

# ETSI EN 302 774 V1.2.1 (2012-02)



**Broadband Wireless Access Systems (BWA) in the  
3 400 MHz to 3 800 MHz frequency band;  
Base Stations;  
Harmonized EN covering the essential requirements  
of article 3.2 of the R&TTE Directive**

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Reference

REN/BRAN-0060007

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Keywords

base station, broadband, radio

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## Foreword

This Harmonized European Standard (EN) has been produced by ETSI Technical Committee Broadband Radio Access Networks (BRAN).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Directive 98/34/EC as amended by Directive 98/48/EC [i.2].

The title and reference to the present document are intended to be included in the publication in the Official Journal of the European Union of titles and references of Harmonized Standard under the Directive 1999/5/EC [i.1].

See article 5.1 of Directive 1999/5/EC [i.1] for information on presumption of conformity and Harmonised Standards or parts thereof the references of which have been published in the Official Journal of the European Union.

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

<b>National transposition dates</b>	
Date of adoption of this EN:	15 February 2012
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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 [i.1]. The modular structure is shown in EG 201 399 [i.3].

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# 1 Scope

The present document is applicable to FDD and TDD Base Stations of Broadband Wireless Access Systems (BWA) operating in the Frequency Band 3 400 MHz to 3 800 MHz. The present document does not address those IMT systems which are considered in EN 301 908 [i.9].

The present document covers the requirements for various channel bandwidths.

The present document is equally applicable to systems utilizing integral or non integral antennas.

Equipment complying with the present document falls within the scope of EC Decision 2008/411/EC [i.4].

The present document is intended to cover the provisions of Directive 1999/5/EC (R&TTE Directive) [i.1], 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 [i.1] may apply to equipment within the scope of the present document.

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

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# 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 referenced 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.

Not applicable.

## 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] 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] Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.3] ETSI EG 201 399 (V2.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of Harmonized Standards for application under the R&TTE Directive".
- [i.4] Commission Decision 2008/411/EC of 21 May 2008 on the harmonisation of the 3 400 - 3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

- [i.5] ETSI EN 300 019 (all parts): "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment".
- [i.6] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [i.7] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.8] 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.9] 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".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Automatic Transmit Power Control (ATPC):** function implemented to offer a dynamic power control

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

**maximum radiated output power:** maximum mean radiated output power (e.i.r.p.) declared by the manufacturer

**maximum radiated power density:** maximum mean radiated output power (e.i.r.p.) density, defined as dBm/MHz

### 3.2 Symbols

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

A <sub>BS</sub>	Base Station Interface A
A <sub>TS</sub>	Terminal Station Interface A
A <sub>UT</sub>	Unit Under Test Interface A
dB	deciBel
dB <sub>c</sub>	deciBel relative to carrier
dB <sub>m</sub>	deciBel relative to 1 mW
f <sub>c</sub>	center frequency
f <sub>o</sub>	operating frequency
f <sub>offset</sub>	offset frequency
GHz	GigaHertz
kHz	kiloHertz
MHz	MegaHertz

### 3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACR	Adjacent Channel Rejection
ATPC	Automatic Transmit Power Control
AWGN	Average White Gaussian Noise

BER	Bit Error Rate
BWA	Broadband Wireless Access
ChBW	Channel BandWidth
CW	Continuous Wave
e.i.r.p.	equivalent isotropically radiated power
FDD	Frequency Division Duplex
IMT	International Mobile Telecommunications
PER	Packet Error Rate
P <sub>max</sub>	Maximum Output Power
P <sub>nom</sub>	Nominal Maximum Output Power
P <sub>SENS</sub>	receiver sensitivity for a given ChBW, while decoding the signal using the most robust modulation declared by the equipment supplier
RF	Radio Frequency
RMS	Root Mean Square
TDD	Time Division Duplex
UUT	Unit Under Test

## 4 Essential requirements specification

### 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 manufacturer. 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.

### 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 seven 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 emissions mask	4.2.2 Transmitter out of band emissions 4.2.3 Transmitter adjacent channel leakage power ratio
Conducted spurious emissions from the transmitter antenna connector	4.2.4 Transmitter spurious emissions
Output power	4.2.4 Maximum output power accuracy
Intermodulation attenuation of the transmitter	4.2.6 Transmit Intermodulation attenuation
Conducted spurious emissions from the receiver antenna connector	4.2.7 Receiver spurious emissions
Impact of interference on receiver performance	4.2.8 Receiver adjacent channel rejection 4.2.9 Receiver blocking 4.2.10 Receiver intermodulation response rejection

#### 4.2.2 Transmitter out of band emissions

##### 4.2.2.1 Definition

Out of band emissions of the transmitter 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

The average level of the transmitter out of band emissions shall not exceed the limits of the masks provided in figures 1 or 2 according to the declared Pnom. For a declared Pnom ≥ 33 dBm, the relative spectrum mask provided in figure 1 is applicable while for a declared Pnom < 33 dBm, the absolute spectrum mask provided in figure 2 is applicable.

