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Harmonized European Standard (Telecommunications series)

**Satellite Earth Stations and Systems (SES);
Harmonized Standard for satellite earth stations for
MSS operating in the 1 980 MHz to
2 010 MHz (earth-to-space) and 2 170 MHz to
2 200 MHz (space-to-earth) frequency bands;
Part 3: User Equipment (UE) for narrowband systems:
Harmonized EN covering the essential requirements
of article 3.2 of the R&TTE Directive**



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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.4] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [1] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

The requirements relevant to Directive 1999/5/EC [1] are summarised in annex A.

The present document is part 3 of a multi-part deliverable covering the Harmonized Standard for satellite earth stations for MSS operating in the 1 980 MHz to 2 010 MHz (earth-to-space) and 2 170 MHz to 2 200 MHz (space-to-earth) frequency bands, as identified below:

- Part 1: "Complementary Ground Component (CGC) for wideband systems: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 2: "User Equipment (UE) for wideband systems: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive";
- Part 3: "User Equipment (UE) for narrowband systems: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".**

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Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [1]. The modular structure is shown in EG 201 399 [i.5].

1 Scope

The present document applies to User Equipment (UE) radio equipment type which have the following characteristics:

- these UEs have both transmit and receive capabilities and operate in a Geostationary satellite network;
- these UEs operate with an assigned channel signal bandwidth (CBw) smaller than 1 MHz;
- these UEs may be handset, handheld, portable, vehicle-mounted, host connected, semi-fixed or fixed equipment, or may be an element in a multi-mode terminal. It may consist of a number of modules with associated connections and user interface, or may be a self contained single unit;
- if the UE is an element in a multi-mode terminal, unless otherwise stated in the present document, its requirements apply only to the UE element of the terminal operating in the Mobile Satellite Service (MSS) frequency bands given in table 1.

This radio equipment type is capable of operating in all or any part of the frequency bands given in table 1.

Table 1: Mobile Satellite Service UE frequency bands

Operating band	Direction of transmission	UE frequency bands
I	UE Transmit (earth-to-space)	1 980 MHz to 2 010 MHz
	UE Receive (space-to-earth)	2 170 MHz to 2 200 MHz

The present document is intended to cover the provisions of Directive 1999/5/EC [1] (R&TTE Directive) article 3.2, which states that "..... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial space radio communications and orbital resources so as to avoid harmful interference".

NOTE 1: In addition to the unwanted emission limits defined in clause 4.2.2 of the present document, additional operational constraints may be required to prevent harmful interference into services operating in the neighbouring bands outside the operational band defined in table 1.

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [1] may apply to equipment within the scope of the present document.

NOTE 2: A list of such ENs is included on the web site <http://www.newapproach.org>.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [2] ITU-T Recommendation O.153 (10/1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".
- [3] CISPR 16-1-4 (2010): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".
- [4] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [5] IEC 60068-2-1 (2007): "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [6] IEC 60068-2-2 (2007): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 102 215: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Recommended approach, and possible limits for measurement uncertainty for the measurement of radiated electromagnetic fields above 1 GHz".
- [i.2] ETSI EN 302 574-1: "Satellite Earth Stations and Systems (SES); Harmonized standard for satellite earth stations for MSS operating in the 1 980 MHz to 2 010 MHz (earth-to-space) and 2 170 MHz to 2 200 MHz (space-to-earth) frequency bands; Part 1: Complementary Ground Component (CGC) for wideband systems: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- [i.3] ETSI EN 302 574-2: "Satellite Earth Stations and Systems (SES); Harmonized standard for satellite earth stations for MSS operating in the 1 980 MHz to 2 010 MHz (earth-to-space) and 2 170 MHz to 2 200 MHz (space-to-earth) frequency bands; Part 2: User Equipment (UE) for wideband systems: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive".
- [i.4] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.5] ETSI EG 201 399: "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [1] and the following apply:

applicant: manufacturer or his authorized representative within the European Community or the person responsible for placing the apparatus on the market

carrier-on time (initial bursts): period when a UE is transmitting a signal

NOTE: For UEs that transmit in a non-continuous mode, the carrier-on time only includes the times when the UE is transmitting a signal.

carrier-on state: UE is in this state when it is authorized by the NCF to transmit and when it transmits a signal

carrier-off state: UE is in this state when either it is authorized by the Network Control Facility (NCF) to transmit but when it does not transmit any signal, or when it is not authorized by the NCF to transmit

conducted measurement: measurement of emissions from an antenna port of the UE made by direct wired connection to the port

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

Equivalent Isotropically Radiated Power (EIRP): product of transmitter power and the antenna gain in the direction considered, relative to an isotropic source radiating uniformly in all directions

fellow radio station: one of the (other) modes of a multimode UE

handheld: indicates a UE which is self-contained and is small enough and light enough to be carried and used during a call with one hand

host-connected: indicates a UE for which connection to or integration with host equipment is necessary to offer functionality

host equipment: any equipment which has a complete user functionality when not connected to the UE, and to which the UE provides additional functionality, and to which connection is necessary for the UE to offer functionality

Installable Equipment (IE): equipment which is intended to be installed in a vehicle

NOTE: An IE may consist of one or several interconnected modules. The IE is composed of modules intended to be externally mounted as declared by the applicant, and defined as Externally Mounted Equipment (EME) and the remaining module(s) as Internally Mounted Equipment (IME).

Laboratory Test Equipment (LTE): logical grouping that contains the standard test equipment provided by a test laboratory

MSS band: continuous range of frequencies allocated by the ITU to the MSS

multimode: indicates equipment that accommodates radio stations of different radio networks

network control channel: channel by which a UE receives general control information from the NCF

NCF control message: message, normally originating from a network, to a specified terminal or set of terminals of the network which indicates to the terminal or set of terminals that it/they should carry out some specific action or should enter or maintain some specific state

NOTE: For test purposes NCF control messages may originate from Special Test Equipment (STE).

nominated bandwidth (B_n): The nominated bandwidth of the UE radio frequency transmission is nominated by the applicant.

NOTE: The nominated bandwidth is wide enough to encompass all spectral elements of the transmission necessary for communication and which have a level greater than the specified unwanted emissions limits. The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability. The nominated bandwidth is centred on the transmit frequency and does not exceed 180 % of the 3dB bandwidth of the signal. The nominated bandwidth is within the assigned part of the MSS transmit frequency band within which the UE operates.

3 dB Bandwidth (B_{3dB}): total width of the signal spectrum 3 dB below the maximum in-band density

operational frequency range(s): sub-portion(s) of the band in the earth-to-space direction to the MSS network, for which the equipment has been designed as declared by the applicant

Portable Equipment (PE): equipment generally intended to be self-contained, free standing and portable

NOTE: A PE would normally consist of a single module, but may consist of several interconnected modules.

radiated measurement: measurement of an actual radiated field

Special Test Equipment (STE): equipment which allows a test laboratory to control the UE so that the tests required by the present document can be performed

spurious emissions: emissions at frequencies beyond the limit of 2,5 MHz above and below the centre frequency of the wanted emission

NOTE: Spurious emissions are generally considered as emissions at frequencies beyond the limit of 250 % of the necessary bandwidth above and below the centre frequency of the wanted emission. For the purposes of the present specification, this limit is defined as frequencies which are 2,5 MHz or greater away from the UE centre carrier frequency, where 2,5 MHz corresponds to 250 % of the maximum value of assigned channel signal bandwidth (CBw).

test laboratory: laboratory which performs the conformance testing of the UE against the present document

NOTE: The test laboratory may be the applicant's laboratory.

test load: substantially non-reactive, non-radiating power attenuator which is capable of safely dissipating the power from the transmitter(s)

transmission format: physical characteristics of the signal that is transmitted by a UE

NOTE: A UE may use more than one transmission format within a single network.

unwanted emissions: emissions falling outside the nominated bandwidth in the carrier-on state and those generated in the carrier-off state

3.2 Symbols

For the purposes of the present document, the following symbols apply:

B3dB	3 dB Bandwidth
B _n	Nominated Bandwidth
CBw	Assigned Channel Signal Bandwidth
dBW	decibels relative to 1 Watt

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CDMA	Code Division Multiple Access
CMF	Control and Monitoring Functions
CW	Continuous Wave
EIRP	Equivalent Isotropically Radiated Power
EMC	Electro-Magnetic Compatibility
EME	Externally Mounted Equipment
EUT	Equipment Under Test
IE	Installable Equipment
IEC	International Electrotechnical Commission/Committee
IME	Internally Mounted Equipment
ITU	International Telecommunications Union
LTE	Laboratory Test Equipment
LV	Low Voltage
MSS	Mobile Satellite Service
NCF	Network Control Facility
PE	Portable Equipment
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
RMS	Root Mean Square
STE	Special Test Equipment
TDMA	Time Division Multiple Access

UE

User Equipment

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

For guidance on how a supplier can declare the environmental profile, see annex C.

4.2 Conformance requirements

The requirements in the present document are based on the assumption that the operating band is shared between systems of the IMT-2000 satellite family or systems having compatible characteristics.

