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Harmonized European Standard (Telecommunications series)

**Broadband Data Transmission Systems operating in the
2 500 MHz to 2 690 MHz frequency band;
Part 2: TDD User Equipment Stations;
Harmonized EN covering the essential requirements
of article 3.2 of the R&TTE Directive**



Reference

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Broadband Radio Access Networks (BRAN), and is now submitted for the Vote phase of the ETSI standards Two-step Approval Procedure.

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.5] (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 [i.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").

Technical specifications relevant to Directive 1999/5/EC [i.1] are given in annex A.

The present document is part 2 of a multi-part deliverable covering the Base Stations (BS) and User Equipment (UE) for Broadband Data Transmission Systems in the 2 500 MHz to 2 690 MHz frequency band, as identified below:

- Part 1: "TDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- Part 2: "TDD User Equipment Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".**
- Part 3: "FDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".
- Part 4: "FDD User Equipment Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive".

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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. The modular structure is shown in EG 201 399 [i.2].

1 Scope

The present document is applicable to TDD User Equipment radio equipment for mobile/nomadic Broadband Data Transmitting Systems operating in the 2 500 MHz to 2 690 MHz frequency band.

TDD radio equipment types operate in the frequency band 2 500 MHz to 2 690 MHz according to national frequency plans designed on the basic assumption that the assigned blocks are in multiples of 5 MHz (centre frequency). The present document covers the requirements for 5 MHz and 10 MHz channelized systems.

The document is equally applicable to systems utilizing integral or non integral antennas, noting that for equipment with an integral antenna a temporary antenna connector is needed to perform testing.

The present document is intended to cover the provisions of Directive 1999/5/EC [i.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".

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 may apply to equipment within the scope of the present document. The present document does not address those IMT-2000 systems which are considered in EN 301 908 [i.3].

NOTE: 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 a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
 - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
 - for informative references.

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

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

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 indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

- [1] ETSI EN 300 019 (all parts): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [2] Void.

- [3] ETSI TR 100 028 (parts 1 and 2) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics" .
- [4] CEPT/ERC Recommendation 74-01E (2005): "Unwanted Emissions in the Spurious Domain".

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.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).
- [i.2] ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".
- [i.3] ETSI EN 301 908 (all parts): " Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks".
- [i.4] ETSI TR 102 215 (V1.3.1): "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.5] 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.

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 [i.1] and the following apply:

burst: period during which radio waves are intentionally transmitted, preceded and succeeded by periods during which no intentional transmission is made

environmental profile: declared range of environmental conditions under which equipment within the scope of the present document is required to be compliant

Eval_BW 1: test condition where the pass band of a rectangular filter with a bandwidth of 4,75 MHz for 5 MHz equipment and 9,5 MHz for 10 MHz equipment is used for measurement centred on an operating channel or a victim channel

Eval_BW 2: measurement for Eval_BW 2 on the operating channel is performed using a rectangular filter with a 4,75 MHz or 9,5 MHz bandwidth and the measurement on the victim channel is performed using an RRC filter with a 3,84 MHz or 7,68 MHz bandwidth (respectively) both with roll-off factor of 0,22 centred on the 1st or 2nd adjacent victim channel

Eval_BW 3: measurement for Eval_BW 3 on the operating channel is performed using a rectangular filter with a 9,5 MHz bandwidth and the measurement on the victim channel is performed using a RRC filter with a 3,84 MHz bandwidth (with roll-off factor of 0,22) centred on the corresponding adjacent victim channel

integral antenna: antenna which is declared to be part of the radio equipment by the supplier

NOTE: Even when equipment with an integral antenna is concerned, it might still be possible to separate the antenna from the equipment using a special tool. In such cases the assessment of the radio equipment and of the antenna against requirements of this multi-part deliverable may be done separately.

maximum output power: mean power level per carrier of the base station or mobile station measured at the antenna connector in a specified reference condition

mean power: when applied to a modulated signal, this is the power (transmitted or received) in a bandwidth

NOTE: The term "mean" here is used to exclude the amplitude fluctuation related to those theoretical variations present in signal for example due to amplitude modulation, pulse shaping, pre-equalization, etc. Time averaging should be applied to estimate mean power with the affect of the theoretical variations. The duty cycle corresponding to burst activity within a frame should be also incorporated for "mean" power estimation.

nominal maximum output power: maximum nominal mean power level measured over total allocated channel bandwidth of the user equipment available at the antenna connector declared by the manufacturer; for equipment implementing dynamic change of modulation format, it is intended as the maximum nominal mean power associated to the modulation format delivering the highest power

operating nominal RF channel width: nominal amount of spectrum used by a single device operating on an identified centre frequency

3.2 Symbols

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

A_{BS}	Base Station Interface A
A_{MS}	Mobile Station Interface A
A_{UUT}	Unit Under Test Interface A
dB	decibel
dBc	decibel relative to P_{nom} carrier power measured in Eval_BW 1
dBm	decibel relative to 1 milliwatt
f	Frequency (of the assigned channel frequency of the wanted signal)
F_c	centre frequency of the assigned channel
GHz	GigaHertz
M_{BS}	Base Station Interface M
MHz	MegaHertz
M_{MS}	Mobile Station Interface M
Nth	Receiver thermal noise
P_{nom}	declared nominal maximum output Power
P_{SENS5}	sensitivity levels at $BER \leq 10^{-6}$, for a 5 MHz channel, corresponding to the most robust modulation and coding rate supported by the technology
P_{SENS10}	sensitivity levels at $BER \leq 10^{-6}$, for a 10 MHz channel, corresponding to the most robust modulation and coding rate supported by the technology

3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AWGN	Additive White Gaussian Noise
BER	Bit Error Ratio
BS	Base Station
BSE	Base Station Emulator
BW	BandWidth
CW	Carrier Wave
DL	DownLink
FDD	Frequency Division Duplexing
PER	Packet Error Ratio
R&TTE	Radio equipment and Telecommunications Terminal Equipment
RF	Radio Frequency

TDD	Time Division Duplexing
TPC	Transmit Power Control
UE	User Equipment
UUT	Unit Under Test

4 Essential requirements specification

With reference to article 3.2 of Directive 1999/5/EC [i.1] the phenomena in this clause have been identified as relevant to the essential requirements.

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 required operational environmental profile.

4.2 Conformance requirements

4.2.1 Introduction

To meet the essential requirement under article 3.2 of the R&TTE Directive [i.1] six essential parameters have been identified. Table 1 provides a cross reference between these six essential parameters and the corresponding eleven technical requirements for equipment within the scope of the present document. To fulfil an essential parameter the compliance with all the corresponding technical requirements in table 1 must be verified.

Table 1: Cross references

Essential parameter	Corresponding technical requirements
Spectrum emission mask	4.2.2 Transmitter Spectrum emission mask
	4.2.3 Transmitter adjacent channel leakage power ratio
Conducted spurious emissions from the transmitter antenna connector	4.2.4 Transmitter spurious emissions
	4.2.5 Nominal maximum output power and tolerance
Output power	4.2.6 Transmitter power control
	4.2.7 Control and monitoring functions
Control and monitoring functions	4.2.8 Receiver spurious emissions
Conducted spurious emissions from the receiver antenna connector	4.2.9 Receiver adjacent channel selectivity (ACS)
Impact of interference on receiver performance	4.2.10 Receiver blocking characteristics
	4.2.11 Receiver intermodulation characteristics
	4.2.12 Receiver response rejection

4.2.2 Spectrum emission mask

4.2.2.1 Definition

Spectrum emission mask defines an out of band emission requirement for the transmitter. These out of band emissions are unwanted emissions outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions.

4.2.2.2 Limits

A user equipment device transmitting on a single RF carrier configured in accordance with the manufacturer's specification shall meet the requirement. Emissions shall not exceed the maximum level specified in tables 2 and 3 for the appropriate UE maximum output power and nominal channel bandwidths of 5 MHz and 10 MHz.

4.2.2.2.1 Spectrum emission mask for 5 MHz bandwidth

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth but relative to dBc centred in the 5 MHz channel.

The power of any UE emission shall not exceed the levels specified in table 2.