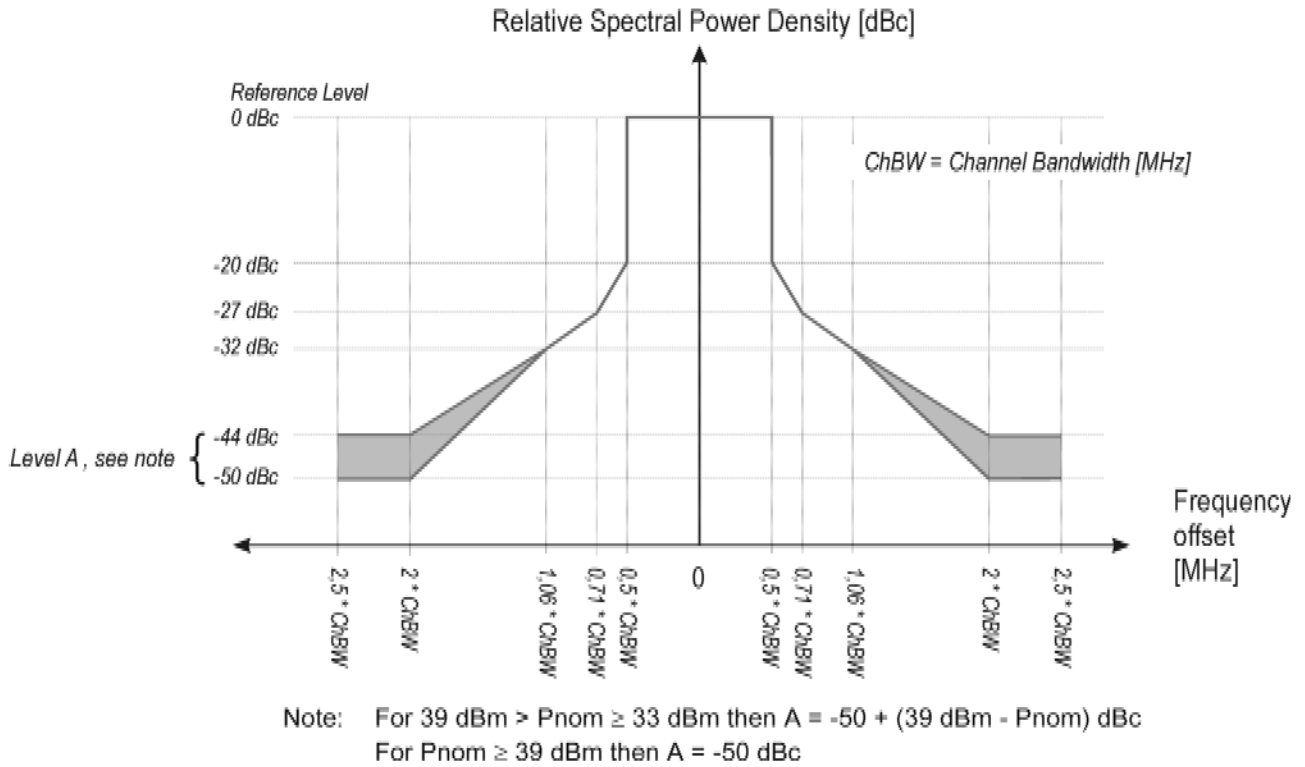


Figure 1: Transmit spectral power density mask for Pnom ≥ 33 dBm

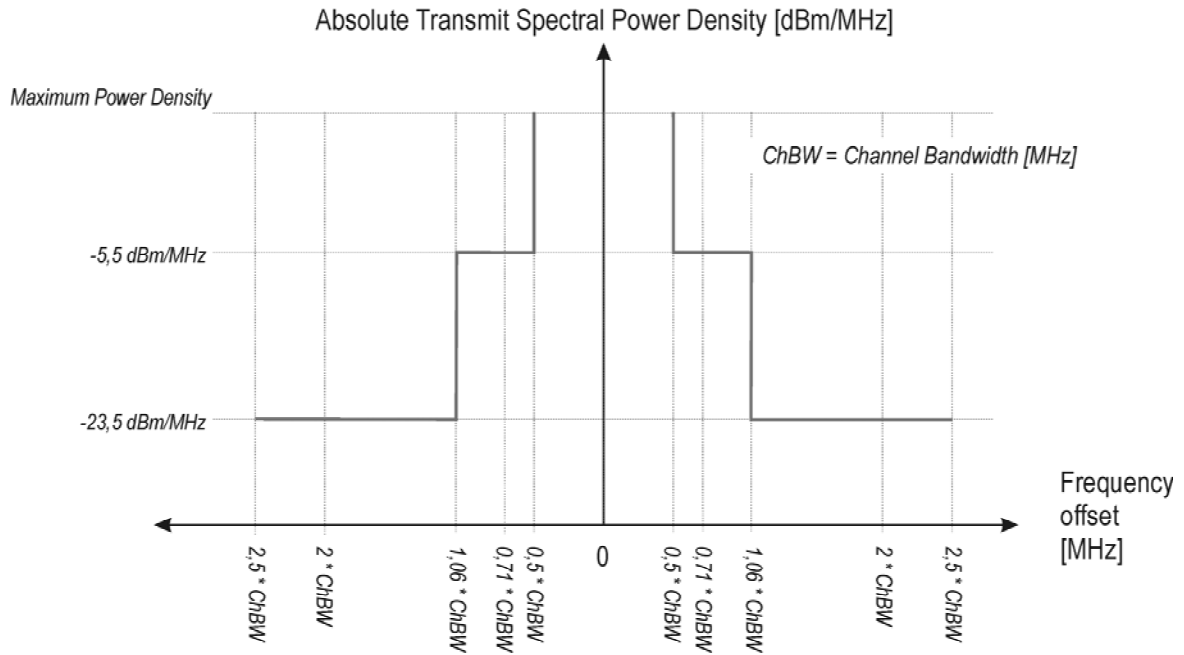


Figure 2: Transmit spectral power density mask for Pnom < 33 dBm

## 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 centre frequency of the operating channel to the mean power measured through a filter pass band centred on the centre frequencies of the first or second adjacent channel.

### 4.2.3.2 Limits

The Adjacent Channel Leakage power Ratio (ACLR) shall be equal to or greater than the limits given in table 2.

The filter pass band for evaluating the level in the operating channel as well as the filter pass band for evaluating the levels in the adjacent channels shall have a width equal to 95 % of the Channel Bandwidth (ChBW).

**Table 2: Minimum ACLR values**

Adjacent channel	ACLR
$F_c \pm \text{ChBW}$	44,2 dB
$F_c \pm 2 \times \text{ChBW}$	48 dB

## 4.2.4 Transmitter spurious emissions

### 4.2.4.1 Definition

Transmitter spurious emissions are any of the transmitter unwanted emissions on frequencies which are more than 250 % of the channel bandwidth (ChBW) away from the centre frequency of the operating channel.

### 4.2.4.2 Limits

The transmitter spurious emissions shall not exceed the limits given in tables 3 and 4.