4.2.1 Introduction

To meet the essential requirements under article 3.2 of the R&TTE Directive [1] a set of essential parameters have been identified. Table 2 provides a cross reference between these 4 essential parameters and the corresponding 4 technical requirements for equipment within the scope of the present document.

Table 2: Cross reference to technical requirements

Essential Parameter	Corresponding Technical Requirement
Spurious emissions in carrier-on state	Clause 4.2.2: Unwanted emissions outside the band 1 980 MHz to 2 010 MHz (carrier on state)
Out-of-band emissions (spectrum emissions mask) in carrier-on state	Clause 4.2.3: Unwanted emissions within the band 1 980 MHz to 2 010 MHz (carrier on state)
Spurious emissions in carrier-off state	Clause 4.2.4: Unwanted emissions in carrier off state
Control and Monitoring functions	Clause 4.2.5: UE Control and Monitoring Functions (CMF)

In the event of any conflict between these different requirements, the most stringent requirement shall apply.

4.2.2 Unwanted emissions outside the band 1 980 MHz to 2 010 MHz (carrier-on state)

4.2.2.1 Justification

Protection of other radio services operating outside the band 1 980 MHz to 2 010 MHz from emissions caused by UEs operating within the band 1 980 MHz to 2 010 MHz.

4.2.2.2 Technical requirements

The maximum EIRP spectral density of the unwanted emissions from the UE outside the band 1 980 MHz to 2 010 MHz shall not exceed the limits in tables 3a and 3b in the carrier-on state.

The limits defined in table 3a are only applicable for frequencies which are 2,5 MHz or greater away from the UE centre carrier frequency. Unwanted emissions at frequencies which are less than 2,5 MHz away from the UE centre carrier frequency shall not exceed the limits defined in table 3b.

NOTE 1: For the purposes of the present specification, spurious emissions are defined as unwanted emissions at frequencies which are 2,5 MHz or greater away from the UE centre carrier frequency, where 2,5 MHz corresponds to 250 % of the maximum value of assigned channel signal bandwidth (CBW).

The limits defined in table 3b are defined by reference to clause 4.2.3 for two specified frequency bands for frequencies which are less than 2,5 MHz away from the UE centre carrier frequency. Unwanted emissions in these bands shall not exceed the limits defined in either table 4a or table 4b in the carrier-on state: the applicant shall declare which alternative shall be used.

In addition to the limits defined in table 3b, unwanted emissions at frequencies which are less than 2,5 MHz away from the UE centre carrier frequency shall also not exceed the limits defined in either table 4a or table 4b in the carrier-on state: the applicant shall declare which alternative shall be used. In the event of any conflict, the more stringent limit shall apply.

In tables 3a and 3b, whenever a change of limit between adjacent frequency bands occurs, the lower of the two limits shall apply at the transition frequency.

For systems employing CDMA, the EIRP limits shall be decreased by $10 \log(N)$ dB, where N is the maximum number of UEs in the receive beam of the satellite to which these UEs are communicating and which are expected to transmit simultaneously in the same frequency band within that same beam. This number shall be declared by the manufacturer.

NOTE 2: $N = 1$ in a TDMA system.

**Table 3a: Unwanted emissions outside the band 1 980 MHz to 2 010 MHz
for frequencies which are 2,5 MHz or greater away from the UE centre carrier frequency**

Frequency Range	Carrier-on state		
	Measurement Bandwidth	EIRP	Measurement method (see notes 5 and 6)
$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	100 kHz	-66 dBW	Peak Hold
$1\,000 \text{ MHz} \leq f < 1\,559 \text{ MHz}$	1 MHz	-60 dBW	Average
$1\,559 \text{ MHz} \leq f < 1\,605 \text{ MHz}$	1 MHz (note 3)	-70 dBW	Average (note 2)
$1\,605 \text{ MHz} \leq f < 1\,960 \text{ MHz}$	1 MHz	-60 dBW	Average
$1\,960 \text{ MHz} \leq f < 1\,970 \text{ MHz}$	300 kHz	-60 dBW	Average
$1\,970 \text{ MHz} \leq f < 1\,975 \text{ MHz}$	100 kHz	-60 dBW	Average
$1\,975 \text{ MHz} \leq f < 1\,977,5 \text{ MHz}$	30 kHz	-60 dBW	Average
$1\,977,5 \text{ MHz} \leq f < 1\,980 \text{ MHz}$	30 kHz (note 7)	-60 dBW (note 7)	Average (note 7)
$1\,980 \text{ MHz} \leq f \leq 2\,010 \text{ MHz}$	N/A (note 1)	N/A (note 1)	N/A (note 1)
$2\,010 \text{ MHz} < f < 2\,012,5 \text{ MHz}$	30 kHz (note 7)	-60 dBW (note 7)	Average (note 7)
$2\,012,5 \text{ MHz} < f < 2\,015 \text{ MHz}$	30 kHz	-60 dBW	Average
$2\,015 \text{ MHz} \leq f < 2\,020 \text{ MHz}$	100 kHz	-60 dBW	Average
$2\,020 \text{ MHz} \leq f < 2\,030 \text{ MHz}$	300 kHz	-60 dBW	Average
$2\,030 \text{ MHz} \leq f < 2\,500 \text{ MHz}$	1 MHz	-60 dBW	Average
$2,5 \text{ GHz} \leq f < 12,75 \text{ GHz}$	1 MHz	-60 dBW (note 4)	Peak Hold

NOTE 1: Unwanted emissions within the band 1 980 MHz to 2 010 MHz are defined in clause 4.2.3.

NOTE 2: The average measurement method defined in clause 5.3.2.3 shall apply except that an averaging period of 20 ms shall be used in the sub-band 1 573,42 MHz to 1 580,42 MHz.

NOTE 3: Measurement bandwidths less than 1 MHz are allowable provided the power in the narrower bandwidth is integrated over 1 MHz.

NOTE 4: In the band 3 960 MHz to 4 020 MHz the maximum EIRP in one, and only one, 3 MHz measurement bandwidth shall not exceed -38 dBW.
In each of the bands 5 940 MHz to 6 030 MHz, 7 920 MHz to 8 040 MHz and 9 900 MHz to 10 050 MHz the maximum EIRP in one, and only one, 10 MHz measurement bandwidth shall not exceed -48 dBW. Elsewhere in this band the power limit in table 3a shall be applied.

NOTE 5: Peak Hold and Average measurements shall be performed as specified in clauses 5.3.2.2 and 5.3.2.3.

NOTE 6: The first and last measurement position should take account of the measurement bandwidth, so that the edge of the measurement bandwidth aligns with the edge of the measured band. For example, with a 30 kHz measurement bandwidth, the first and last measurement positions are 15 kHz inside the measured band edges.

NOTE 7: This limit shall only apply for frequencies which are 2,5 MHz or greater away from the UE centre carrier frequency. The limits defined in table 3b shall apply for frequencies which are less than 2,5 MHz away from the UE centre carrier frequency.

**Table 3b: Unwanted emissions outside the band 1 980 MHz to 2 010 MHz
for frequencies which are less than 2,5 MHz away from the UE centre carrier frequency**

Frequency Range	Carrier-on state		
	Measurement Bandwidth	EIRP	Measurement method (see notes 2 and 3)
1 977,50 MHz $\leq f <$ 1 978,50 MHz	30 kHz	-55 dBW	Average
1 978,50 MHz $\leq f <$ 1 979,50 MHz	30 kHz	-55 dBW to -35 dBW (note 4)	Average
1 979,50 MHz $\leq f <$ 1 979,65 MHz	30 kHz	-35 dBW	Average
1 979,65 MHz $\leq f <$ 1 979,75 MHz	30 kHz	-35 dBW to -15 dBW (note 4)	Average
1 979,75 MHz $\leq f <$ 1 980,00 MHz	(note 1)	(note 1)	(note 1)
2 010,00 MHz $\leq f <$ 2 010,25 MHz	(note 1)	(note 1)	(note 1)
2 010,25 MHz $\leq f <$ 2 010,35 MHz	30 kHz	-15 dBW to -35 dBW (note 4)	Average
2 010,35 MHz $\leq f <$ 2 010,50 MHz	30 kHz	-35 dBW	Average
2 010,50 MHz $\leq f <$ 2 011,50 MHz	30 kHz	-35 dBW to -55 dBW (note 4)	Average
2 011,50 MHz $\leq f <$ 2 012,50 MHz	30 kHz	-55 dBW	Average
NOTE 1: The limits defined in clause 4.2.3 shall apply for unwanted emissions in the frequency bands 1 979,75 MHz to 1 980,00 MHz and 2 010,00 MHz to 2 010,25 MHz.			
NOTE 2: Peak Hold and Average measurements shall be performed as specified in clauses 5.3.2.2 and 5.3.2.3.			
NOTE 3: The first and last measurement position should take account of the measurement bandwidth, so that the edge of the measurement bandwidth aligns with the edge of the measured band. For example, with a 30 kHz measurement bandwidth, the first and last measurement positions are 15 kHz inside the measured band edges.			
NOTE 4: Linearly interpolated in dBW versus frequency.			

4.2.2.3 Conformance test

Conformance tests shall be carried out in accordance with clause 5.3.2.