Table 2: Spectrum emission mask requirement

Frequency offset Δf	Minimum requirement	Measurement bandwidth
0 MHz to 1 MHz	$\left\{ -33,5 - 15 \times \left(\frac{\Delta f}{\text{MHz}} \right) \right\} \text{dBc}$	30 kHz
1 MHz to 5 MHz	$\left\{ -33,5 - 1 \times \left(\frac{\Delta f}{\text{MHz}} - 1 \right) \right\} \text{dBc}$	1 MHz
5 MHz to 6 MHz	$\left\{ -37,5 - 10 \times \left(\frac{\Delta f}{\text{MHz}} - 5 \right) \right\} \text{dBc}$	1 MHz
6 MHz to 10 MHz	-47,5 dBc	1 MHz
NOTE 1: Δf is the separation between the edge of 5 MHz channel allocation and the centre of the measuring filter. NOTE 2: The first measurement position with a 30 kHz filter is at Δf equals to 0,015 MHz; the last is at Δf equals to 0,985 MHz. NOTE 3: The first measurement position with a 1 MHz filter is at Δf equals to 1,5 MHz; the last is at Δf equals to 9,5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.		

4.2.2.2.2 Spectrum emission mask for 10 MHz bandwidth

The out-of-channel emission is specified as a power level relative to dBc centred in the 10 MHz channel.

The power of any UE emission shall not exceed the levels specified in table 3.

Table 3: Spectrum emission mask requirement

Frequency offset Δf	Minimum requirement	Measurement bandwidth
0 MHz to 2 MHz	$\left\{ -36,5 - 7,5 \times \left(\frac{\Delta f}{\text{MHz}} \right) \right\} \text{dBc}$	30 kHz
2,0 MHz to 10,0 MHz	$\left\{ -36,5 - 0,5 \times \left(\frac{\Delta f}{\text{MHz}} - 2 \right) \right\} \text{dBc}$	1 MHz
10,0 MHz to 12,0 MHz	$\left\{ -40,5 - 5 \times \left(\frac{\Delta f}{\text{MHz}} - 10 \right) \right\} \text{dBc}$	1 MHz
12,0 MHz to 20,0 MHz	-50,5 dBc	1 MHz
NOTE 1: Δf is the separation between the edge of 10 MHz channel allocation and the centre of the measuring filter. NOTE 2: The first measurement position with a 30 kHz filter is at Δf equals to 0,015 MHz; the last is at Δf equals to 1,985 MHz. NOTE 3: The first measurement position with a 1 MHz filter is at Δf equals to 2,5 MHz; the last is at Δf equals to 19,5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.		

4.2.2.3 Conformance

Conformance tests described in clause 5.4.1 shall be carried out.

4.2.3 Transmitter Adjacent Channel Leakage power Ratio (ACLR)

4.2.3.1 Definition

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the mean power measured through a filter pass band centred on the assigned channel frequency to the mean power measured through a filter pass band centred on a first or second adjacent channel. The first adjacent and second adjacent channel centre offsets relative to the assigned channel centre frequency are 5 MHz and 10 MHz when the nominal occupied channel bandwidth is 5 MHz. These offsets are 10 MHz and 20 MHz respectively when the nominal occupied channel bandwidth is 10 MHz. The filter pass band, response and nominal bandwidth are set according to Eval_BW 1, Eval_BW 2 or Eval_BW 3.

4.2.3.2 Limits

4.2.3.2.1 ACLR requirements for 5 MHz bandwidth

For 5 MHz BW the ACLR shall be equal to or greater than the limits specified in table 4.

NOTE: This assumes that the adjacent channel mean power is greater than -55 dBm within the relevant evaluation BW.

Table 4: User equipment ACLR limits for 5 MHz channel BW

Adjacent channel	ACLR limit relative to assigned channel frequency (dB)	
	ACLR limit for Eval_BW 1	ACLR limit for Eval_BW 2
$F_c \pm 5,0$ MHz	29,2	32,2
$F_c \pm 10,0$ MHz	43,2	42,2

4.2.3.2.2 ACLR requirements for 10 MHz bandwidth

For 10 MHz BW the ACLR shall be equal to or greater than the limits specified in table 5.

NOTE: This assumes that the adjacent channel mean power is greater than -58 dBm within the relevant evaluation BW.

Table 5: User Equipment ACLR limits for 10 MHz Channel BW

Adjacent channel	ACLR limit relative to assigned channel frequency (dB)		
	ACLR limit for Eval_BW 1	ACLR limit for Eval_BW 2	ACLR limit for Eval_BW 3
$F_c \pm 7,5$ MHz	n/a	n/a	32,2
$F_c \pm 10,0$ MHz	29,2	32,2	n/a
$F_c \pm 20,0$ MHz	43,2	42,2	n/a
n/a:	not applicable.		

4.2.3.3 Conformance

Conformance tests described in clause 5.4.2 shall be carried out.

4.2.4 Transmitter spurious emissions

4.2.4.1 Definition

Transmitter spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This conducted measurement is measured at the RF output port.

4.2.4.2 Limits

The limits of spurious emissions (or more precisely, according latest ITU-R definitions, unwanted emissions in the spurious domain), shall conform to CEPT/ERC Recommendation 74-01 [4].

The following requirements in tables 6 and 7 are only applicable for frequencies, which are greater than 250 % of the channel bandwidth (that is 12,5 MHz for the 5 MHz channel bandwidth and 25 MHz for the 10 MHz channel bandwidth) away from the carrier centre frequency. In the following f_c is the centre frequency of transmit signal and f is the frequency of spurious emission. BW is the channel bandwidth of choice, i.e. 5 MHz or 10 MHz.

Table 6: Transmitter spurious emissions

Frequency band	Measurement bandwidth	Minimum requirements
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36 dBm
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36 dBm
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	-36 dBm
$1 \text{ GHz} < f < 12,75 \text{ GHz}$	30 kHz If $2,5 \times \text{BW} \leq f_c - f < 10 \times \text{BW}$	-30 dBm
	300 kHz If $10 \times \text{BW} \leq f_c - f < 12 \times \text{BW}$	-30 dBm
	1 MHz If $12 \times \text{BW} \leq f_c - f $	-30 dBm

Table 7: Additional spurious emissions requirements applicable for 5 MHz and 10 MHz

Frequency band	Measurement bandwidth	Minimum requirement
$2\ 620 \text{ MHz} \leq f \leq 2\ 690 \text{ MHz}$	1 MHz	-40 dBm
NOTE: As exceptions, up to five measurements with a level up to the applicable requirements defined in table 6 are permitted for each channel used in the measurement.		

4.2.4.3 Conformance

Conformance tests described in clause 5.4.3 shall be carried out.

4.2.5 Nominal maximum output power and tolerance

4.2.5.1 Definition

The nominal maximum output power (P_{nom}) is the nominal mean power level measured over total allocated channel bandwidth available at the antenna connector.

The tolerance of the output power is the difference between the declared P_{nom} and the actual maximum output power, with the corresponding tolerance limits.

4.2.5.2 Limits

The P_{nom} shall not exceed the 26 dBm limit.

The maximum tolerance for maximum output power is ± 2 dB.

Table 8: Void

4.2.5.3 Requirement

The manufacturer shall declare the (P_{nom}) of the user equipment.

4.2.5.4 Conformance

Conformance tests described in clause 5.4.4 shall be carried out.

4.2.6 Transmitter power control

4.2.6.1 Definition

Transmit Power Control (TPC) is a mechanism that shall be used by the equipment to ensure a mitigation factor on the aggregate power from a large number of devices to improve the spectrum sharing conditions.

4.2.6.2 Limits

The minimum TPC range shall be 15 dB.

4.2.6.3 Conformance

Conformance tests described in clause 5.4.4 shall be carried out.

4.2.7 Control and monitoring functions

4.2.7.1 Definition

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

This test is applicable to radio communications equipment.

This test shall be performed on the radio communications equipment.

4.2.7.2 Limits

The maximum measured power during the duration of the test shall not exceed -30 dBm.

4.2.7.3 Conformance

Conformance tests described in clause 5.4.5 shall be carried out.

4.2.8 Receiver spurious emissions

4.2.8.1 Definition

The receiver spurious emissions are the emissions generated or amplified in a receiver that appear at the UE antenna connector.