**Table 3: Transmitter spurious emissions limits**

Frequency range	Measurement bandwidth	Limit
9 kHz to 1 GHz	100 kHz	-36 dBm
1 GHz to 19 GHz	30 kHz If $2,5 \times \text{ChBW} \leq  f_c - f  < 10 \times \text{ChBW}$	-30 dBm
	300 kHz If $10 \times \text{ChBW} \leq  f_c - f  < 12 \times \text{ChBW}$	-30 dBm
	1 MHz If $12 \times \text{ChBW} \leq  f_c - f $	-30 dBm

**Table 4: Additional spurious emissions limits in specific bands**

Frequency range	Measurement bandwidth	Limit
876 MHz to 915 MHz	100 kHz	-61 dBm
921 MHz to 960 MHz	100 kHz	-57 dBm
1 710 MHz to 1 785 MHz	100 kHz	-61 dBm
1 805 MHz to 1 880 MHz	100 kHz	-47 dBm
1 900 MHz to 1 920 MHz	1 MHz	-44 dBm
1 920 MHz to 1 980 MHz	1 MHz	-49 dBm
2 010 MHz to 2 025 MHz	1 MHz	-44 dBm
2 110 MHz to 2 170 MHz	1 MHz	-52 dBm
2 500 MHz to 2 570 MHz	1 MHz	-49 dBm
2 570 MHz to 2 690 MHz	1 MHz	-52 dBm

## 4.2.5 Maximum output power accuracy

### 4.2.5.1 Definition

The Maximum Output Power Accuracy is the difference between the declared Nominal Maximum Output Power ( $P_{nom}$ ) and the actual Maximum Output Power ( $P_{max}$ ).

### 4.2.5.2 Limits

In normal operating conditions, the actual Maximum Output Power ( $P_{max}$ ), shall remain within +2,0 dB and -2,0 dB of the manufacturers declared Nominal Maximum Output Power ( $P_{nom}$ ).

In extreme operating conditions, the actual Maximum Output Power ( $P_{max}$ ), shall remain within +2,5 dB and -2,5 dB of the manufacturers declared Nominal Maximum Output Power ( $P_{nom}$ ).

## 4.2.6 Transmitter intermodulation attenuation

### 4.2.6.1 Definition

The transmitter intermodulation attenuation is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by the presence of the transmitter power and an unwanted signal (interferer) reaching the transmitter via the antenna.

### 4.2.6.2 Limits

The transmitter shall comply with the requirements and corresponding limits in clauses 4.2.3, 4.2.4 and 4.2.5 in the presence of the interfering test signal described in clause 5.4.5.1.

## 4.2.7 Receiver spurious emissions

### 4.2.7.1 Definition

Receiver spurious emissions are emissions at any frequency, when the equipment is in receive mode.

### 4.2.7.2 Limits

The spurious emissions of the receiver shall not exceed the limits given in table 5.

**Table 5: Receiver spurious emission limits**

Frequency range	Measurement bandwidth	Limit
9 kHz to 1 GHz	100 kHz	-57 dBm
1 GHz to 19 GHz	1 MHz	-47 dBm

## 4.2.8 Receiver adjacent channel rejection (ACR)

### 4.2.8.1 Definition

The receiver adjacent channel rejection is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted signal (interferer) either in the first or second adjacent channel.

NOTE: Receiver adjacent channel rejection is expressed as the ratio, in dB, of the level of the unwanted signal to the level of the wanted signal, at the receiver input.

#### 4.2.8.2 Limits

The minimum receiver adjacent channel rejection for a Bit Error Rate (BER)  $\leq 10^{-6}$  is given in table 6.

**Table 6: Minimum receiver adjacent channel rejection ratio for BER  $\leq 10^{-6}$**

First adjacent channel (dB)	Second adjacent channel (dB)
20	39

#### 4.2.9 Receiver blocking

##### 4.2.9.1 Definition

Receiver blocking is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted signal (interferer) on frequencies other than those of the adjacent channels.

##### 4.2.9.2 Limits

The Bit Error Rate (BER) shall not exceed  $10^{-6}$  for the parameters provided in table 7, except at frequencies on which spurious responses are found.

**Table 7: Receiver Blocking parameters**

Centre frequency of interfering signal	Interfering signal mean power	Wanted signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
3 380 MHz to 3 820 MHz	-40 dBm	$P_{\text{SENS}} + 6$ dB	$2,5 \times \text{ChBW}$	Modulation and coding equal to those of the wanted signal
1 MHz to 3 380 MHz 3 820 MHz to 12 750 MHz	-15 dBm	$P_{\text{SENS}} + 6$ dB	$2,5 \times \text{ChBW}$	CW
NOTE: $P_{\text{SENS}}$ refers to the receiver sensitivity for a given ChBW, while decoding the signal using the most robust modulation declared by the equipment supplier.				

#### 4.2.10 Receiver intermodulation response rejection

##### 4.2.10.1 Definition and applicability

Receiver intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of two or more unwanted signals (interferers) with a specific frequency relationship to the wanted signal.

##### 4.2.10.2 Limits

The Bit Error Rate (BER) shall not exceed  $10^{-6}$  for the parameters provided in table 8.

**Table 8: Receiver intermodulation characteristics**

Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Wanted signal mean power	Type of interfering signal
-48 dBm	$1,5 \times \text{ChBW}$	$P_{\text{SENS}} + 6$ dB	CW signal
-48 dBm	$3,5 \times \text{ChBW}$	$P_{\text{SENS}} + 6$ dB	Modulation and coding equal to those of the wanted signal
NOTE: $P_{\text{SENS}}$ refers to the receiver sensitivity for a given ChBW, while decoding the signal using the most robust modulation declared by the equipment supplier.			

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## 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 [i.5].

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.

### 5.2 Product information

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

- the operating RF frequency range of the equipment;
- for equipment using multiple antennae or smart antenna systems:
  - the number of transmit chains;
  - if more than one transmit chain is active, whether the power is distributed equally or not;
  - the number of receive chains;
- the nominal occupied channel bandwidth(s);
- the modulation format(s) employed by the equipment;
- the worst case modulation scheme for each of the requirements (see clause 5);
- the Nominal Maximum Output Power accuracy ( $P_{nom}$ ) from the equipment;
- the normal and extreme operating conditions (e.g. voltage and temperature) applicable to the equipment;
- conversion relationship between BER and PER, if required.

### 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 9.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated in accordance with the principles contained within TR 100 028-1 [i.6], TR 100 028-2 [i.7] or TR 102 215 [i.8] 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 9 is based on such expansion factors.