4.2.3 Unwanted emissions within the band 1 980 MHz to 2 010 MHz (carrier-on state)

4.2.3.1 Justification

Protection of other systems operating within the band 1 980 MHz to 2 010 MHz from unwanted emissions caused by UEs operating in the band 1 980 MHz to 2 010 MHz.

4.2.3.2 Technical requirements

The maximum EIRP spectral density of the unwanted emissions from the UE within the band 1 980 MHz to 2 010 MHz shall not exceed the limits in either table 4a or table 4b in the carrier-on state. The applicant shall declare which alternative shall be used.

In tables 4a and 4b, whenever a change of limit between adjacent frequency bands occurs, the lower of the two limits shall apply at the transition frequency.

Table 4a: Maximum EIRP spectral density of the unwanted emissions in the carrier-on state

Frequency offset (kHz) (see note 1)	Carrier-on state		
	Maximum EIRP in specified measurement bandwidth (dBW) (see notes 2 and 3)	Measurement bandwidth (kHz)	Measurement Method (see notes 4 and 5)
0 to 25	0 to $(-15 + E)$	3	Average
25 to 125	$(-15 + E)$ to $(-45 + E)$	3	Average
125 to 425	$(-45 + E)$	3	Average
425 to 1 500	$(-45 + E)$ to -60	3	Average
1 500 to 10 000	-50 to -60	30	Average
10 000 to 30 000	-60	30	Average

NOTE 1: Frequency offset is determined from the edge of the nominated bandwidth.

NOTE 2: Linearly interpolated in dBW vs. Frequency offset.

NOTE 3: E (dB) is the excess EIRP in the occupied bandwidth of the UE compared with 15 dBW. For a UE where the EIRP is equal to or less than 15 dBW, E shall equal 0 dB. For a UE where the EIRP is above 15 dBW, E shall equal (EIRP - 15). In cases where the antenna directivity of the UE is greater than 15 dBi then the factor E shall be limited to a maximum value of 15 dB. In all other cases, the factor E shall be limited to a maximum value of 10 dB.

NOTE 4: Peak Hold and Average measurements shall be performed as specified in clauses 5.3.2.2 and 5.3.2.3.

NOTE 5: The first and last measurement position should take account of the measurement bandwidth, so that the edge of the measurement bandwidth aligns with the edge of the measured band. For example, with a 30 kHz measurement bandwidth, the first and last measurement positions are 15 kHz inside the measured band edges.

Table 4b: Maximum EIRP spectral density of the unwanted emissions in the carrier-on state

Frequency offset (kHz) (see notes 1 and 3)	Carrier-on state		
	Maximum EIRP in specified measurement bandwidth (dBW) (see notes 2 and 5)	Measurement bandwidth (kHz)	Measurement Method (see notes 6 and 7)
0 to 25	0 to $(-15 + E)$	3	Average
25 to 55	$(-15 + E)$ to $(-25 + E)$ (see note 4)	3	Average
55 to AB	$(-25 + E)$ (see note 4)	3	Average
AB to $(AB + 0,35 \times B3dB)$	$(-25 + E)$ to $(-38 + E)$ (see note 4)	3	Average
$(AB + 0,35 \times B3dB)$ to CD	$(-38 + E)$	3	Average
CD to $(CD + 0,25 \times B3dB)$	$(-38 + E)$ to $(-45 + E)$	3	Average
$(CD + 0,25 \times B3dB)$ to EF	$(-45 + E)$	3	Average
EF to GH	$(-45 + E)$ to -60	3	Average
GH to 10 000	-50 to -60	30	Average
10 000 to 30 000	-60	30	Average

NOTE 1: Frequency offset is determined from the edge of the nominated bandwidth.
NOTE 2: Linearly interpolated in dBW vs. Frequency offset.
NOTE 3: The parameters AB, CD, EF, GH are defined below.
NOTE 4: The limit of $(-25 + E)$ dBW in this table is determined on the assumption that the adjacent channel interference results from a single interferer. This limit shall apply to UEs that are designed for operation in a network where the occurrence of two (or more) interferers, all transmitting with the maximum permitted level of unwanted emissions, does not exceed 0,1 % of the time; otherwise a limit of $(-30 + E)$ dBW shall apply.
NOTE 5: E (dB) is the excess EIRP in the occupied bandwidth of the UE compared with 15 dBW. For a UE where the EIRP is equal to or less than 15 dBW, E shall equal 0 dB. For a UE where the EIRP is above 15 dBW, E shall equal $(EIRP-15)$. In cases where the antenna directivity of the UE is greater than 15 dBi then the factor E shall be limited to a maximum value of 15 dB. In all other cases, the factor E shall be limited to a maximum value of 10 dB.
NOTE 6: Peak Hold and Average measurements shall be performed as specified in clauses 5.3.2.2 and 5.3.2.3.
NOTE 7: The first and last measurement position should take account of the measurement bandwidth, so that the edge of the measurement bandwidth aligns with the edge of the measured band. For example, with a 30 kHz measurement bandwidth, the first and last measurement positions are 15 kHz inside the measured band edges.

The parameters AB, CD, EF and GH are defined in kHz as a proportion of the 3dB Bandwidth as follows:

AB = (55) or (100 % of the B3dB), whichever is the greater;

CD = (95) or (200 % of the B3dB), whichever is the greater;

EF = (125) or (300 % of the B3dB), whichever is the greater;

GH = (1 500) or (400 % of the B3dB), whichever is the greater.

For systems employing CDMA, the EIRP limits in tables 4a and 4b shall be decreased by $10 \times \log(N)$ dB, where N is the maximum number of UEs in the receive beam of the satellite to which these UEs are communicating and which are expected to transmit simultaneously in the same frequency band within that same beam. This number, N, shall be declared by the applicant.

NOTE: N = 1 in a TDMA system.

The conformance requirements apply for the full range of environmental conditions corresponding to the type of equipment as specified in clause 4.1.

4.2.3.3 Conformance test

Conformance tests shall be carried out in accordance with clause 5.3.3.

4.2.4 Unwanted emissions in carrier-off state

4.2.4.1 Justification

Protection of other radio services and systems from unwanted emissions caused by UEs in the carrier-off state.

4.2.4.2 Technical requirements

The maximum EIRP spectral density of the unwanted emissions from the UE in the carrier-off state shall not exceed the limits in table 5.

In table 5, whenever a change of limit between adjacent frequency bands occurs, the lower of the two limits shall apply at the transition frequency.

Table 5: Maximum EIRP spectral density of the unwanted emissions in the carrier-off state

Frequency (MHz)	Maximum EIRP in specified measurement bandwidth (dBW)	Measurement bandwidth	Measurement Method (see notes 3 and 4)
30 to 1 000	-87	100 kHz	Peak Hold
1 000 to 2 170	-77	100 kHz	Peak Hold
2 170 to 2 200	-97 + G (see notes 1 and 2)	100 kHz	Average
2 200 to 12 750	-77	100 kHz	Peak Hold

NOTE 1: G (dB) is a compensation factor that depends on the UE antenna gain relative to an isotropic antenna, with a maximum value of G=7 dB. For a UE where the antenna gain is 8 dBi or greater, G shall equal 7 dB. For other UEs, if the antenna gain is 1 dBi or greater, G shall equal 1 dB less than the UE antenna gain; otherwise G shall equal 0 dB.

NOTE 2: The lower unwanted emission limit in this band is to protect nearby UE receivers operating in the same band.

NOTE 3: Peak Hold and Average measurements shall be performed as specified in clauses 5.3.2.2 and 5.3.2.3.

NOTE 4: The first and last measurement position should take account of the measurement bandwidth, so that the edge of the measurement bandwidth aligns with the edge of the measured band. For example, with a 30 kHz measurement bandwidth, the first and last measurement positions are 15 kHz inside the measured band edges.

The conformance requirements apply for the full range of environmental conditions corresponding to the type of equipment as specified in clause 4.1.

4.2.4.3 Conformance test

Conformance tests shall be carried out in accordance with clause 5.3.4.

4.2.5 UE Control and Monitoring Functions (CMF)

4.2.5.1 Absence of a valid network handling of output power

4.2.5.1.1 Definition

This requirement verifies that the control and monitoring functions of the UE prevent it from transmitting in the absence of a valid network.

4.2.5.1.2 Limit

The maximum measured power during the duration of the test shall not exceed the limits defined in table 5.

4.2.5.1.3 Conformance

Conformance tests described in clause 5.3.5 shall be carried out.

4.2.5.2 Loss of signal handling of output power

4.2.5.2.1 Definition

This requirement verifies that the control and monitoring functions of the UE prevent it from transmitting if the received downlink signal fails.

In the event of a loss of the received signal, the UE shall stop transmitting within 5 seconds.

4.2.5.2.2 Limit

The maximum measured power when the UE has stopped transmitting (carrier-off state) shall not exceed the limits defined in table 5.

4.2.5.2.3 Conformance

Conformance tests described in clause 5.3.5 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

For guidance on how a supplier can declare the environmental profile, see annex C.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

5.2 Interpretation of the measurement results

All results of the tests performed shall be recorded in a test report.

For each test, the test report shall also include the test conditions (status of the UE, frequency of operation) and the environmental test conditions.