4.2.8.2 Limits

The limits of spurious emissions (or more precisely, according latest ITU-R definitions, unwanted emissions in the spurious domain), shall conform to CEPT/ERC Recommendation 74-01 [4].

Tables 9 and 10 list the receiver spurious emission requirements where f_c is the center frequency of transmit signal and f is the frequency of spurious emission. BW is the channel bandwidth of choice, i.e. 5 MHz or 10 MHz.

Table 9: Receiver spurious emissions

Frequency band	Measurement bandwidth	Minimum requirements
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-57 dBm
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-57 dBm
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	-57 dBm
$1 \text{ GHz} < f < 12,75 \text{ GHz}$	30 kHz If $2,5 \times \text{BW} \leq f_c - f < 10 \times \text{BW}$	-47 dBm
	300 kHz If $10 \times \text{BW} \leq f_c - f < 12 \times \text{BW}$	-47 dBm
	1 MHz If $12 \times \text{BW} \leq f_c - f $	-47 dBm

Table 10: Additional receiver spurious emission requirements for 5 MHz and 10 MHz

Frequency band	Measurement bandwidth	Maximum level
$2 \text{ 500 MHz} \leq f \leq 2 \text{ 690 MHz}$	5 MHz	-59 dBm

4.2.8.3 Conformance

Conformance tests described in clause 5.4.6 shall be carried out.

4.2.9 Receiver Adjacent Channel Selectivity (ACS)

4.2.9.1 Definition

The receiver adjacent and 2nd Adjacent Channel Selectivity (ACS) is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the interferer power level (in dB) relative to thermal noise (N_{th}).

To reference the receiver adjacent and 2nd adjacent channel selectivity values properly, a sensitivity level is defined as the signal level for Bit Error Ratio (BER) $\leq 10^{-6}$ (or equivalent PER) performance for AWGN channel, over the channel bandwidth (5 MHz or 10 MHz), corresponding to the most robust modulation and coding rate supported by the technology.

N_{th} is the receiver thermal noise of the equipment as declared by the manufacturer and is equal to $kTBwF$ with Bw is the bandwidth of the equipment and F is the receiver noise figure.

4.2.9.2 Limits

Tables 11 and 12 list the limits and the test parameters for the receiver ACS in the first adjacent channel and 2nd adjacent channels for 5 MHz and 10 MHz channel bandwidths, respectively. For an assigned channel bandwidth of 5 MHz, and interferer channel bandwidth of 5 MHz is used and for an assigned channel bandwidth of 10 MHz, and interferer channel bandwidth of 10 MHz is used. All the measurements are done over 95 % of the channel. The compliant system shall be able to meet a Bit Error Ratio (BER) $< 10^{-6}$ (or equivalent PER) with the interference levels specified in the tables. Please note that depending on some assumed packet sizes, equivalent Packet Error Ratio (PER) criteria can be used alternatively.

Table 11: Limits and test parameters for receiver adjacent channel selectivity for 5 MHz channel bandwidth

Description	In-channel	Interferer on 1 st adjacent channel	Interferer on 2 nd adjacent channel
ACS limits (dB)		33	47
Power (dBm)	$P_{\text{SENS}} + 3$	$N_{\text{th}} + 33$	$N_{\text{th}} + 47$
Centre frequency (MHz)	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz

Table 12: Limits and test parameters for receiver adjacent channel selectivity for 10 MHz channel bandwidth

Description	In-channel	Interferer on 1 st adjacent channel	Interferer on 2 nd adjacent channel
ACS limits (dB)		33	47
Power (dBm)	$P_{\text{SENS}} + 3$	$N_{\text{th}} + 33$	$N_{\text{th}} + 47$
Centre frequency (MHz)	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

4.2.9.3 Conformance

Conformance tests described in clause 5.4.7 shall be carried out.

4.2.10 Receiver blocking characteristics

4.2.10.1 Definition

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies to interfering signals with center frequency within the ranges specified in the tables below, using a 1 MHz step size. The blocking performance shall apply to all frequencies except those at which a spurious response occur.

P_{SENS5} and P_{SENS10} are the sensitivity levels at $\text{BER} \leq 10^{-6}$, for 5 MHz and 10 MHz channels respectively, corresponding to the most robust modulation and coding rate supported by the user equipment. The wanted signal with the most robust modulation and coding supported by the UE shall be used.

4.2.10.2 Limits

The wanted signal with the most robust modulation and coding supported by the UE shall be used.

BER performance requirement at $\text{BER} \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input:

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS5} .
- Interfering signal with the following parameters.

Table 13: Blocking for 5 MHz channel bandwidth

Centre frequency of interfering signal	Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
2 500 MHz to 2 690 MHz	-49 dBm	12,5 MHz	Modulation and coding equal to those of the wanted signal

BER performance requirement at $\text{BER} \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input.

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS10} .

- Interfering signal with the following parameters.

Table 14: Blocking for 10 MHz channel bandwidth

Centre frequency of interfering signal	Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
2 500 MHz to 2 690 MHz	-49 dBm	25 MHz	Modulation and coding equal to those of the wanted signal

4.2.10.3 Conformance

Conformance tests described in clause 5.4.8 shall be carried out.

4.2.11 Receiver intermodulation characteristics

4.2.11.1 Definition and applicability

Third and higher order mixing of two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

4.2.11.2 Limits

BER performance requirement at $BER \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input.

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS5} .
- Two interfering signals with the following parameters.

Table 15: Receiver intermodulation characteristics for 5 MHz channel bandwidth

Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
-55 dBm	7,5 MHz	CW signal
-55 dBm	17,5 MHz	Modulation and coding equal to those of the wanted signal

BER performance requirement at $BER \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input.

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS10} .
- Two interfering signals with the following parameters.

Table 16: Receiver intermodulation characteristics for 10 MHz channel bandwidth

Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
-55 dBm	15 MHz	CW signal
-55 dBm	35 MHz	Modulation and coding equal to those of the wanted signal

4.2.11.3 Conformance

Conformance tests described in clause 5.4.9 shall be carried out.

4.2.12 Receiver spurious response

4.2.12.1 Definition

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the blocking limits as specified in tables 13 and 14 are not met.

4.2.12.2 Limits

BER performance requirement at $BER \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input.

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS5} .

Table 17: Receiver spurious response for 5 MHz channel bandwidth

Centre frequency of interfering signal	Interfering signal mean power	Type of interfering signal
2 500 MHz to 2 690 MHz	-49 dBm	CW

BER performance requirement at $BER \leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to UE antenna input.

- A wanted signal at the assigned channel frequency, with mean power 6 dB above P_{SENS10} .

Table 18: Receiver spurious response for 10 MHz channel bandwidth

Centre frequency of interfering signal	Interfering signal mean power	Type of interfering signal
2 500 MHz to 2 690 MHz	-49 dBm	CW

4.2.12.3 Conformance

Conformance tests described in clause 5.4.10 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

The technical requirements of the present document apply under the environmental profile, for intended operation of the equipment and antennas, declared by the manufacturer.

The environmental profile may be determined by the environmental class of the equipment according to the guidance given in EN 300 019 [1].

The combination of the equipment and its antennas shall comply with all the requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

For equipment with an integral antenna, an appropriate RF interface (temporary antenna connector) is required to enable the equipment to be assessed.

5.2 Product information

The following information shall be stated by the manufacturer in order to carry out the test suites:

- the operating RF channel centre frequency range of the equipment;
- the nominal occupied channel bandwidth;
- the modulation format(s) employed by the equipment;
- the nominal maximum output power (P_{nom}) from the equipment;
- the operational environmental profile(s) applicable to the equipment;
- the TPC range(s);
- conversion relationship between BER and PER, if required;
- the receiver sensitivity levels P_{SENS5} and P_{SENS10} ;
- the receiver thermal noise N_{th} .

5.3 Interpretation of the measurement results

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 shall be used to decide whether the user 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 19.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with the principles contained within TR 100 028 [3] or TR 102 215 [i.4] as appropriate and shall correspond to an expansion factor (coverage factor) $k = 1,96$ or $k = 2$ (which provides a confidence level of 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 19 is based on such expansion factors.