**Table 9: Maximum measurement uncertainty**

Parameter	Conditions	Uncertainty
5.4.4 Maximum output power accuracy	-	±0,7 dB
5.4.1 Spectrum emission mask	-	±1,5 dB
5.4.2 Transmitter adjacent channel leakage power ratio	-	±0,8 dB
5.4.3 Transmitter spurious emissions	for BS and coexistence bands: for results < -60 dBm: for results > -60 dBm	±3,0 dB ±2,0 dB
	Outside above: f ≤ 2,2 GHz: 2,2 GHz < f ≤ 4 GHz: 4 GHz < f:	±1,5 dB ±2,0 dB ±4,0 dB
5.4.6 Receiver spurious emissions	for BS receive and transmit band:	±3,0 dB
	Outside above: f ≤ 2,2 GHz: 2,2 GHz < f ≤ 4 GHz: 4 GHz < f:	±2,0 dB ±2,0 dB ±4,0 dB
5.4.7 Receiver adjacent channel rejection		±1,1 dB
5.4.8 Receiver blocking	For offset < 15 MHz For offset ≥ 15 MHz and: f ≤ 2,2 GHz: 2,2 GHz < f ≤ 4 GHz: f > 4 GHz:	±1,4 dB ±1,1 dB ±1,8 dB ±3,2 dB
5.4.9 Receiver intermodulation response rejection		±1,3 dB

## 5.4 Essential radio test suites

### 5.4.1 Spectrum emission mask

#### 5.4.1.1 Test Conditions

The conformance requirements in clause 4.2.2 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed using the worst case modulation scheme for this requirement. This worst case modulation scheme shall be declared by the manufacturer.

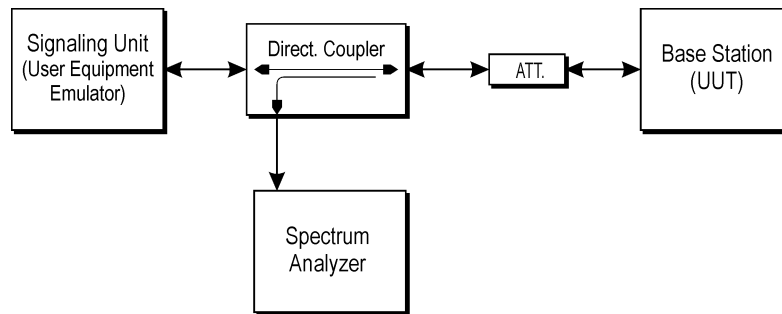
The UUT shall be configured to operate continuously at its declared Nominal Maximum Output Power (P<sub>nom</sub>) and the measurements shall be performed only during the transmitting part of the TDD frame.

When performing conducted measurements on smart or multiple antenna systems (devices with multiple transmit chains) a power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.1.2 Test Setup

The test setup is shown in figure 3.



**Figure 3: Test setup for testing the spectrum emission mask**

### 5.4.1.3 Test Procedure

The test procedure shall be as follows:

- Step 1            Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2            Make sure the data link connection has been established between the UUT and the Signalling Unit.
- Step 3            Configure the UUT to transmit at P<sub>nom</sub>.
- Step 4            Spectrum analyser settings:
- Resolution bandwidth:    100 kHz
  - Video bandwidth:        300 kHz
  - Detector mode:            True RMS
  - Sweep Time:              Gated, ≥ 5 s
  - Centre Frequency:        Centre frequency of the channel being tested
- For performing the relative measurements (figure 1), use the marker to find the highest average power level of the power envelope of the UUT. This level shall be used as the reference level for the relative measurements.
- Step 5            Compare the power envelope of the UUT with the limits provided in clause 4.2.2. A screen capture of the power envelope may be recorded.

## 5.4.2 Transmitter Adjacent Channel Leakage power Ratio (ACLR)

### 5.4.2.1 Test Conditions

The conformance requirements in clause 4.2.3 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each Channel Bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worst case modulation scheme for this requirement. This worst case modulation scheme shall be declared by the manufacturer.

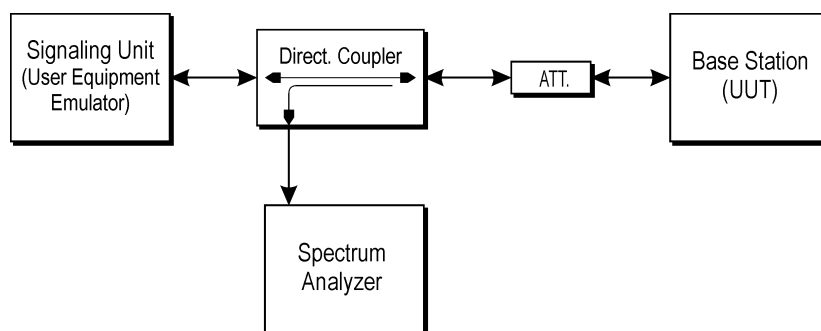
The UUT shall be configured to operate continuously at its declared Nominal Maximum Output Power (P<sub>nom</sub>) and the measurements shall be performed only during the transmitting part of the TDD frame.

In case of conducted measurements on smart or multiple antenna systems (devices with multiple transmit chains) operating in a mode with more than 1 transmit chain active simultaneously, measurements need only to be performed on one of the transmit chains (antenna outputs) provided that symmetrical power distribution is applied across all transmit chains. This assumes that the unused transmit chains are properly terminated. The results for this single transmit chain need to be extrapolated to take into account the other transmit chains in order to evaluate the measured result against the absolute mask contained in figure 2. Alternatively, or if asymmetrical power distribution is applied, a power combiner may be used to combine all transmit chains into a single test point.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

#### 5.4.2.2 Test Setup

The test setup is shown in figure 4.