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 6.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterising the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in specific ETSI deliverables TR 100 028 [4] or TR 102 215 [i.1].

Table 6 is based on such expansion factors.

Table 6: Maximum measurement uncertainty

Parameter	Uncertainty
Radio Frequency above 1 MHz	± 1 part in 10^7
EIRP spectral density within the operational frequency range(s)	$\pm 0,75$ dB
Unwanted radiated emissions	± 6 dB
Unwanted conducted emissions	± 4 dB

5.3 Essential radio test suites

5.3.1 General

5.3.1.1 Description of equipment

The applicant shall provide a statement which contains all of the information related to the UE and its testing environment.

This shall include:

- self contained or host-connected;
- single mode or multimode;
- antenna:
 - active; or
 - passive, with an antenna port available; or
 - passive, no antenna port available;
- the method by which the equipment can be switched into its test modes;
- the fault conditions which cause transmission shut-down;
- the nominal, the lower extreme and the higher extreme operational voltages;
- the transmission formats for which the different EIRP spectral density limits apply and the maximum gross data rate at which the UE is designed to operate for each of those formats;
- the value(s) of nominated bandwidth for each transmission format for that network;
- the value(s) of the 3 dB bandwidth for each transmission format for that network;
- the appropriate choice of table 4a or table 4b for testing each transmission format for that network. The same choice shall be used for all tests of a given transmission format;
- in an information leaflet, for each network for which the UE is designed to operate:
 - a) the name of the network;
 - b) the operating frequency range(s) of the UE;
 - c) the frequency sub-bands and operating conditions for which the different EIRP spectral density limits apply.

NOTE 1: In the case of a multimode UE, the other modes of operation are to be stated.

NOTE 2: If the UE has an active antenna, the antenna is regarded as an integral part of the UE and the antenna port if available is not to be used for testing.

NOTE 3: If the UE is intended for use with a passive antenna, the maximum gain of any antenna intended to be used with the equipment is to be stated.

NOTE 4: If conducted emissions measurements are to be performed, at the choice of the applicant, the maximum antenna gain at the frequency of particular measured spurious emissions may be stated.

NOTE 5: If Special Test Equipment (STE) is required see clause 5.3.1.4.2.

NOTE 6: Transmission formats include all relevant differences in the format of the transmitted data e.g. the different modulations schemes and/or burst sizes that are used within the relevant network.

5.3.1.2 Testing of host-connected equipment and plug-in modules

5.3.1.2.1 Alternative approaches

For equipment for which connection to or integration with host equipment is required to offer functionality, two alternative approaches are permitted. The applicant shall declare which alternative shall be used.

5.3.1.2.2 Alternative A: combined equipment

Under alternative A, a combination of UE and a specific type of host equipment shall be used for testing according to the present document.

Where more than one such combination is intended, testing shall not be repeated for combinations of UE and other host equipment where the latter are substantially similar, in particular such that the host models are unlikely to significantly influence the emissions of the UE.

Where more than one such combination is intended and host equipment are not substantially similar, one combination shall be tested against the full set of requirements of the present document; other combinations shall be tested separately for radiated emissions only.

5.3.1.2.3 Alternative B: use of a test jig

Under alternative B, where the UE is intended for use with a variety of host equipment, the applicant shall supply a suitable test jig that is representative of the range of host equipment in which the UE may be used. In particular, the test jig shall be designed such that any alteration of the UE's emissions is minimized. The test jig shall allow the UE part to be powered and stimulated in a way similar to the way it would be powered and stimulated when connected to or inserted into the host equipment.

The UE shall be tested against the full set of requirements of the present document.

5.3.1.3 CMF/Special Test Equipment (STE)

The STE shall provide the necessary facilities for tests which require that the UE be operated in its normal operating manner, situated in an environment where receipt of the appropriate network control channel(s) and of NCF commands is under the control of the test laboratory.

The STE shall also provide means for the test laboratory to interface its test equipment with the UE for the purpose of monitoring the UE responses.

For other tests, where the required test mode cannot be, or is not, provided by a special test facility within the UE, then the STE shall also provide the facility to put the UE into these required test modes.

5.3.1.4 General test requirements

5.3.1.4.1 UE test modes

The UE is required to be placed in a number of different test modes in order for the various tests specified within the present document to be carried out:

- 1) power-off;
- 2) power-on (applies to all the following test modes);
- 3) carrier-off state;
- 4) carrier-on state, maximum transmit power, in a specified channel within the operational frequency range(s), transmitting with a specified transmission format and modulated with the test modulating signal as specified in clause 5.3.1.4.2.2;
- 5) carrier-on state, maximum transmit power, in a specified channel within the operational frequency range(s), set by NCF command, transmitting with a specified transmission format and modulated with the test modulating signal as specified in clause 5.3.1.4.2.2;

NOTE: If this is available for all tests (4) is not required separately.

- 6) carrier-on state at any detectable power.

The UE may be placed into test modes 4 and 5 either by means of a special facility existing internally in the UE, or by means of a Special Test Equipment (STE).

If the UE has been modified by the applicant for these tests, then full documentation showing such modification(s) shall be provided to demonstrate that the modification(s) will not cause the test results to deviate from normal operational performance.

5.3.1.4.2 Special Test Equipment (STE)

5.3.1.4.2.1 Use of STE for control and monitoring functions tests

The test arrangement shall be as shown in figure 1 for radiated and conducted measurements.

This test arrangement assumes that the STE is responsible for simulating for the UE the NCF commands or network control channel in the same way as they are received by the UE in normal operating mode. The response received by the STE from the UE shall be routed to the LTE without modification that would significantly affect the measurement.

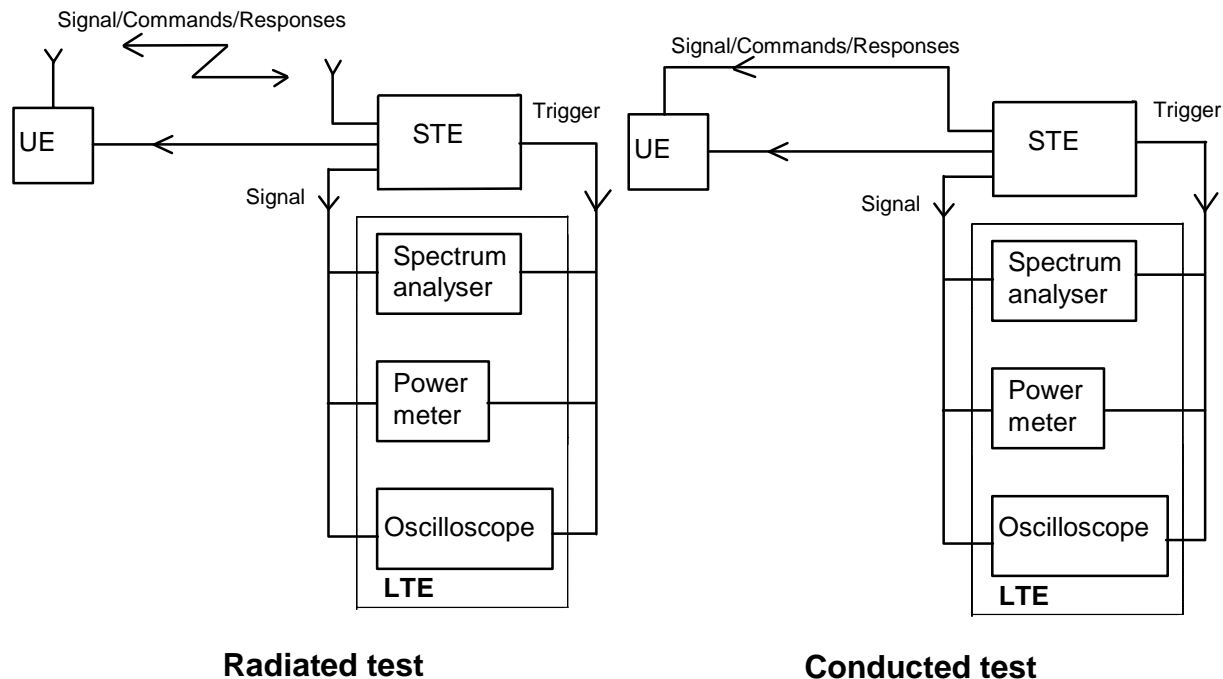


Figure 1: General test arrangement for control and monitoring tests

The dual trace storage oscilloscope, or other suitable method, may be used to monitor the response of the UE to the simulated events by measuring the time difference between the event or command reception, and the compliance with that event.

The power meter and spectrum analyser shall be used to monitor the UE output signal during all the test procedure.

5.3.1.4.2.2 Test modulating signal

The test modulating signal is a baseband signal which modulates the carrier of the UE and is dependent upon the type of equipment under test. It is a signal representing a pseudorandom bit sequence of at least 511 bits in accordance with ITU-T Recommendation O.153 [2]. This sequence shall be continuously repeated and shall be at the maximum bit rate declared by the applicant at which the UE is able to operate.

If not internally generated by the UE, this test modulating signal shall be provided by the STE.