Table 19: Maximum measurement uncertainty

Parameter	Conditions	Uncertainty
5.4.4 Nominal maximum output power and tolerance	Normal	$\pm 0,7$ dB
5.4.1 Spectrum emission mask		$\pm 1,5$ dB
5.4.2 Transmitter adjacent channel leakage power ratio	-	$\pm 0,8$ dB
5.4.3 Transmitter spurious emissions	for UE and coexistence bands: for results < -60 dBm: for results > -60 dBm:	$\pm 3,0$ dB $\pm 2,0$ dB
	Outside above: $f \leq 2,2$ GHz: $2,2$ GHz < $f \leq 4$ GHz: 4 GHz < f :	$\pm 1,5$ dB $\pm 2,0$ dB $\pm 4,0$ dB
5.4.5 Receiver spurious emissions	for UE receive and transmit band:	$\pm 3,0$ dB
	Outside above: $f \leq 2,2$ GHz: $2,2$ GHz < $f \leq 4$ GHz: 4 GHz < f :	$\pm 2,0$ dB $\pm 2,0$ dB $\pm 4,0$ dB

5.4 Essential radio test suites

In figure 1 to 7, two way arrows represent possible protocol messages exchanged between BS Emulator and UE UUT to configure UE UUT for proper transmission with specified power levels. Power transmissions from the UE UUT are one way in uplink and from right to left in figures 1 to 6.

5.4.1 Spectrum emission mask

The purpose of this test is to verify compliance of UE equipment to the spectrum mask emission requirements of clause 4.2.2.

5.4.1.1 Method of test for UE spectral emission mask

Figure 1 shows the test setup for testing UE spectrum emission masks.

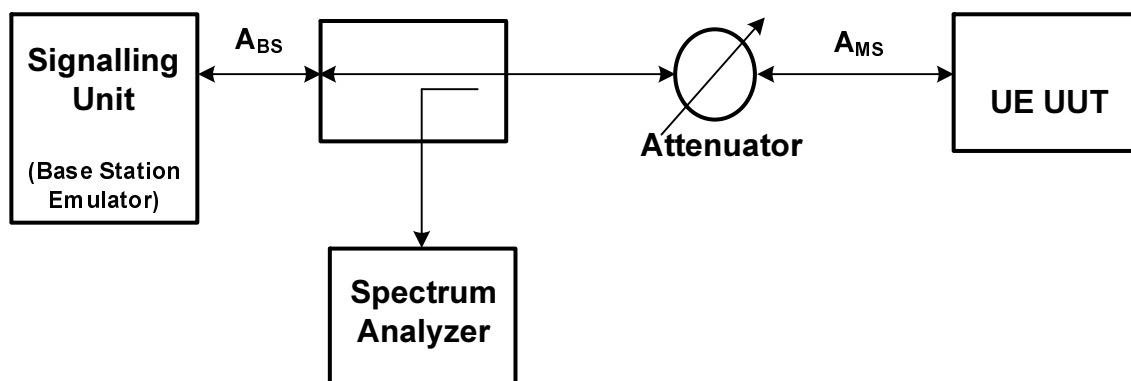


Figure 1: Test Setup for spectral mask emission testing of user equipment

5.4.1.1.1 Initial conditions

The UUT shall be configured to operate at the Pnom level declared for the equipment.

For a UUT with antenna connector(s) and using external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector provided, conducted measurements shall be used.

For systems implementing dynamic change of the modulation order; this test shall be modified and executed accordingly to accurately capture transient behaviour. For example, if a system automatically operates at higher output power when lower order modulations are used, the test must correctly capture this effect. There may be a need for manufacturers to include information to identify the correct test conditions. The equipment shall be configured to operate with continuous modulation mode switching at the maximum switching speed permitted by the system, with equal duty cycle for all modulation orders, and with all training bursts or reference signals active as in normal operation.

In spectrum analyzer, set the resolution bandwidth to 30 kHz for the first 1 MHz (2 MHz for the 10 MHz channel bandwidth case) of measurement from the edge of assigned channel and 1 MHz for the remaining of measurements and also set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

5.4.1.1.2 Procedure

- | | |
|--------|---|
| Step 1 | Set the RF channel to the lowest channel centre frequency from the declared range. |
| Step 2 | Make sure the data link connection has been established between UE UUT and Signalling Unit. |
| Step 3 | The spectrum analyzer must be correctly configured to measure the spectral mask. To avoid having the spectrum analyzer average the spectrum during periods when there is no transmission occurring (such as a DL burst), it is important to use a gated trigger mode. The gated trigger should be set up so that the spectrum analyzer is only triggered when the UUT is transmitting. Some spectrum analyzers can be configured for a gated trigger using the RF burst directly. However, other spectrum analyzers will require an independent gate signal, and this signal must be derived from the Base Station Emulator (BSE). It is therefore recommended that the BSE provide a frame trigger signal. The UE UUT is configured to transmit at Pnom as measured over the 5 MHz or 10 MHz of allocated bandwidth.

Measurements should only be conducted during the transmission. |
| Step 4 | Measure and note the signal spectrum over the range specified in clause 4.2.2.2. Table 2 (or table 3) according the specified measurement bandwidths in the tables. Note that measurement aggregation is needed to compare with specified numbers according to the 1 MHz measurement bandwidth in the tables. |
| Step 5 | Repeat steps 3 to 5 at the middle and highest RF channel center frequencies from the declared range. |
| Step 6 | Repeat steps 2 to 6 for all modulation schemes supported by the equipment under test. |
| Step 7 | End of test. |

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps 1 to 7 shall be performed on a selected single antenna port with Pnom transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps 1 to 7 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at $P_{nom} - 10 \times \log_{10} N$ level).
 - b) The measurement results of Step 4 are combined (measured power levels are added).
 - c) Results of Step b. is compared with the requirement thresholds.

5.4.2 Transmitter Adjacent Channel Leakage power Ratio (ACLR)

The purpose of this test to verify compliance of UE equipment to the transmitter adjacent channel leakage power ratio requirements of clause 4.2.3.

5.4.2.1 Method of test for UE ACLR

Figure 2 shows the test setup for testing UE ACLR.

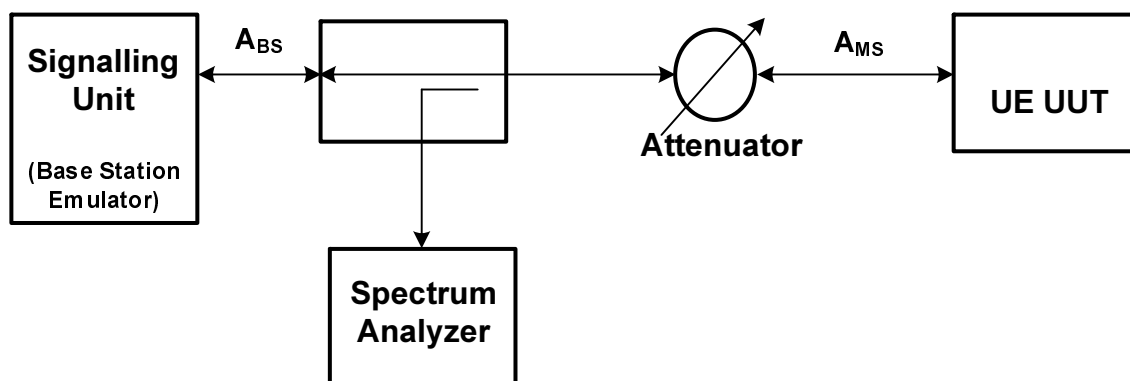


Figure 2: Test Setup for ACLR Testing of User Equipment

5.4.2.1.1 Initial conditions

The UUT shall be configured to operate at the P_{nom} level declared for the equipment.

For a UUT with antenna connector(s) and using external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector provided, conducted measurements shall be used.

For systems implementing dynamic change of the modulation order, the equipment shall be configured to operate with continuous modulation mode switching at the maximum switching speed permitted by the system, with equal duty cycle for all modulation orders, and with all training bursts or reference signals active as in normal operation.

In spectrum analyzer, set the resolution bandwidth to at least 100 kHz and set the video bandwidth to value of three times the measurement bandwidth.