**Figure 4: Test Setup for ACLR Testing**

#### 5.4.2.3 Test Procedure

The test procedure shall be as follows:

- |        |  |
|--------|--|
| Step 1 | Configure the UUT to operate on the centre frequency of the channel to be tested.  |
| Step 2 | Make sure the data link connection has been established between the UUT and the Signalling Unit.   |
| Step 3 | Configure the UUT to transmit at $P_{nom}$ .   |
| Step 4 | Spectrum analyser settings: <ul style="list-style-type: none"> <li>- Resolution bandwidth: 100 kHz</li> <li>- Video bandwidth: 300 kHz</li> <li>- Detector mode: True RMS</li> <li>- Trace mode: Average</li> <li>- Sweep Time: Gated, <math>\geq 5</math> s</li> <li>- Centre Frequency: Centre frequency of the operating channel</li> </ul> |
| Step 5 | Measure the aggregated power over a frequency range equal to 95 % of the Channel Bandwidth (ChBW) centred on the centre frequency of the operating channel.  |
| Step 6 | Change the centre frequency of the spectrum analyser to the centre frequency of the first adjacent channel below the operating channel and perform a new measurement as in step 5.   |
| Step 7 | Calculate the ACLR by subtracting the level (in dBm) measured in step 6 from the level measured in step 5. This value shall be recorded and compared with the limits in clause 4.2.3.  |
| Step 8 | Repeat steps 6 and 7 for the second adjacent channel below the operating channel and also for the first and second adjacent channel above the operating channel.   |



### 5.4.3 Transmitter spurious emissions

#### 5.4.3.1 Test Conditions

The conformance requirements in clause 4.2.4 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worst case modulation scheme for this requirement. This worst case modulation scheme shall be declared by the manufacturer.

The UUT shall be configured to operate continuously at its declared Nominal Maximum Output Power ( $P_{nom}$ ) and the measurements shall be performed only during the transmitting part of the TDD frame.

For a UUT without an integral antenna and for a UUT with an integral antenna but with a temporary antenna connector(s), one of the following options shall be used:

- The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).
- The level of unwanted emissions shall be measured as their effective radiated power when radiated by cabinet and antenna.

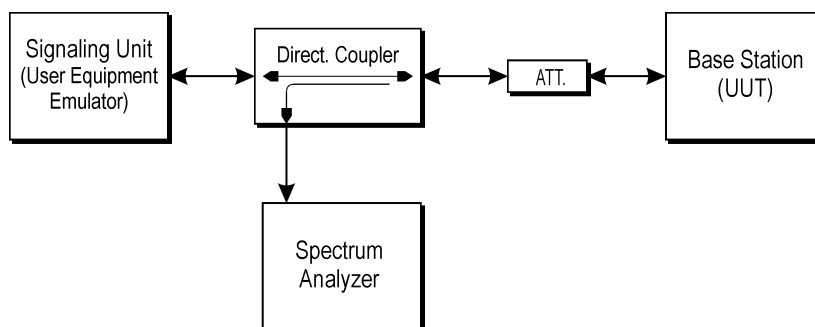
When performing the conducted spurious emissions testing on smart or multiple antenna systems (devices with multiple transmit chains) a power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

NOTE: Special care should be taken with selecting the power splitter/combiner, i.e. it should be capable to handle the output power of the UUT and it should have sufficient isolation between the ports to avoid intermodulation products being produced in the UUT.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

#### 5.4.3.2 Test Setup

Figure 5 shows the test setup for testing transmitter spurious emission.



**Figure 5: Test Setup for Transmitter Spurious Emission Testing**

#### 5.4.3.3 Test Procedure

The test procedure shall be as follows:

- Step 1 Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2 Make sure the data link connection has been established between the UUT and the Signalling Unit.

- Step 3 Configure the UUT to transmit at  $P_{nom}$ .
- Step 4 Spectrum analyser settings:
- Resolution bandwidth: see clause 4.2.4, tables 3 and 4
  - Video bandwidth: 3 times the resolution bandwidth
  - Detector mode: true RMS
  - Trace mode: average
  - Sweep Time: gated,  $\geq 5$  s
- Step 5 Measure the transmitter spurious emissions over the ranges specified in clause 4.2.4, tables 3 and 4. Any emissions that exceed the level of 6 dB below the applicable limit shall be recorded.

## 5.4.4 Maximum output power accuracy

### 5.4.4.1 Test Conditions

The conformance requirements in clause 4.2.5 shall be verified under normal and extreme operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worst case modulation scheme for this requirement. This worst case modulation scheme shall be declared by the manufacturer.

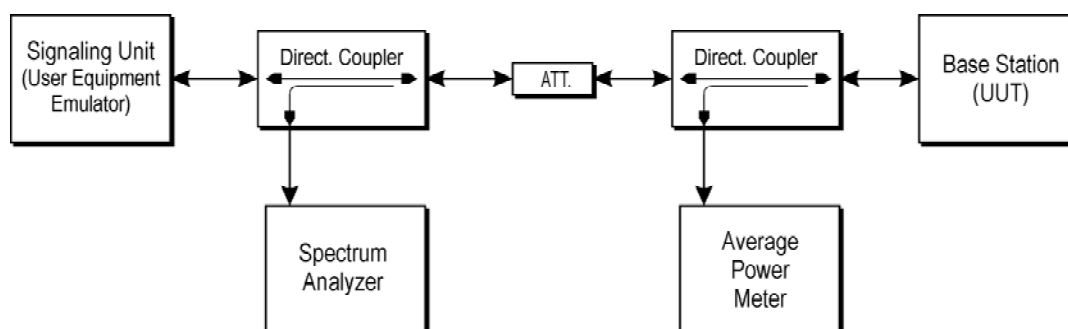
The UUT shall be configured to operate continuously at its declared Nominal Maximum Output Power ( $P_{nom}$ ) and the measurements shall be performed only during the transmitting part of TDD frame.

When performing conducted measurements on smart or multiple antenna systems (devices with multiple transmit chains) a power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.4.2 Test Setup

The test setup is shown in figure 6.



**Figure 6: Test Setup for maximum output power accuracy testing**

### 5.4.4.3 Test Procedure

The test procedure shall be as follows:

- Step 1            Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2            Make sure the data link connection has been established between the UUT and the Signalling Unit.
- Step 3            Configure the UUT to transmit at P<sub>nom</sub>.
- Step 4            Measure the actual Maximum Output Power level (P<sub>max</sub>).
- Step 5            Calculate the Maximum Output Power Accuracy by comparing the measured Maximum Output Power (P<sub>max</sub>) in step 4 above with the declared Nominal Maximum Output Power (P<sub>nom</sub>). The Maximum Output Power Accuracy shall be recorded and shall be less than the limits specified in clause 4.2.5.