5.3.1.4.3 Laboratory Test Equipment (LTE)

The Laboratory Test Equipment (LTE) is a logical grouping that contains the measurement equipment provided by the test laboratory.

It shall be verified that the responses of the LTE, including any test antenna, to a constant amplitude sine wave signal remain within ± 1 dB of calibration across the frequency range of interest.

The maximum values of measurement uncertainty for the LTE associated with each measurement parameter given in table 6 for a 95 % confidence level, shall apply as appropriate to the test cases described in the present document.

5.3.1.4.4 Methods of test for UE RF emissions according to the equipment type

Measurements shall be performed according to the equipment type as defined in table 7.

Table 7: Options for testing

Equipment with passive antenna port available (external, internal or temporary)	Radiated from cabinet from 30 MHz to 4 GHz (passive antenna port connected to a dummy load), and conducted from the passive antenna port, from 100 kHz to 12,75 GHz.
Equipment with no passive antenna port available (see note)	Radiated from complete UE, including its antenna, from 30 MHz to 12,75 GHz.
NOTE: Equipment with an active antenna shall be assumed to have no antenna port available.	

The methods of measurement for radiated emissions are described in clause 5.3.1.4.5.

The methods of measurement for conducted emissions are described in clause 5.3.1.4.6.

5.3.1.4.5 Procedures for measurement of radiated emissions

5.3.1.4.5.1 General

Clause 5.3.1.4.5 contains methods for tests involving the measurement of a radiated field. This field may be radiated by an antenna and/or by the cabinet of the equipment itself.

It is recognized that for some parameters, alternative test methods may exist. It is the responsibility of the test laboratory to ensure that any alternative test method used yields results identical to those described in the present document.

5.3.1.4.5.2 Test site

The standard test site shall be a calibrated open air test site, whose dimensions are appropriate to the frequency range of measurements according to the specification of CISPR 16-1-4 [3].

All radiated measurement tests shall be conducted in such a way as to ensure that there is no interference to operational satellite and terrestrial systems. In some cases operating on a test site may produce electromagnetic perturbation or, conversely, external radiation may disturb the measurement. For these reasons, and also in order to reduce the space required, or to perform tests under extreme environmental conditions, other arrangements may be used, such as:

- anechoic chamber;
- indoor test site.

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

The methods of measurement described in this annex are based on an open air test site. If an anechoic chamber or an indoor test site are used, some changes may apply to the method of measurement. For each radiated measurement, the nature and the dimensions of the test arrangement used shall be recorded in the test report.

5.3.1.4.5.3 Test set up for radiated emissions of the UE

The tests shall be carried out with the UE at the specified environmental conditions and for the specified power supply voltages.

For IE, EME and IME it shall be installed with a separation of approximately 0,5 m. Between the two equipment, the maximum length connection cable specified by the applicant 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-conducting support at a height between 0,5 m and 1 m. The IME shall be set on a non-conducting support at a height between 0,5 m and 1 m. Any associated equipment, if required for normal operation of the UE, 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 applicant on a non-metallic table at a height between 0,5 m and 1 m.

The UE under test shall be placed on the support in its standard position and shall be switched-on.

Each antenna (UE antenna and test antenna) shall be positioned to be outside the near field of the other antenna.

The spectrum analyser noise floor shall be at least 6 dB below the minimum value to be measured.

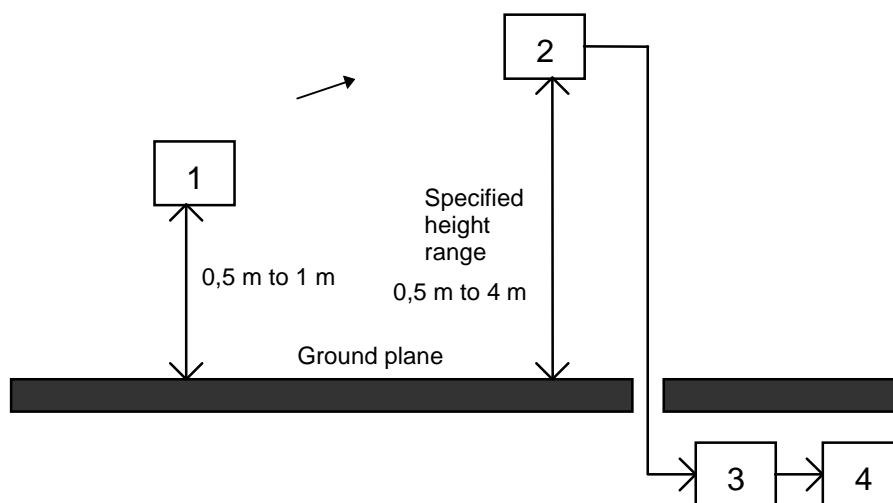
5.3.1.4.5.4 Reference position of the UE

During radiated measurements, the UE is required to be oriented specifically in relation to the test antenna connected to the LTE. This position is called the reference position and is determined as follows:

- the UE shall be placed in a mode whereby it is transmitting;
- the UE shall be rotated in both horizontal and vertical planes in order to locate the direction of maximum field strength that is detected by the test antenna. This orientation shall be called the reference position.

5.3.1.4.5.5 Measurement procedure for radiated emissions (peak)

5.3.1.4.5.5.1 Measurement procedure for peak radiated emissions of the UE



Key:

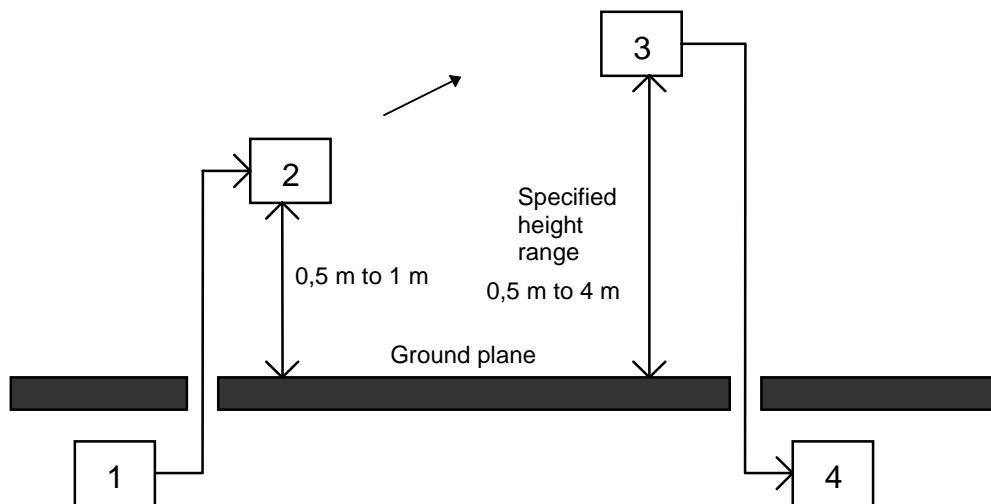
- 1) UE under test (with antenna);
- 2) Test antenna;
- 3) Input filter (if necessary);
- 4) Spectrum analyser.

Figure 2: Measurement arrangement No.1

Measurement arrangement No.1 of figure 2 shall be used.

- a) For each measurement bandwidth, the following actions shall be performed:
- The UE shall be placed in the reference position as described in clause 5.3.1.4.5.4.
 - The test antenna shall have the same polarization as the UE and connected to a spectrum analyser, eventually through a suitable entry filter to avoid overloading of the spectrum analyser.
 - Precautions may be required to ensure that the filter does not attenuate the harmonics of the carrier.
 - The test antenna and the entry filter shall be suitable for the measured frequency band, and replaced by other each time it will be necessary.
 - The spectrum analyser shall be tuned to the measurement bandwidth to analyse.
 - The resolution bandwidth of the spectrum analyser shall be set to a suitable value to correctly perform the measurement, and the peak hold function shall be activated. The video bandwidth shall be set to at least 3 times the resolution bandwidth.

- b) Only the discrete signals having a level equal or greater than 6 dB below the specified limit shall be precisely measured.
 - The test antenna shall be raised or lowered through the specified height range to look for the maximum signal on the spectrum analyser (this may not be necessary if the test site is an anechoic chamber or an indoor test site).
 - The maximum measured value shall be recorded.
- c) The procedure is repeated from a) to b) with the other measurement bandwidths to cover all the frequency range to be analysed.
- d) In the case where the test site has been calibrated before, the absolute measurement is sufficient to determine the actual value of EIRP of the radiated emissions. The precise knowledge of distance between the UE and the test antenna, and the characteristics of the test antenna and the input filter allow the determination of the EIRP radiated by the UE.
- e) In the case where the test site cannot be calibrated, a relative measurement can be done according to the following procedure:



Key:

- 1) Sinusoidal RF signal generator;
- 2) Substitution antenna;
- 3) Test antenna;
- 4) Spectrum analyser.

Figure 3: Measurement arrangement No.2

Using measurement arrangement No.2 of figure 3, a substitution antenna shall replace the UE in the same position where was the UE antenna. It shall be connected to the signal generator.