5.4.2.1.2 Procedure

Eval_BW 1 and Eval_BW 2 Test Case.

- Step 1 Set the RF channel to the lowest channel centre frequency from the declared range.
- Step 2 Make sure the data link connection has been established between UE UUT and Signalling Unit.
- Step 3 The spectrum analyzer must be correctly configured to measure the aggregated power. To avoid having the spectrum analyzer average the spectrum during periods when there is no transmission occurring (such as a DL burst), it is important to use a gated trigger mode. The gated trigger should be set up so that the spectrum analyzer is only triggered when the UUT is transmitting. Some spectrum analyzers can be configured for a gated trigger using the RF burst directly. However, other spectrum analyzers will require an independent gate signal, and this signal must be derived from the Base Station Emulator (BSE). It is therefore recommended that the BSE provide a frame trigger signal. The UE UUT is configured to transmit at P_{nom}.

Measurements should only be conducted during the transmission.

- Step 4 Measure the aggregated power measured over a frequency range equal to 4,75 MHz and 9,5 MHz (for 5 MHz and 10 MHz cases respectively) centred on the assigned channel frequency.
- Step 5 Average over a sufficient number of transmitted bursts to obtain a stable reading.

- Step 6 Measure the aggregated power measured over a frequency range equal to 4,75 MHz and 9,5 MHz (for 5 MHz and 10 MHz cases respectively) for Eval_BW 1 measurement and to 3,84 MHz and 7,68 MHz (for 5 MHz and 10 MHz cases respectively) for Eval_BW 2 measurement centred on the first lower adjacent channel frequency which is 5 MHz (10 MHz for 10 MHz channel bandwidth) apart from operating RF channel center frequency.
- Step 7 Average over a sufficient number of transmitted bursts to obtain a stable reading.
- Step 8 Calculate the ACLR by: (Power according to step 5) / (Power according to step 7).
- Step 9 Repeat steps 4 to 8 for the second adjacent (lower) RF channel (centre frequency 10 MHz for the 5 MHz channel bandwidth and 20 MHz for 10 MHz channel bandwidth, respectively, below the assigned channel frequency of the transmitted signal) and also for the first and second upper adjacent RF channel.
- Step 10 Run steps 2 to 9 at the middle and highest RF channel center frequencies from the declared range.
- Step 11 End of test.

Eval_BW 3 Test Case.

- Step 12 Measure the aggregated power measured over a frequency range equal to 9,5 MHz centred on the assigned channel frequency.
- Step 13 Average over a sufficient number of transmitted bursts to obtain a stable reading.
- Step 14 Measure the aggregated power measured over a frequency range equal to 3,84 MHz centred on the first lower adjacent channel frequency which is 7,5 MHz apart from operating RF channel center frequency.
- Step 15 Average over a sufficient number of transmitted bursts to obtain a stable reading.
- Step 16 Calculate the ACLR by: (Power according to step 13) / (Power according to step 15).
- Step 17 Run steps 12 to 16 at the middle and highest channel centre frequencies from the declared range.
- Step 18 End of test.

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps 1 to 18 shall be performed on a selected single antenna port with P_{nom} transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps 1 to 18 shall be repeated when all antenna are enabled with a total transmit power of P_{nom} (e.g. each antenna is transmitting at P_{nom} - 10 × log₁₀ N level).
 - b) Step 5 is modified to include total combined power (measured power levels are added over N antenna).
 - c) Step 13 is modified to include total combined power (measured power levels are added over N antenna).
 - d) Step 15 is modified to include total combined power (measured power levels are added over N antenna).
 - e) Step 7 is modified to include total combined power (measured power levels are added over N antenna).

5.4.3 Transmitter spurious emissions

5.4.3.1 Method of test for UE transmitter spurious emission

Figure 3 shows the test setup for testing UE transmitter spurious emission.

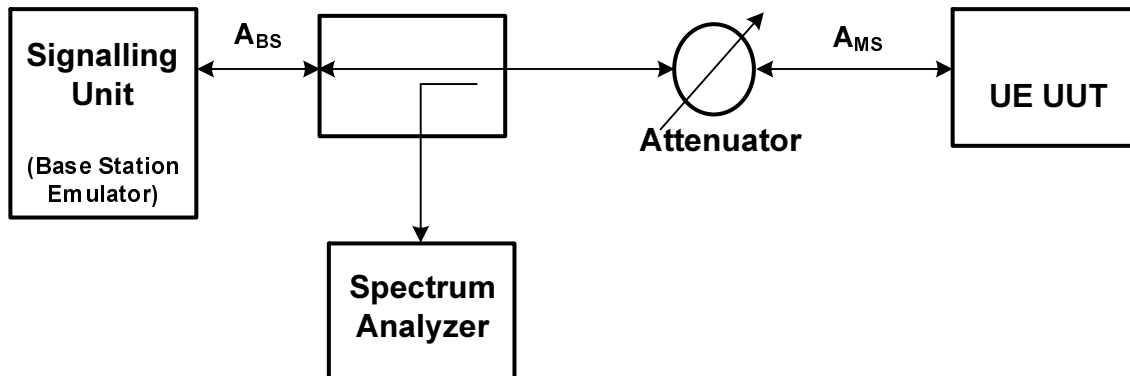


Figure 3: Test Setup for UE Transmitter spurious Emission Testing of User Equipment

5.4.3.1.1 Initial conditions

The UUT shall be configured to operate at the P_{nom} level declared for the equipment.

For a UUT with antenna connector(s) and using external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector provided, conducted measurements shall be used.

In spectrum analyzer, set the measurement bandwidth as specified in the relevant tables 6 and 7 of clause 4.2.4.2. Set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

For systems implementing dynamic change of the modulation order, the equipment shall be configured to operate with continuous modulation mode switching at the maximum switching speed permitted by the system, with equal duty cycle for all modulation orders, and with all training bursts or reference signals active as in normal operation.

5.4.3.1.2 Procedure

- Step 1 Set the RF channel at lowest channel centre frequency.
- Step 2 Make sure the data link connection has been established between UE UUT and Signalling Unit.
- Step 3 The UE UUT is configured to transmit at its P_{nom} output power as measured over the 5 MHz or 10 MHz of allocated bandwidth.
- Step 4 Measure and note the UE transmitter spurious emissions over the range specified in clause 4.2.4.2, tables 6 and 7 according to the specified measurement bandwidths in the tables.
- Step 5 Repeat steps 2 to 4 at middle and highest RF channel center frequencies from the declared range.
- Step 6 End of test.

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps 1 to 6 shall be performed on a selected single antenna port with P_{nom} transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps 1 to 6 shall be repeated when all antenna are enabled with a total transmit power of P_{nom} (e.g. each antenna is transmitting at $P_{nom} - 10 \times \log_{10} N$ level).
 - b) The measurement results of Step 4 are combined (measured power levels are added).

Results of Step b) is compared with the requirement thresholds.

5.4.4 Transmitter power control and nominal maximum output power and tolerance

The purpose of this test to verify compliance of UE equipment nominal maximum output power and tolerance and transmit power control in support of requirement clauses 4.2.5 and 4.2.6.

5.4.4.1 Method of test

Figure 4 shows the test setup for testing UE nominal maximum output power and tolerance and transmit power control.

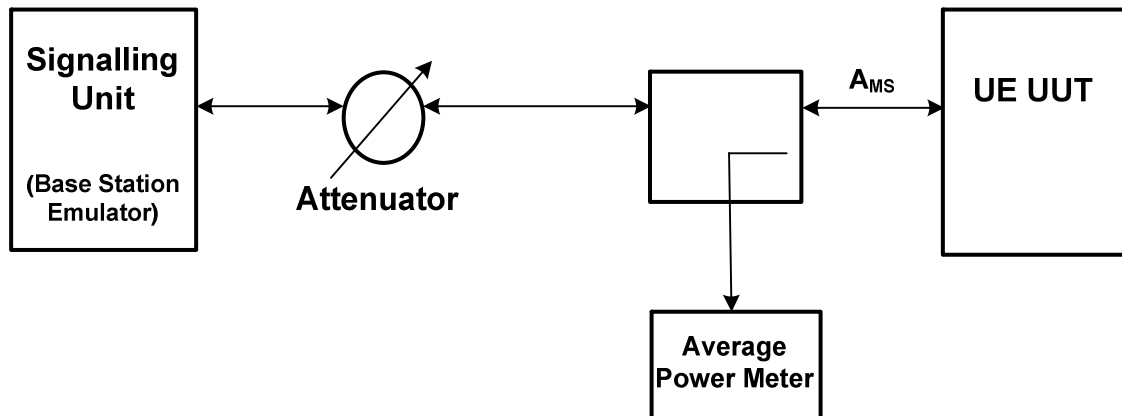


Figure 4: Test Setup for UE nominal maximum output power and tolerance and transmit power control

5.4.4.1.1 Initial conditions

The UUT shall be configured to operate at the P_{nom} level declared for the equipment.