## 5.4.5 Transmitter Intermodulation attenuation

### 5.4.5.1 Test Conditions

The conformance requirements in clause 4.2.6 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating ( $f_0$ ) on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The UUT shall be configured to operate continuously at its declared Nominal Maximum Output Power (P<sub>nom</sub>).

The test signal to simulate the interfering signal shall have the following characteristics:

- a) The level shall be 30 dB lower than the mean power of the wanted signal (at the UUT antenna connector).
- b) The bandwidth of the test signal (interferer) shall be equal to the bandwidth of the wanted signal. The test signal shall be like-modulated as the wanted signal, and the active time slots of both signals shall be synchronized.
- c) The centre frequency of the test signal (interferer) will be at offsets  $f_{\text{offset}} = \pm n \times \text{ChBW}$  (with  $n = 1$  to 3) from the centre frequency ( $f_0$ ) of the wanted signal on the operating channel.

NOTE: As an example, for a channel bandwidth (ChBW) of 5 MHz, the frequency of the test signal (interferer) should be  $\pm 5$  MHz,  $\pm 10$  MHz and  $\pm 15$  MHz offset from the wanted signal.

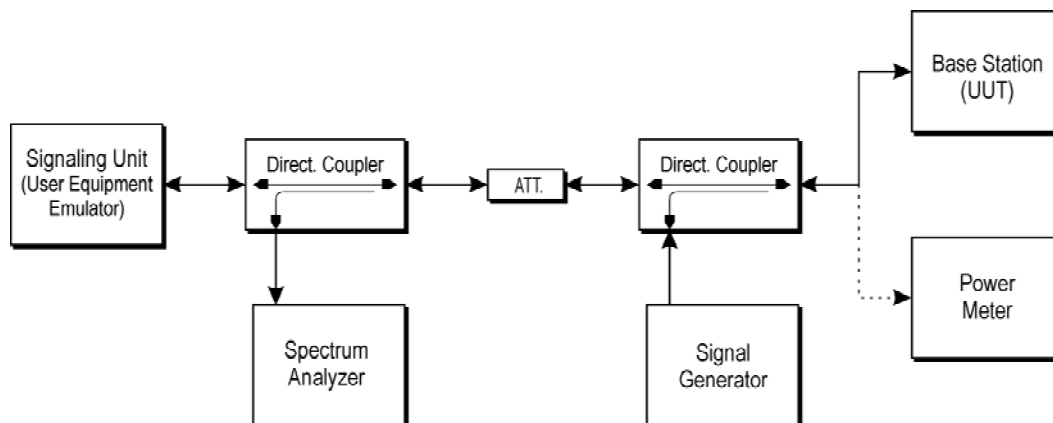
- d) Test signals that are partially or completely outside the declared operating frequency band are excluded.

When performing conducted measurements on smart or multiple antenna systems (devices with multiple transmit chains) a power splitter/combiner shall be used to combine all the transmit chains (antenna outputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.5.2 Test Setup

The test setup is shown in figure 7.



**Figure 7: Test Setup for testing the transmitter intermodulation attenuation**

### 5.4.5.3 Test Procedure

The test procedure shall be as follows:

- Step 1 Replace the UUT by the power meter and configure the signal generator to produce the test signal as described in clause 5.4.5.1.
- Step 2 Disconnect the power meter and re-connect the UUT. Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 3 Make sure the data link connection has been established between the UUT and the Signalling Unit.
- Step 4 Configure the UUT to transmit at  $P_{nom}$ .
- Step 5 Using the test procedures described in clauses 5.4.1, 5.4.2 and 5.4.3, it shall be verified whether the UUT complies with the requirements contained in clauses 4.2.2, 4.2.3 and 4.2.4 at the frequencies of all third and fifth order intermodulation products.

NOTE: The frequency band occupied by the test signal is excluded from the measurements.

- Step 6 The test shall be repeated for each of the frequencies identified for the test signal in clause 5.4.5.1.
- Step 7 It shall be recorded whether the equipment is compliant with this requirement.

## 5.4.6 Receiver spurious emissions

### 5.4.6.1 Test Conditions

The conformance requirements in clause 4.2.7 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

For UUT without an integral antenna and for a UUT with an integral antenna but with a temporary antenna connector(s), one of the following options shall be used:

- The level of unwanted emissions shall be measured as their power in a specified load (conducted spurious emissions) and their effective radiated power when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation).

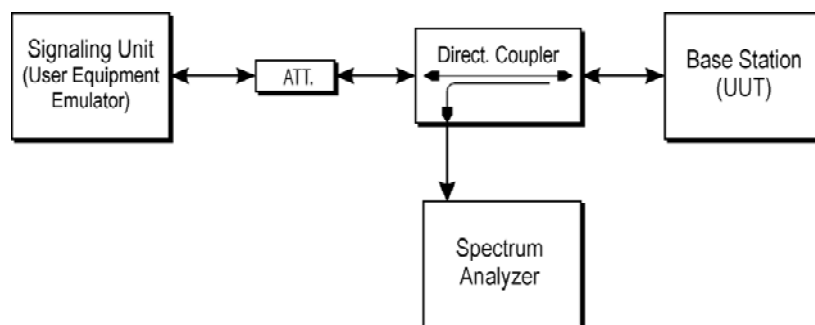
- The level of unwanted emissions shall be measured as their effective radiated power when radiated by cabinet and antenna.

When performing the conducted spurious emissions testing on multiple or smart antenna systems (devices with multiple receive chains) a power splitter/combiner shall be used to combine all the receive chains (antenna inputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

#### 5.4.6.2 Test Setup

The test setup is shown in figure 8.



**Figure 8: Test Setup for Receiver Spurious Emission Testing**

#### 5.4.6.3 Test Procedure

The test method below assumes, that for the duration of the test, the UUT is configured into a continuous receive mode, or is operated in a mode where no transmissions occur. If this is not possible, than the gating function of the spectrum analyser shall be used to ignore the transmissions from the UUT so that the measurement is performed only during the receive part of the TDD frame. The complete method of measurement shall be documented in the test report.

