropriate to the test equipment being used. The precise knowledge of distance between the EUT and the reference antenna, the reference antenna gain and the amplification/attenuation characteristics of the post reference antenna network allow the determination of the unwanted EIRP density radiated by the EUT.

B.7 Alternative measurement procedure

For the case in which it is desired to measure the power of the emissions from the MES by direct coupling at the interface point between the antenna and the rest of the MES, the method set out in this annex shall apply except that the test set-up will need to be modified to allow direct coupling of the measuring equipment to the antenna feed, and references to the positioning of the measuring antenna shall be ignored. The MES maximum antenna gain at the measurement frequency shall be taken into account.

For this test set-up it may also be necessary to arrange for the coupling of signals from the STE to the MES in order to put the MES into its normal mode, as described in annex C, clause C.4.

Annex C (normative): Test procedure for unwanted emissions in the service frequency bands

C.1 Introduction

The test consists of the measurement of in-band unwanted emissions (as specified in subclause 5.2) radiated from the EUT by means of a reference antenna whose gain is accurately known across the frequency range of interest.

C.2 Measuring apparatus

In order to carry out the test, the following elements are required, as a minimum:

- a reference antenna calibrated across the frequency range of interest;
- the necessary post reference antenna pre-amplification and amplification devices;
- a spectrum analyzer with sweep/store capability.

For this apparatus utilised, it shall be verified that the specifications set out in annex B, clause B.2 are met.

C.3 Equipment Under Test

The EUT comprises those units with all necessary cables ensuring a proper functioning of the equipment as specified in annex B, clause B.3.

C.4 Special Test Equipment

In order to measure the system radiation under operational (transmitting) conditions, proper arrangement shall be provided (by the manufacturers) to put the MES terminal in its normal operating mode (in particular in the normal transmit mode with maximum transmit burst rate). This may require the use of STE provided by the manufacturer (see subclause 5.1).

C.5 Test set-up

The tests shall be carried out at ambient environmental conditions and for a nominal power supply voltage.

For IE, the EME and the IME shall be installed with a separation of about 0,5 m. Between the two pieces of equipment, the maximum length connection cable specified by the manufacturer shall be installed. The height of the cable shall be between 0,5 m and 1 m. The cable shall be maintained in that position by non-metallic means. The EME shall be set, in its normal operating configuration on a non-metallic table at a height between 0,5 m and 1 m. The IME shall be set on a non-metallic table at a height between 0,5 m and 1 m.

For PE, the equipment shall be arranged in its normal operating configuration as recommended by the manufacturer on a non-metallic table at a height between 0,5 m and 1 m.

The measuring antenna shall be installed in the horizontal plane of the radiating part of the MES. Each antenna shall be positioned to be outside the near-field of the other antenna.

In addition, it shall be verified that the test site is suitable with respect to the ambient noise power density which shall be at least 6 dB lower than the lowest specification value being measured.

C.6 Measuring procedure

The EUT shall be switched on and the STE (if used) activated. The measuring antenna shall be placed at the specified distance from the EUT. Measurements shall be made in the horizontal plane around the EUT to detect unwanted emissions within the specified bands in order to obtain the position where the power spectral density is maximum. The height of the measuring antenna shall be varied between 1 m and 4 m

and the EUT shall be rotated through 360° to maximize the emissions (vertical and horizontal) to ensure that the values obtained are maximized. The precise knowledge of the distance between the two antennas, the reference antenna gain and the determination of the amplification/attenuation characteristics of the post reference antenna network allow the determination of the unwanted EIRP density radiated by the EUT.

C.7 Alternative measuring procedure

For the case in which it is desired to measure the power of the emissions from the MES by direct coupling at the interface point between the antenna and the rest of the MES, the method set out in this annex shall apply except that the test set-up will need to be modified to allow direct coupling of the measuring equipment to the antenna feed and references to the positioning of the measuring antenna shall be ignored. The MES maximum antenna gain at the measurement frequency shall be taken into account.

For this test set-up it may also be necessary to arrange for the coupling of signals from the STE to the MES in order to put the MES into its normal transmit mode, as described in annex C, clause C.4.

Annex D (normative): EIRP density - test procedure

D.1 Introduction

This annex describes a test procedure for determining the EIRP density (specified in subclause 5.3) radiated by MES terminals. The EIRP density considered is the component of the main radiated carrier which is emitted in any direction.

D.2 Measuring apparatus

In order to carry out the test, the following elements are required, as a minimum:

- spectrum analyzer covering the necessary frequency range;

- means of connecting the test equipment directly to the antenna feed in order to measure the signals input to the antenna.

For the apparatus utilised, it shall be verified that the specifications set out in annex B, clause B.2 are met.

D.3 Equipment Under Test

The EUT comprises those units with all necessary cables ensuring a proper functioning of the equipment as specified in annex B, subclause B.1.3, but without the antenna.

Where the EUT is so designed that it is not normally possible to make a direct connection to the feed at the antenna connecting point, the manufacturer shall provide a means of so doing specifically for the test MES.

D.4 Special Test Equipment

In order to measure the system radiation under worst case transmitting conditions (in terms of unwanted emissions), proper arrangement shall be provided (by the manufacturers) to put the MES terminal in its transmit mode, in particular with maximum transmit duty cycle. This may require the use of STE provided by the manufacturer (see subclause 5.1).

D.5 Test set-up

The necessary connections shall be made with the STE, the power supply and the measuring apparatus.

D.6 Measuring procedure

First the antenna transmit gain pattern shall be determined according to subclause 5.3 of this ETS.

The measuring apparatus shall be connected to the EUT at the antenna connecting point. The STE (if used) shall be enabled in order to put the MES into a transmitting state. The transmitted spectrum shall be displayed on the spectrum analyzer and the maximum power spectral density per 4 kHz shall be determined.

The transmit on axis antenna gain shall be added to the measured power spectral density and compared to the EIRP density limits specified in subclause 5.3.

History

Document history			
February 1996	Public Enquiry	PE 102:	1996-02-19 to 1996-06-14