For a UUT with antenna connector(s) and using external antenna(s), or for a UUT with integral antenna(s) but with a temporary antenna connector provided, conducted measurements shall be used.

5.4.4.1.2 Procedure

- Step 1 Set the RF channel to the lowest channel centre frequency from the declared range.
- Step 2 Make sure the data link connection has been established between UE UUT and Signalling Unit.
- Step 3 The UE UUT is configured to continuously transmit at the declared P_{nom}.
- Step 4 Measure and note the measured power level for compliance with nominal maximum output power and tolerance in clause 4.2.5.
- Step 5 Have Signalling Unit to instruct UE UUT to decrease the transmit power in steps of 1 dB down to the point that the power can not be reduced further. Record the minimum power level.
- Step 6 Note the difference between the power measured in step 4 and the minimum power measured in step 5 and compare this to the minimum range requirement of clause 4.2.6.2.
- Step 7 Repeat steps 3 to 6 at the middle and highest RF channel center frequencies from the declared range.
- Step 8 Repeat steps 2 to 6 for all modulation schemes supported by the UE UUT.
- Step 9 End of test.

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps 1 to 9 shall be performed on a selected single antenna port with P_{nom} transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps 1 to 9 shall be repeated when all antenna are enabled with a total transmit power of P_{nom} (e.g. each antenna is transmitting at $P_{nom} - 10 \times \log_{10} N$ level).
 - b) Step 4 is modified to include total combined power (measured power levels are added over N antenna).
 - c) Step 6 is modified to include total combined power (measured power levels are added over N antenna).

5.4.5 Control and monitoring functions

5.4.5.1 Method of test

Figure 5 shows the test setup for testing UE control and monitoring functions.

- a) At the start of the test, the UE shall be switched off. The UE antenna connector shall be connected to a power measuring equipment, with 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 broadband 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.

- b) The UE shall be switched on for a period of approximately fifteen minutes, and then switched off.
- c) The EUT 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.
- d) Step c) shall be repeated four times.
- e) 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 4.2.7.2 in order to prove compliance.

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps a) to e) shall be performed on a selected single antenna port with P_{nom} transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps a) to e) shall be repeated when all antenna are enabled with a total transmit power of P_{nom} (e.g. each antenna is transmitting at $P_{nom} - 10 \times \log_{10} N$ level).
 - b) Step e) is modified to include total combined power (measured power levels are added over N antenna).

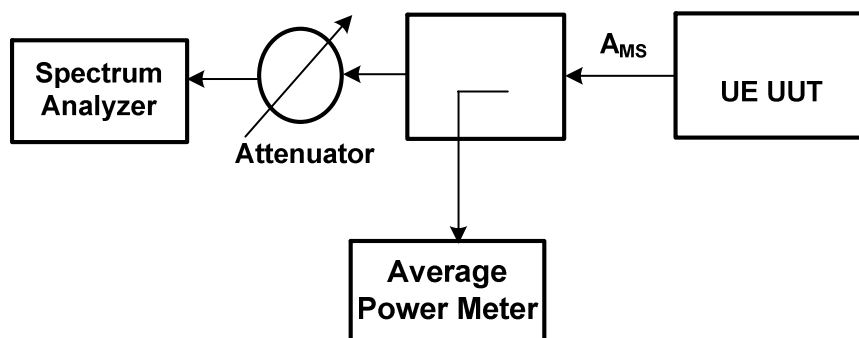


Figure 5: Test Setup for UE control and monitoring functions

5.4.6 Receiver spurious emissions

5.4.6.1 Method of test

Figure 6 shows the test setup for testing UE receiver spurious emission.

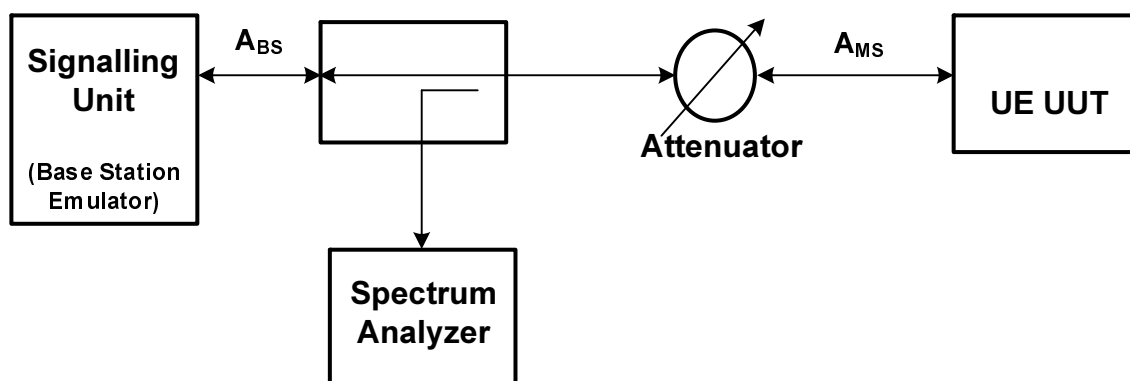


Figure 6: Test Setup for Receiver Spurious Emission Testing of User Equipment

5.4.6.1.1 Initial conditions

In spectrum analyzer, set the measurement bandwidth as specified in the relevant tables 9 and 10 of clause 4.2.8. Set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

5.4.6.1.2 Procedure

- Step 1 Set the RF channel at lowest channel centre frequency.
- Step 2 Make sure the data link connection has been established between UE UUT and Signalling Unit.
- Step 3 The UE UUT is configured to transmit at its P_{nom} output power as measured over the 5 MHz or 10 MHz of allocated bandwidth.
- Step 4 Measure and note the UE receiver spurious emissions over the range specified in clause 4.2.8 tables 9 and 10 according to the specified measurement bandwidths in the tables. The receiver spurious emissions should be only measured during the receive part of the TDD frame.
- Step 5 Repeat steps 2 to 4 at middle and highest RF channel center frequencies from the declared range.
- Step 6 End of test.

In the case that UE supports multiple transmit antenna (antenna 1 to N):

- 1) If single transmit antenna is a valid mode of operation, Steps 1 to 6 shall be performed on a selected single antenna port with P_{nom} transmit level.
- 2) To test the mode with multiple antenna enabled:
 - a) Steps 1 to 6 shall be repeated when all antenna are enabled with a total transmit power of P_{nom} (e.g. each antenna is transmitting at $P_{nom} - 10 \times \log_{10} N$ level).
 - b) Step 3 is modified to include total combined power (measured power levels are added over N antenna).
 - c) Step 4 is modified to include total combined power (measured power levels are added over N antenna).

5.4.7 Receiver Adjacent Channel Selectivity (ACS)

5.4.7.1 Method of test

Interfering source shall be a conforming unsynchronized signal with the same signalling technology as the in-channel signal.

Figure 7 shows the test setup for testing UE receiver adjacent channel selectivity.