- f) The signal generator shall be tuned to each frequency at which an emission has been detected in the case of unwanted emissions measurement, or to the frequency at the middle of each measurement bandwidth in the case of EIRP spectral density measurement, the substitution antenna shall be suitable for this frequency.
 - The spectrum analyser shall be tuned to the measurement bandwidth to analyse and put in the same conditions as for the measurement with the UE, with the peak hold function activated.
 - The level of the signal generator shall be adjusted to give the same signal level on the spectrum analyser as in b).
 - The output level of the signal generator shall be recorded. This value, after corrections due to the gain of the substitution antenna and the cable loss between the signal generator and the substitution antenna, is the radiated emission level of the UE.
- g) The f) procedure is repeated with the other measurement bandwidths to cover the whole frequency range to be analysed.

- h) a) to g) shall be repeated with test antennas of the opposite polarization for the unwanted emission measurements.

5.3.1.4.5.5.2 Measurement procedure for peak radiated emissions of the cabinet

This method of measurement applies to transmitters having an antenna socket and has to be performed in addition to conducted measurements of the UE in the case of unwanted emissions.

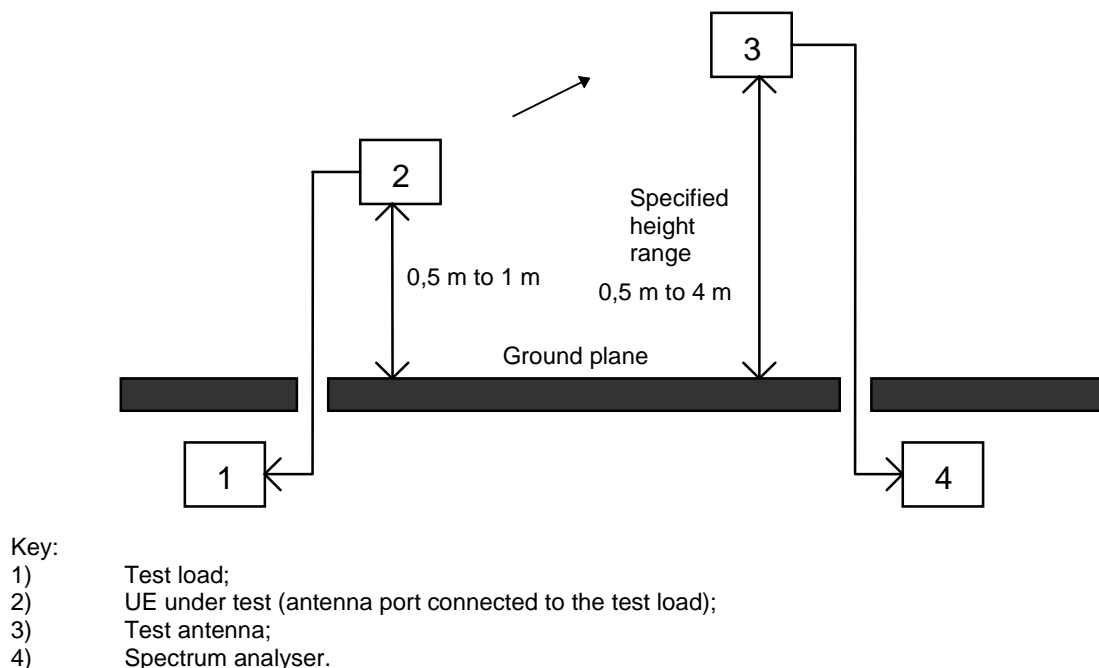


Figure 4: Measurement arrangement No.3

Measurement arrangement No.3 of figure 4 shall be used for measurement of radiated emissions of the cabinet.

The procedure is a peak measurement as in clause 5.3.1.4.5.5.1.

The same method as in clause 5.3.1.4.5.5.1 shall be applied with the exception that measurement arrangement No.3 replaces measurement arrangement No.1 (measurement arrangement No.2 remains the same for the relative measurement).

5.3.1.4.5.6 Measurement procedure for radiated emissions (average)

5.3.1.4.5.6.1 Measurement procedure for average radiated emissions of the UE

Measurement arrangement No.1 of figure 2 shall be used.

- a) For each measurement bandwidth, the following actions shall be performed:
- the UE shall be placed in the reference position as described in clause 5.3.1.4.5.4;
 - the test antenna shall have the same polarization as the UE and connected to a spectrum analyser, eventually through a suitable entry filter to avoid overloading of the spectrum analyser;
 - precautions may be required to ensure that the filter does not attenuate the harmonics of the carrier;
 - the test antenna and the entry filter shall be suitable for the measured frequency band, and replaced by other each time it will be necessary;
 - the spectrum analyser shall be tuned to the measurement bandwidth to analyse;
 - the resolution bandwidth of the spectrum analyser shall be set to a suitable value to correctly perform the measurement, and the average function shall be activated. The video bandwidth shall be set to the same value as the resolution bandwidth.

- b) The test antenna shall be raised or lowered through the specified height range to look for the maximum received signal on the spectrum analyser (this step may not be necessary if the test site is an anechoic chamber or an indoor test site).
 - The EIRP shall be averaged until the variance over the measured bandwidth is less than 1 dB. The averaged value shall be recorded.
- c) The procedure shall be repeated from a) to b) with the other measurement bandwidths to cover the whole frequency range to be analysed.
- d) In the case where the test site has been calibrated before, the absolute measurement is sufficient to determine the actual value of EIRP of the radiated emissions. The precise knowledge of distance between the UE and the test antenna, the characteristics of the test antenna and the input filter allow the determination of the EIRP radiated by the UE.
- e) In the case where the test site cannot be calibrated, a relative measurement can be done according to the following procedure:
 - using measurement arrangement No.2 of figure 3, a substitution antenna shall replace the UE in the same position where was the UE antenna. It shall be connected to the signal generator.
- f) The signal generator shall be tuned to the centre frequency of each measurement bandwidth. The substitution antenna shall be suitable for this frequency.
 - The spectrum analyser shall be tuned to the measurement bandwidth to analyse and put in the same conditions as for the measurement with the UE with the average function activated.
 - The level of the signal generator shall be adjusted to give the same signal level on the spectrum analyser as in b) when averaged until the variance over the measured bandwidth is less than 1 dB. The output level of the signal generator shall be recorded.
 - This value, after corrections due to the gain of the substitution antenna and the cable loss between the signal generator and the substitution antenna, is the radiated emission level of the UE.
- g) The f) procedure shall be repeated with the other measurement bandwidths to cover the whole frequency range to be analysed.
- h) a) to g) shall be repeated with test antennas of the opposite polarization for the unwanted emission measurements.

5.3.1.4.5.6.2 Measurement procedure for average radiated emissions of the cabinet

This method of measurement applies to transmitters having an antenna socket and has to be performed in addition to conducted measurements of the UE for unwanted emissions.

Measurement arrangement No.3 of figure 4 shall be used for measurement of radiated emissions of the cabinet.

The procedure is an average measurement as in clause 5.3.1.4.5.6.1.

The same method as in clause 5.3.1.4.5.6.1 shall be applied with the exception that measurement arrangement No.3 replaces measurement arrangement No.1 (measurement arrangement No.2 remains the same for the relative measurement).

5.3.1.4.6 Procedures for measurement of conducted emissions

5.3.1.4.6.1 General

Clause 5.3.1.4.6 contains the procedure for conducted emission measurements.

It is recognized that for some parameters, alternative test methods may exist. It is the responsibility of the test laboratory to ensure that any alternative test method used yields results identical to those described in the present document.

5.3.1.4.6.2 Test site

There are no specific requirements for the test site for conducted measurements except that they shall be performed in such a way as to ensure that there is no interference to operational satellite and terrestrial systems.

5.3.1.4.6.3 Test set-up

Measurement arrangement of figure 5 shall be used.

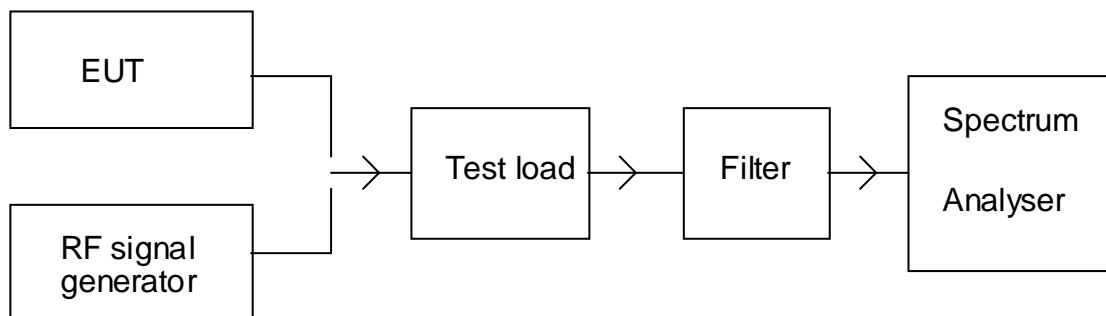


Figure 5: Measurement arrangement for conducted emissions

The antenna port of the UE shall be connected to a spectrum analyser through a test load and eventually an appropriate filter to avoid overloading of the spectrum analyser.

Precautions may be required to ensure that the test load does not generate or that the filter does not attenuate, the harmonics of the carrier. The entry filter shall be suitable for the measured frequency band, and replaced by another each time it will be necessary.