- Step 1            Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2            Make sure the data link connection has been established between UUT and Signalling Unit.
- Step 3            The UUT is configured to be in a continuous receive mode or in a mode where no transmissions occur.
- Step 4            Spectrum analyser settings:
- Resolution bandwidth:    see clause 4.2.7, table 5
  - Video bandwidth:        3 times the resolution bandwidth
  - Detector mode:            true RMS
  - Trace mode:                average
- Step 5            Any emissions identified that fall within the 6 dB range below the applicable limit, shall be individually measured. A simple measurement using the Video Average detector of the spectrum analyser is permitted. The measured values shall be recorded and compared with the limits in clause 4.2.7, table 5.

NOTE: The limits for receiver spurious emissions in clause 4.2.7 refer to average power levels.

## 5.4.7 Receiver adjacent channel rejection

### 5.4.7.1 Test Conditions

The conformance requirements in clause 4.2.8 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequency of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worse case modulation scheme which is applicable for this requirement. This worse case modulation scheme shall be declared by the manufacturer.

The unwanted signal (interferer) shall be an unsynchronised conforming signal with the same signalling technology and channel bandwidth as the wanted signal.

To reference the receiver adjacent channel rejection values, the receiver sensitivity level is defined as the signal level for Bit Error Rate (BER)  $\leq 10^{-6}$  performance, over the channel bandwidth, corresponding to the most robust modulation and coding rate supported by the technology.

The test procedure below includes a BER measurement. Depending on some assumed packet sizes, equivalent Packet Error Rate (PER) criteria can be used alternatively.

When performing the conducted spurious emissions testing on multiple or smart antenna systems (devices with multiple receive chains) a power splitter/combiner shall be used to combine all the receive chains (antenna inputs) into a single test point. The insertion loss of the power splitter/combiner shall be taken into account.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.7.2 Test Setup

The test setup is shown in figure 9.

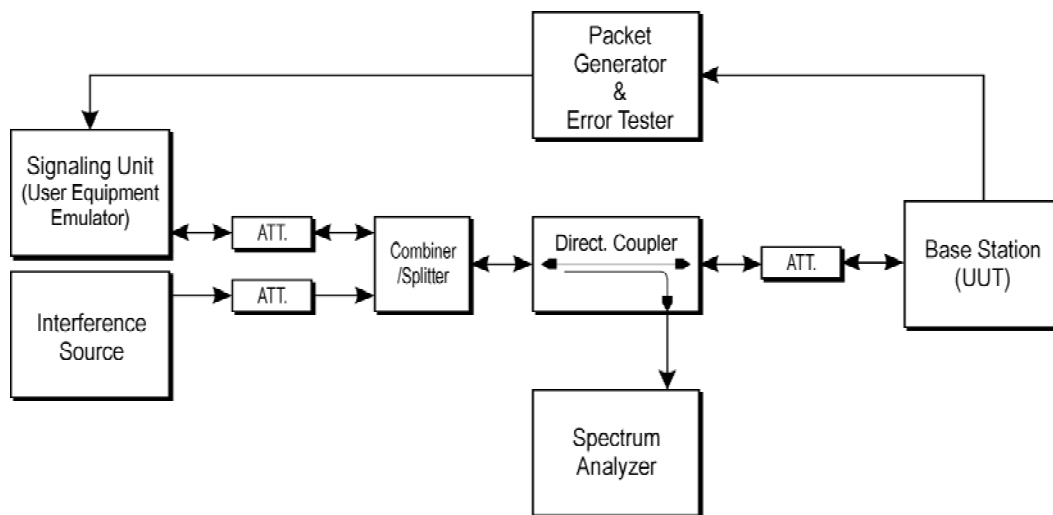


Figure 9: Test setup for receiver adjacent channel rejection test

### 5.4.7.3 Test Procedure

The test procedure shall be as follows:

- Step 1            Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2            Make sure the data link connection has been established between UUT and Signalling Unit.
- Step 3            Adjust the level of the wanted signal such that the BER or equivalent PER will correspond to a value of  $10^{-6}$ . Increase the level of the wanted signal by 3 dB.
- Step 4            Turn on the unwanted signal (interferer) and set the frequency for the upper adjacent. The interfering signal in the adjacent channel shall be transmitted in a continuous mode.
- Step 5            Perform a continuous BER measurement and increase the level of the unwanted signal (interferer) until a BER  $> 10^{-6}$  is obtained. The power difference (in dB) between the unwanted and the wanted signal, is the adjacent channel rejection. This value shall be recorded and compared with the limits in clause 4.2.8.
- Step 6            Repeat the measurement in step 5 with the frequency of the unwanted signal (interferer) set to the centre frequency of the second adjacent channel above the operating channel and also for the first and second adjacent channel below the operating channel ( $F_0 + \text{ChBW}$ ,  $F_0 - 2 \times \text{ChBW}$  and  $F_0 + 2 \times \text{ChBW}$ ).

## 5.4.8 Receiver blocking

### 5.4.8.1 Test Conditions

The conformance requirements in clause 4.2.9 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the lowest, middle and highest carrier centre frequency from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worse case modulation scheme which is applicable for this requirement. This worse case modulation scheme shall be declared by the manufacturer.

The interferer shall be an unsynchronised conforming signal with the same signalling technology and channel bandwidth as the wanted signal.