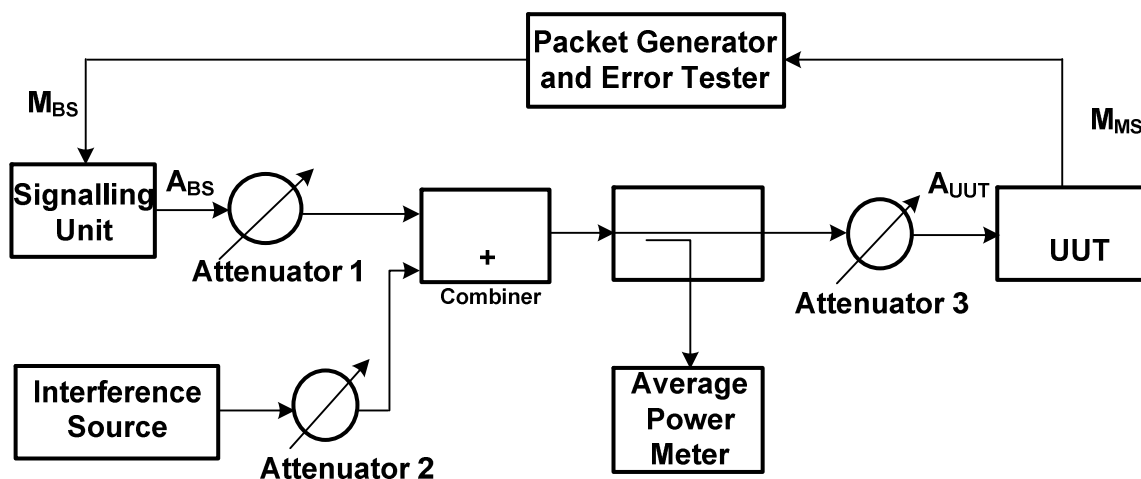


Figure 7: Test setup for receiver adjacent channel selectivity test

5.4.7.1.1 Procedure

Test case for 5 MHz channel bandwidth

- Step 1 Adjust the received signal level at A_{UUT} to be 3 dB above the sensitivity level P_{SENS5} for 5 MHz under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
- Step 2 Turn on the interfering source and configure it to transmit at $F_c - 5$ MHz from the nominal (desired) operation frequency.
- Step 3 Increase the interfering source power to the interference level in table 11 for 5 MHz.
- Step 4 Perform a BER measurement and record the results.
- Step 5 Turn the interference source off.
- Step 6 Repeat step 1 to step 5 above for the test cases shown in table 11.
- Step 7 Repeat the test procedure for the low, middle, and high channel of the declared frequency range.

Test case for 10 MHz channel bandwidth

- Step 1 Adjust the received signal level at A_{UT} to be 3 dB above the sensitivity level P_{SENS10} under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
- Step 2 Turn on the interfering source and configure it to transmit at $F_c - 10$ MHz from the nominal (desired) operation frequency.
- Step 3 Increase the interfering source power to the interference level in table 12.
- Step 4 Perform a BER measurement and record the results.
- Step 5 Turn the interference source off.
- Step 6 Repeat step 1 to step 5 above for the test cases shown in table 12.
- Step 7 Repeat the test procedure for the low, middle, and high channel of the declared frequency range.

Table 20: Test parameters for receiver adjacent channel selectivity

Description	In-channel	Interferer on 1 st adjacent channel	Interferer on 2 nd adjacent channel
Power (dBm)	$P_{\text{SENS}} + 3$	Nth + 33	Nth + 47
Centre frequency (MHz)	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz

Table 21: Test parameters for receiver adjacent channel selectivity

Description	In-channel	Interferer on 1 st adjacent channel	Interferer on 2 nd adjacent channel
Power (dBm)	$P_{\text{SENS}} + 3$	Nth + 33	Nth + 47
Centre frequency (MHz)	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

In the case that UE supports multiple receive antenna (antenna 1 to N), a single channel connected to multiple antenna through splitter. For this case, the test system is calibrated to the antenna ports and identical signals and power levels ($\pm 0,3$ dB) are applied to each antenna port.

5.4.8 Receiver blocking characteristics

5.4.8.1 Method of test

Interfering source shall be a conforming unsynchronized signal with the same signalling technology as the in-channel signal.

Figure 8 shows the test setup of the receiver blocking test.

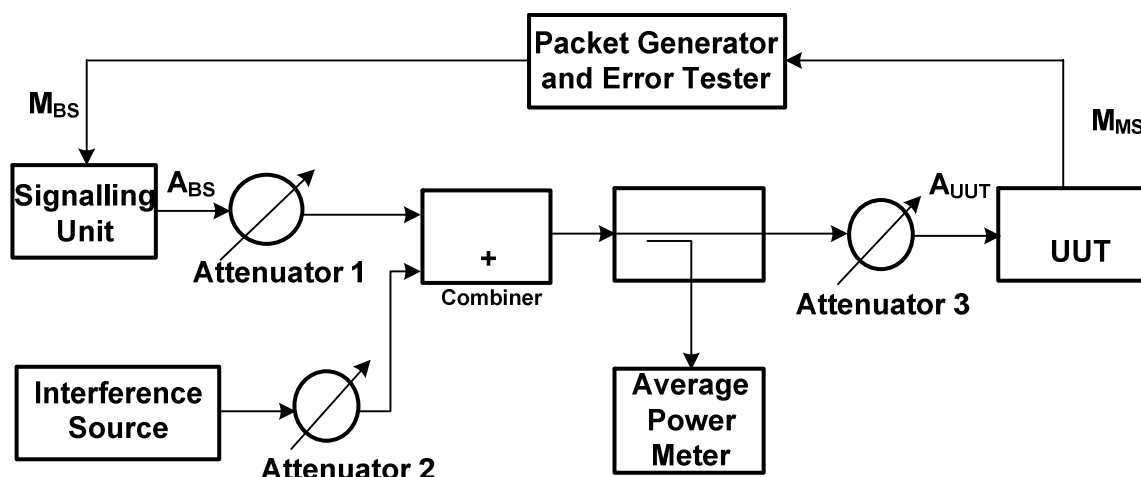


Figure 8: Test setup for receiver blocking test

5.4.8.1.1 Initial conditions

Set the desired received signal BW as defined in test case 1 of table 22.

5.4.8.1.2 Procedure

- Step 1 Set the desired received signal at lowest channel centre frequency from the declared range.
- Step 2 Adjust the received signal level at A_{UUT} to be 6 dB above the sensitivity level P_{SENS5} or P_{SENS10} under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
- Step 3 Turn on the interfering source and configure it to transmit as defined in table 22.
- Step 4 Step the interfering signal generator frequency through the frequency range indicated in table 22 with a step size of 1 MHz.
- Step 5 Measure the BER of the desired signal received for each step of the interfering frequency and record the results.
- Step 6 Turn the interference source off.
- Step 7 Repeat the test procedure at middle and highest channel centre frequencies for the desired received signal from the declared range.
- Step 8 Repeat the test procedure for remaining test cases defined in table 22.

In the case that UE supports multiple receive antenna (antenna 1 to N), a single channel connected to multiple antenna through splitter. For this case, the test system is calibrated to the antenna ports and identical signals and power levels ($\pm 0,3$ dB) are applied to each antenna port.

Table 22: Test parameters for receiver blocking for 5 MHz and 10 MHz BW

Test case	Centre frequency of interfering signal	Desired signal and interfering signal bandwidth	Interfering signal mean power	Desired signal mean power	Minimum offset of interfering signal from the channel edge
1	2 500 MHz to 2 690 MHz	5 MHz	-49 dBm	$P_{SENS5} + 6$ dB	12,5 MHz
2	2 500 MHz to 2 690 MHz	10 MHz	-49 dBm	$P_{SENS10} + 6$ dB	25 MHz

5.4.9 Receiver intermodulation characteristics

5.4.9.1 Method of test

Interfering sources shall consist of a CW signal and a conforming unsynchronized signal with the same signalling technology as the in-channel signal.

Figure 9 shows the test setup for the receiver intermodulation test.