The spectrum analyser noise floor shall be at least 6 dB below the minimum value to be measured.

5.3.1.4.6.4 Measurement procedure for conducted emissions (peak)

- a) For each measurement bandwidth, the following actions shall be performed:
 - The spectrum analyser shall be tuned to the measurement bandwidth to analyse.
 - The resolution bandwidth of the spectrum analyser shall be set to a suitable value to correctly perform the measurement, and the peak hold function shall be activated. The video bandwidth shall be set to at least 3 times the resolution bandwidth.
- b) The peak power detected value of each discrete signal having a level equal or greater than 6 dB below the specified limit shall be recorded.
 - In the case of EIRP spectral density measurement within the nominated bandwidth, the peak power density value within the measurement bandwidth shall be recorded.
- c) The procedure shall be repeated from a) to b) with the other measurement bandwidths to cover all the spectrum band(s) which are required to be measured.
- d) The actual value of EIRP of the equivalent radiated emissions in each measurement bandwidth shall be derived by adding either the UE maximum antenna gain or the declared gain at the spurious emission frequency to the power value read from the spectrum analyser.

5.3.1.4.6.5 Measurement procedure for conducted emissions (average)

- a) For each measurement bandwidth, the following actions shall be performed:
 - The resolution bandwidth of the spectrum analyser shall be set to a suitable value to correctly perform the measurement, and the average function shall be activated. The video bandwidth shall be set to the same value as the resolution bandwidth.
 - The measurement time should be such that the difference of the measured levels, averaged over subsequent measurement samples, is less than 1 dB, or a measurement time of 100 ms may be used if the measured values comply with the applicable limits.
- b) The averaged power density value within the measured bandwidth shall be recorded.
- c) The procedure shall be repeated from a) to b) with the other measurement bandwidths to cover the whole frequency range to be analysed.
- d) The actual value of EIRP of the radiated emissions in each measurement bandwidth shall be derived by adding the UE maximum antenna gain measured at the normal operating frequency to the power spectral density value read from the spectrum analyser.

5.3.2 Unwanted emissions outside the band 1 980 MHz to 2 010 MHz (carrier-on state)

5.3.2.1 Method of test

NOTE: The tests defined in this clause refer to tables 3a and 3b. For frequencies which are less than 2,5 MHz away from the UE centre carrier frequency, table 3b refers to tables 4a and 4b and in these cases any references to table 3b should be understood to refer to table 4a or table 4b as appropriate (refer to clause 5.3.1.1).

This test shall be carried out for the minimum and for the maximum UE transmit frequencies for which the UE is designed to operate, as specified by the applicant.

If the UE supports multiple transmission formats, each of the relevant transmission formats shall be tested at each frequency.

The transmit frequencies and the transmission formats used for the test shall be entered in the test report.

The environmental test conditions are given in clause 5.1.

For each test, the UE shall be set to transmit (carrier-on state) on one of the specified transmitting frequencies to be tested and in one of the specified transmission formats to be tested and shall be set to transmit at its maximum power for that transmit frequency and transmission format, by means of the STE or by another test facility provided by the applicant.

If there is a handover function in the UE (to allow change of frequency channel during a call), this function shall be disabled.

The transmitted carrier shall be modulated by a test signal as specified in clause 5.3.1.4.2.2.

In the test equipment, the spectrum analyser noise floor shall be at least 6 dB below the appropriate limits given in table 3a or table 3b as appropriate.

The measurements are performed with the radiated or with the conducted method according to the cases defined in clause 5.3.1.4.4.

For measurements of radiated unwanted emissions, clause 5.3.1.4.5 applies.

For measurements of conducted unwanted emissions, clause 5.3.1.4.6 applies.

5.3.2.2 Peak measurement

In the case of peak measurement, the spectrum analyser shall be set in sweep mode and shall be operated under the following conditions:

- frequency sweep: as required for frequency range to be assessed;
- resolution bandwidth: measurement bandwidth specified in table 3a or table 3b as appropriate;
- video bandwidth: at least three times the measurement bandwidth;
- averaging: no;
- peak hold: yes.

The sweep time shall be the shortest possible time consistent with proper calibration and ease of operation.

The spectrum analyser shall be stepped over the frequency ranges specified in tables 3a and 3b for peak measurement.

The results obtained shall be compared to the limits in clause 4.2.2.2 in order to prove compliance with the requirement.

5.3.2.3 Average measurement

In the case of average measurement, the spectrum analyser shall be set in sweep mode and shall be operated under the following conditions:

- frequency sweep: as required for frequency range to be assessed;
- resolution bandwidth: measurement bandwidth specified in table 3a or table 3b as appropriate;
- video bandwidth: equal to the measurement bandwidth;
- averaging: yes;
- peak hold: no.

The measurement time shall be such that the difference of the measured levels, averaged over subsequent measurement samples, is less than 1 dB. The average measurement should use Root Mean Square (RMS) detection.

For a UE operating in a non-continuous carrier mode, the measurement shall be performed over the active part of the transmitted bursts. The total sample time used for measurement shall be not less than 40 % of the duration of the active part of the transmitted burst. The measurement shall be made over the random part of the burst, excluding any preambles or synchronization sequences.

The spectrum analyser shall be stepped over the frequency ranges specified in tables 3a and 3b for average measurement.

The results obtained shall be compared to the limits in clause 4.2.2.2 in order to prove compliance with the requirement.

5.3.2.4 Test requirements

For measurements of radiated unwanted emissions of the UE, the measured values shall in no case exceed the limits given in tables 3a and 3b.

For measurements of conducted unwanted emissions of the UE, the measured values plus the maximum antenna gain shall in no case exceed the limits given in tables 3a and 3b.

5.3.3 Unwanted emissions within the band 1 980 MHz to 2 010 MHz (carrier-on state)

5.3.3.1 Method of test

NOTE: The tests defined in this clause refer to table 4a or table 4b as appropriate (refer to clause 5.3.1.1). The tests in this clause are restricted to the band 1 980 MHz to 2 010 MHz: the other use of tables 4a and 4b for testing frequencies outside of this band is defined in clause 5.3.2 and is not repeated here.

This test shall be carried out for the minimum and for the maximum UE transmit frequency for which the UE is designed to operate, as specified by the applicant.

If the UE supports multiple transmission formats, each of the relevant transmission formats shall be tested at each frequency.

The transmit frequencies and the transmission formats used for the test shall be entered in the test report.

The environmental test conditions are given in clause 5.1.

For each test, the UE shall be set to transmit (carrier-on state) on one of the specified transmitting frequencies to be tested and in one of the specified transmission formats to be tested and shall be set to transmit at its maximum power for that transmit frequency and transmission format, by means of the STE or by another test facility provided by the applicant.

If there is a handover function in the UE (to allow change of frequency channel during a call), this function shall be disabled.

The transmitted carrier shall be modulated by a test signal at maximum rate as specified in clause 5.3.1.4.2.2.

In the test equipment, the spectrum analyser noise floor shall be at least 6 dB below the appropriate limits given in table 4a or 4b as appropriate.

The measurements are performed with the radiated or with the conducted method according to the cases defined in clause 5.3.1.4.4.

For measurements of radiated unwanted emissions, clause 5.3.1.4.5 applies.

For measurements of conducted unwanted emissions, clause 5.3.1.4.6 applies.

5.3.3.2 Measurement method

The spectrum analyser shall be set in sweep mode and shall be operated under the following conditions:

- frequency sweep: as required for frequency range to be assessed;
- resolution bandwidth: measurement bandwidth specified in table 4a or 4b as appropriate;
- video bandwidth: equal to the measurement bandwidth;
- averaging: yes;
- peak hold: no.

The measurement time should be such that the difference of the measured levels, averaged over subsequent measurement samples, is less than 1 dB.

For a UE operating in a non-continuous carrier mode, the measurement shall be performed over the active part of the transmitted bursts. The total sample time used for measurement shall be not less than 40 % of the duration of the active part of the transmitted burst. The measurement shall be made over the random part of the burst, excluding any preambles or synchronization sequences.

For each of the transmit frequencies to be used for the test, measurements shall be made over the frequency ranges from 1 980 MHz to $(f_c - B_n / 2)$ and from $(f_c + B_n / 2)$ to 2 010 MHz, $(f_c - B_n / 2)$ being the lower boundary frequency of the nominated bandwidth for the transmit frequency being tested, and $(f_c + B_n / 2)$ being the upper boundary frequency of the nominated bandwidth for the transmit frequency being tested.

The results obtained shall be compared to the limits in clause 4.2.3.2 in order to prove compliance with the requirement.

5.3.3.3 Test requirements

For measurements of radiated unwanted emissions of the UE, the measured values shall in no case exceed the limits given in table 4a or 4b as appropriate over the frequency range 1 980 MHz to 2 010 MHz.

For measurements of conducted unwanted emissions, the measured values plus the maximum antenna gain, shall in no case exceed the limits given in table 4a or 4b as appropriate over the frequency range 1 980 MHz to 2 010 MHz.

5.3.4 Unwanted emissions in carrier-off state

5.3.4.1 Method of test

The UE shall be switched-on and set in the carrier-off state.

If there is a periodic automatic transmission of bursts (e.g. for location updating), the STE shall provide a means to inhibit it, or to trigger the measurement in order to analyse only the non-transmitting periods.

The environmental test conditions are given in clause 5.1.

In the test equipment, the spectrum analyser noise floor shall be at least 6 dB below the appropriate limits given in table 5.

The measurements are performed with the radiated or with the conducted method according to the cases defined in clause 5.3.1.4.4.

For measurements of radiated unwanted emissions, clause 5.3.1.4.5 applies.

For measurements of conducted unwanted emissions, clause 5.3.1.4.6 applies.

5.3.4.2 Measurement method

The spectrum analyser shall be set in sweep mode and shall be operated under the following conditions:

- frequency sweep: as required for frequency range to be assessed;
- resolution bandwidth: measurement bandwidth specified in table 5;
- video bandwidth: at least 3 times the measurement bandwidth;
- averaging: no;
- peak hold: yes.

The sweep time shall be the shortest possible time consistent with proper calibration and ease of operation.

The spectrum analyser shall be stepped over the frequency ranges specified.

The results obtained shall be compared to the limits in clause 4.2.4.2 in order to prove compliance with the requirement.

5.3.4.3 Test requirements

For measurements of radiated unwanted emissions of the UE, the measured values shall in no case exceed the limits given in table 5.

For measurements of conducted unwanted emissions of the UE, the measured values plus the maximum antenna gain shall in no case exceed the limits given in table 5.

5.3.5 UE Control and Monitoring Functions (CMF)

5.3.5.1 Method of test

The environmental test conditions are given in clause 5.1.

In the test equipment, the spectrum analyser noise floor shall be at least 6 dB below the appropriate limits given in table 5 and shall have the following characteristics:

- the RF bandwidth shall exceed the total operating transmit frequency range of the UE for operation with an applicable part;
- the response time of the power measuring equipment shall be such that the measured power has reached within 1 dB of its steady state value within 100 μ s of a CW signal being applied;
- it shall record the maximum power measured.

NOTE: The equipment may include a video low pass filter to minimize its response to transients or Gaussian noise peaks.

The measurements are performed with the radiated or with the conducted method according to the cases defined in clause 5.3.1.4.4.

For measurements of radiated unwanted emissions, clause 5.3.1.4.5 applies.

For measurements of conducted unwanted emissions, clause 5.3.1.4.6 applies.

5.3.5.2 Testing of output power in absence of a valid network

5.3.5.2.1 Test procedure

The UE shall be placed in an environment where the receipt of all network control channel(s) is prevented.

- a) At the start of the test, the UE shall be switched off.
- b) The UE shall be switched on for a period of approximately fifteen minutes, and then switched off.
- c) The UE shall remain switched off for a period of at least thirty seconds, and shall then be switched on for a period of approximately one minute.

The test shall be repeated four times.

5.3.5.2.2 Measurement method

The maximum power emitted from the UE throughout the duration of the test shall be recorded.

The results obtained shall be compared to the limits in clause 4.2.5.1.2 in order to prove compliance.

5.3.5.3 Testing of output power in loss of signal

5.3.5.3.1 Test procedure

The UE shall be set to transmit (carrier on state) on one of the specified transmitting frequencies to be tested and in one of the specified transmission formats to be tested and shall be set to transmit at its maximum power for any of the declared transmit frequency and transmission format, by means of the STE or by another test facility provided by the applicant.

- 1) The STE removes all of the downlink signals.
- 2) The STE waits 5 seconds and then verifies that the UE transmitter has been switched off.
- 3) The STE monitors the UE transmitted power for a further 30 seconds and verifies that the UE transmitter is not switched on during this time.

- 4) The test shall be repeated four times.

5.3.5.3.2 Measurement method

The maximum power emitted from the UE throughout the duration of the test shall be recorded.

The results obtained shall be compared to the limits in clause 4.2.5.2.2 in order to prove compliance.

Annex A (normative): HS Requirements and conformance Test specifications Table (HS-RTT)

The HS Requirements and conformance Test specifications Table (HS-RTT) in table A.1 serves a number of purposes, as follows:

- it provides a statement of all the requirements in words and by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it provides a statement of all the test procedures corresponding to those requirements by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);
- it qualifies each requirement to be either:
 - Unconditional: meaning that the requirement applies in all circumstances; or
 - Conditional: meaning that the requirement is dependant on the manufacturer having chosen to support optional functionality defined within the schedule.
- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;
- it qualifies each test procedure to be either:
 - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;
 - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted.

Table A.1: HS Requirements and conformance Test specifications Table (HS-RTT)

Harmonized Standard EN 302 574-3 The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&TTE Directive						
Requirement			Requirement Conditionality		Test Specification	
No	Description	Reference: Clause No	U/C	Condition	E/O	Reference: Clause No
1	Unwanted emissions outside the band 1 980 MHz to 2 010 MHz	4.2.2	U		O	5.3.2
2	Unwanted emissions within the band 1 980 MHz to 2 010 MHz	4.2.3	U		O	5.3.3
3	Unwanted emissions in carrier off state	4.2.4	U		O	5.3.4
4	UE Control and Monitoring Functions (CMF)	4.2.5	U		O	5.3.5

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement or its test specification.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C	Indicates whether the requirement is to be <i>unconditionally</i> applicable (U) or is <i>conditional</i> upon the manufacturers claimed functionality of the equipment (C).
Condition	Explains the conditions when the requirement shall or shall not be applicable for a technical requirement which is classified "conditional".

Test Specification:

E/O	Indicates whether the test specification forms part of the Essential Radio Test Suite (E) or whether it is one of the Other Test Suite (O).
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NOTE: All tests whether "E" or "O" are relevant to the requirements. Rows designated "E" collectively make up the Essential Radio Test Suite; those designated "O" make up the Other Test Suite; for those designated "X" there is no test specified corresponding to the requirement. The completion of all tests classified "E" as specified with satisfactory outcomes is a necessary condition for a presumption of conformity. Compliance with requirements associated with tests classified "O" or "X" is a necessary condition for presumption of conformity, although conformance with the requirement may be claimed by an equivalent test or by manufacturer's assertion supported by appropriate entries in the technical construction file.

Clause Number	Identification of clause(s) defining the test specification in the present document unless another document is referenced explicitly. Where no test is specified (that is, where the previous field is "X") this field remains blank.
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Annex B (informative): The EN title in the official languages

The enlargement of the European Union (EU) resulted in a requirement from the EU for a larger number of languages for the translation of the titles of Harmonized Standards and mandated ENs that are to be listed in the Official Journal to support the implementation of this legislation.

For this reason the title translation concerning the present document can be consulted via the [e-approval](#) application.

Annex C (informative): Environmental profile specification

C.1 Introduction

This informative annex specifies the environmental profile of the UE.

The following environmental conditions may be declared by the supplier:

- barometric pressure: minimum and maximum;
- temperature: minimum and maximum;
- relative humidity: minimum and maximum;
- power supply: lower and upper voltage limit.

When operating outside the boundary limits of the declared operational environmental profile the equipment should not make ineffective use of the radio frequency spectrum so as to cause harmful interference.

C.2 Temperature

The UE should fulfil all the requirements in the full temperature range as given in table C.1.

Table C.1: Temperatures

Range	Conditions
+15 °C to +35 °C	For normal conditions (with relative humidity of 25 % to 75 %)
-10 °C to +55 °C	For extreme conditions (see IEC 60068-2-1 [5] and IEC 60068-2-2 [6])

The low and high extreme temperature conditions are denoted as TL (temperature low, 10 °C) and TH (temperature high, +55 °C).

C.3 Voltage

The UE should fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The supplier should declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage should not be higher, and the higher extreme voltage should not be lower than that specified in table C.2.

Table C.2: Power sources

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 × nominal	1,1 × nominal	nominal
Regulated lead acid battery	0,9 × nominal	1,3 × nominal	1,1 × nominal
Non regulated batteries: Leclanché/lithium	0,85 × nominal	nominal	nominal
Mercury/nickel and cadmium	0,90 × nominal	nominal	nominal

C.4 Test environment

Where a normal environment is required then the normal conditions shown in clauses C.2 and C.3 should be applied.

Where an extreme environment is required then the various combinations of extreme temperatures together with the extreme voltages shown in clauses C.2 and C.3 should be applied. The combinations are:

- low extreme temperature/low extreme voltage (TL/VL);
- low extreme temperature/high extreme voltage (TL/VH);
- high extreme temperature/low extreme voltage (TH/VL);
- high extreme temperature/high extreme voltage (TH/VH).

Annex D (informative): Bibliography

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- ITU-R Recommendation SM.329-10 (02/2003): "Unwanted emissions in the spurious domain".
- ITU-R Recommendation SM.1539-1 (11/2002): "Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329".
- ETSI EN 301 681: "Satellite Earth Stations and Systems (SES); Harmonized EN for Mobile Earth Stations (MESs) of Geostationary mobile satellite systems, including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) in the 1,5/1,6 GHz bands under the Mobile Satellite Service (MSS) covering essential requirements under article 3.2 of the R&TTE Directive".

History

Document history		
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