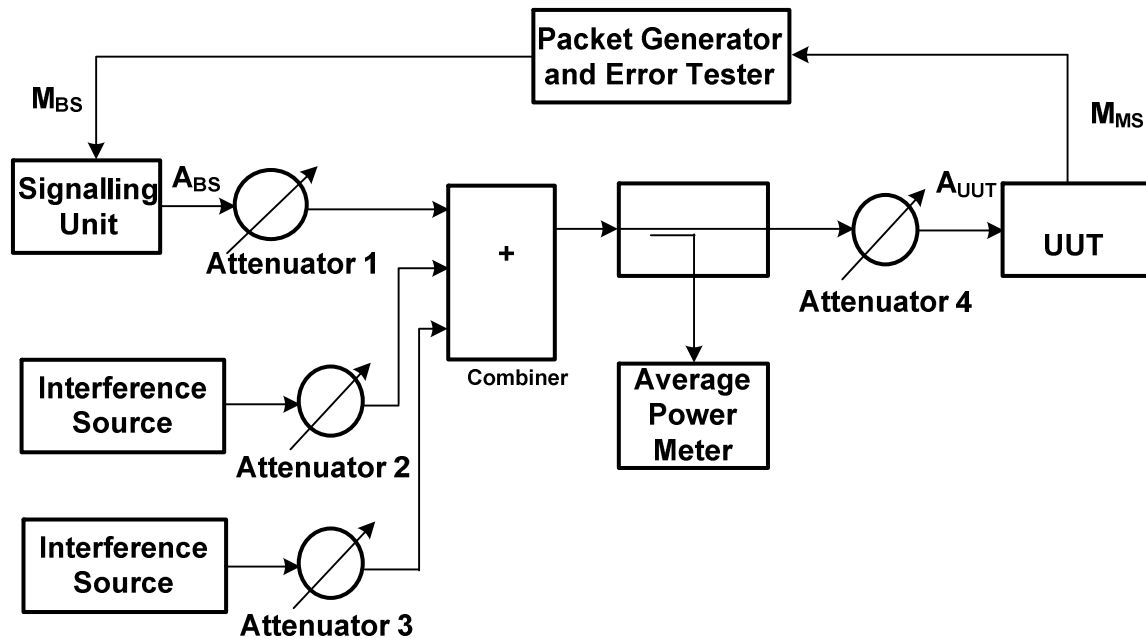


Figure 9: Test setup for receiver intermodulation test

5.4.9.1.1 Initial conditions

Set the desired received signal BW as defined in test case 1 of table 23.

5.4.9.1.2 Procedure

- Step 1 Set the desired received signal at lowest channel centre frequency from the declared range.
- Step 2 Adjust the received signal level at A_{UUT} to be 6 dB above the sensitivity level $P_{SENS} + 6$ dB under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
- Step 3 Turn on the interfering sources and configure to transmit as defined in table 23 with positive offset with respect to the desired signal.
- Step 4 Measure the BER of the desired signal received and record the results.
- Step 5 Reconfigure interfering sources to transmit as defined in table 23 with negative offset with respect to the desired signal.
- Step 6 Measure the BER of the desired signal received and record the results.
- Step 7 Turn the interference source off.
- Step 8 Repeat the test procedure at middle and highest channel centre frequencies for the desired received signal from the declared range.
- Step 9 Repeat the test procedure for remaining test cases defined in table 23.

In the case that UE supports multiple receive antenna (antenna 1 to N), a single channel connected to multiple antenna through splitter. For this case, the test system is calibrated to the antenna ports and identical signals and power levels ($\pm 0,3$ dB) are applied to each antenna port.

Table 23: Test parameters for receiver intermodulation for 5 MHz and 10 MHz BW

Test case	Desired signal bandwidth	Desired signal mean power	Interfering signal mean power	Offset of interfering signal from the channel edge	Type of interfering signal
1	5 MHz	$P_{\text{SENS5}} + 6$ dB	-55 dBm	7,5 MHz	CW signal
			-55 dBm	17,5MHz	Modulation and coding equal to those of the wanted signal
2	10 MHz	$P_{\text{SENS10}} + 6$ dB	-55 dBm	15 MHz	CW signal
			-55 dBm	35 MHz	Modulation and coding equal to those of the wanted signal

5.4.10 Receiver response rejection

5.4.10.1 Method of test

The interfering source shall consist of a CW signal. Test frequencies for the desired signal and CW interferer shall be defined from those exceptions declared during execution of the receiver blocking test.

Figure 10 shows the test setup for the receiver spurious response test.

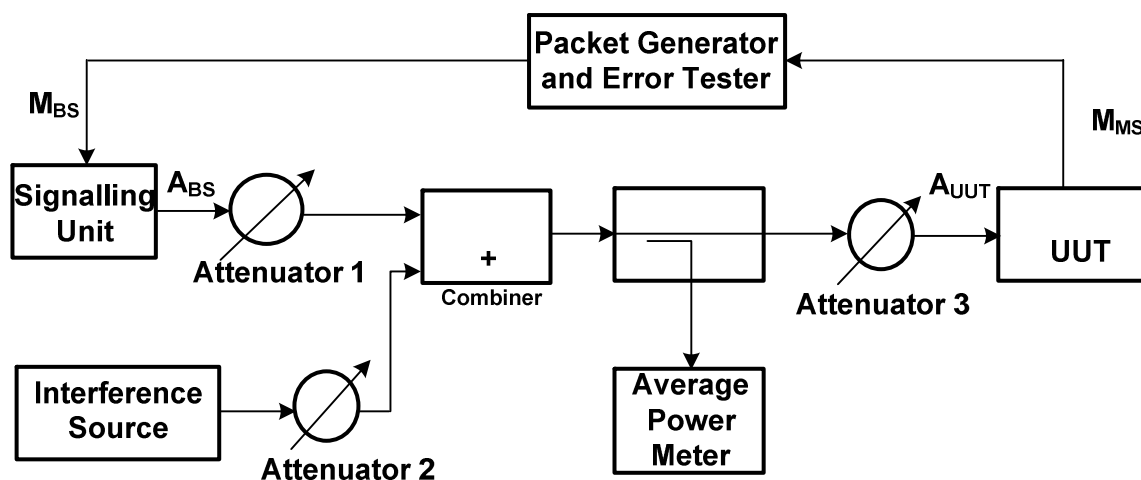


Figure 10: Test setup for receiver spurious response test

5.4.10.1.1 Initial conditions

Set the desired received signal BW to the signal BW used in the receiver blocking test, as described in clause 5.4.8.1.1, at which the blocking test failed.

5.4.10.1.2 Procedure

- Step 1 Set the desired received signal frequency to the frequency used for the receiver blocking test, as described in clause 5.4.8.1.1 at which the blocking test failed.
- Step 2 Set the power level of the wanted signal according to table 22.
- Step 3 Set the frequency of the interferer signal according the recorded spurious response frequency values obtained from the blocking test as described in clause 5.4.8.1.1 at which the blocking test failed.

- Step 4 Set the power level of the interferer according to table 22.
- Step 5 Measure the BER of the desired signal received and record the results.
- Step 6 Repeat the test procedure at all frequencies which the blocking test failed.

In the case that UE supports multiple receive antenna (antenna 1 to N), a single channel connected to multiple antenna through splitter. For this case, the test system is calibrated to the antenna ports and identical signals and power levels ($\pm 0,3$ dB) are applied to each antenna port.

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 302 544-2						
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	Spectrum emission mask	4.2.2	U		E	5.4.1
2	Transmitter adjacent channel leakage power ratio	4.2.3	U		E	5.4.2
3	Transmitter spurious emissions	4.2.4	U		E	5.4.3
4	Nominal maximum output power and tolerance	4.2.5	U		E	5.4.4
5	Transmitter power control	4.2.6	U		E	5.4.4
6	Control and monitoring functions	4.2.7	U		E	5.4.5
7	Receiver spurious emissions	4.2.8	U		E	5.4.6
8	Receiver adjacent channel selectivity (ACS)	4.2.9	U		E	5.4.7
9	Receiver blocking characteristics	4.2.10	U		E	5.4.8
10	Receiver intermodulation characteristics	4.2.11	U		E	5.4.9
11	Receiver response rejection	4.2.12	U		E	5.4.10

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 *unconditionally* applicable (U) or is *conditional* 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).

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.

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): Bibliography

- CEPT ECC/DEC/(05)05: "ECC Decision of 18 March 2005 on harmonized utilization of spectrum for IMT-2000/UMTS systems operating within the band 2 500 - 2 690 MHz".
- European Commission Decision 2008/477/EC of 13 June 2008 on the harmonization of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.
- 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).

History

Document history				
V1.1.0	May 2008	Public Enquiry	PE 20080905:	2008-05-07 to 2008-09-05
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