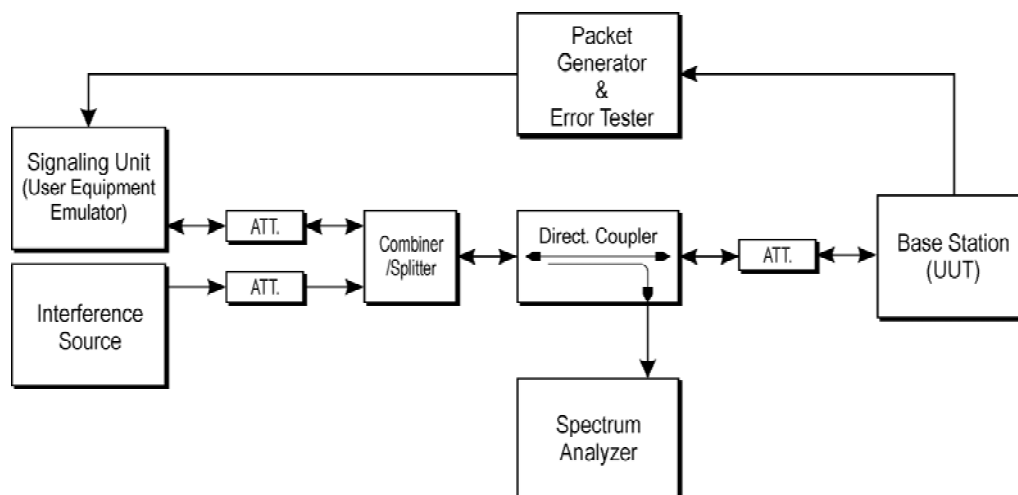
Depending on some assumed packet sizes, equivalent Packet Error Rate (PER) criteria can be used as an alternative to BER.

In the case that the UUT supports multiple receive antennas, a single channel connected to multiple antenna ports through a splitter/combiner shall be used. 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.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.8.2 Test Setup

The test setup is shown in figure 10.



**Figure 10: Test setup for receiver blocking test**

### 5.4.8.3 Test Procedure

- Step 1 Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2 Make sure the data link connection has been established between UUT and Signaling Unit.
- Step 3 Adjust the received (wanted) signal level at the UUT to be 6 dB above the level  $P_{\text{SENS}}$  under AWGN channel condition ( $P_{\text{SENS}} + 6$  dB).

NOTE: The signal level is measured over the time period of the data burst only within the downlink transmission.

- Step 4 Turn on and configure the interfering signal for Test Case 1 as defined in table 10 set to the start of the frequency range above the desired signal.
- Step 5 Measure the BER of the desired signal received over the interfering signal centre frequency range and record the results.
- Step 6 Repeat steps 4 and 5 with the interfering signal for Test Case 1 as defined in table 10 set to the start of the frequency range below the desired signal.
- 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 test case 2 defined in table 10.

**Table 10: Test Parameters for receiver blocking test**

Test Case	Centre frequency of interfering signal	Interfering signal mean power	Wanted signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
1	3 380 MHz to 3 820 MHz	-40 dBm	$P_{\text{SENS}} + 6$ dB	$2,5 \times \text{ChBW}$	Modulation and coding equal to those of the wanted signal
2	1 MHz to 3 380 MHz 3 820 MHz to 12 750 MHz	-15 dBm	$P_{\text{SENS}} + 6$ dB	$2,5 \times \text{ChBW}$	CW



## 5.4.9 Receiver intermodulation response rejection

### 5.4.9.1 Test Conditions

The conformance requirements in clause 4.2.10 shall be verified only under normal operating conditions.

The measurements shall be performed when the UUT is operating on the centre frequencies of the lowest, middle and highest channel from the declared range. The measurements shall be repeated for each channel bandwidth (ChBW) supported by the equipment.

The measurements shall be performed for the worse case modulation scheme which is applicable for this requirement. This worse case modulation scheme shall be declared by the manufacturer.

The interferers shall be unsynchronised conforming signals with the same signalling technology and channel bandwidth as the wanted signal.

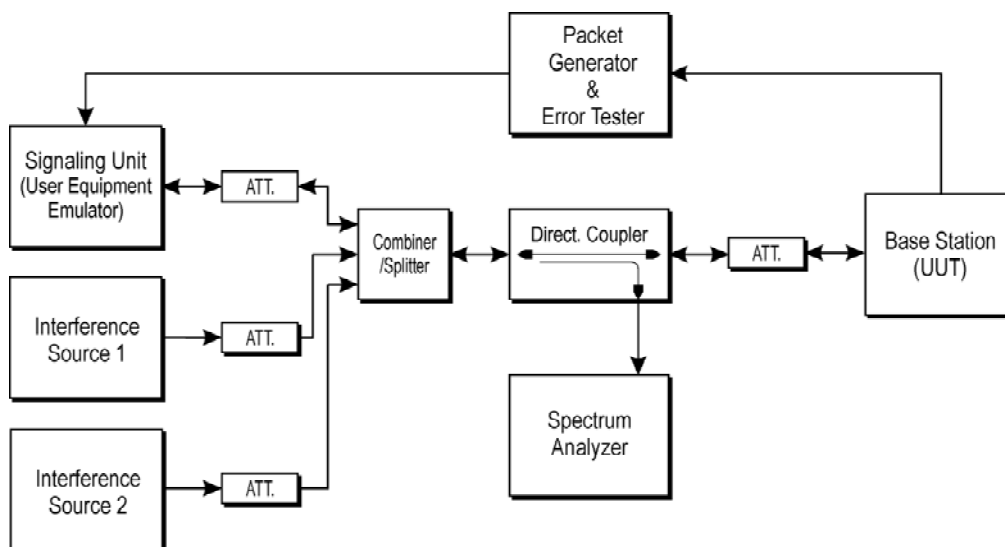
Depending on some assumed packet sizes, equivalent Packet Error Rate (PER) criteria can be used as an alternative to BER.

In the case that the UUT supports multiple receive antennas, a single channel connected to multiple antenna ports through a splitter/combiner shall be used. 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.

In the case where the UUT has an integral antenna, without temporary antenna connector(s) provided, only radiated measurements shall be used.

### 5.4.9.2 Test Setup

The test setup is shown in figure 11.



**Figure 11: Test setup for receiver intermodulation response rejection**

### 5.4.9.3 Test Procedure

- Step 1 Configure the UUT to operate on the centre frequency of the channel to be tested.
- Step 2 Make sure the data link connection has been established between UUT and Signalling Unit.
- Step 3 Adjust the received (wanted) signal level at the UUT to be 6 dB above the level  $P_{\text{SENS}}$  under AWGN channel condition ( $P_{\text{SENS}} + 6$  dB).

NOTE: The signal level is measured over the time period of the data burst only within the downlink transmission.

- Step 4 Turn on and configure the interfering signals in channels above the operating channel and in accordance with the operating ChBW of the UUT as defined in table 11.
- Step 5 Measure the BER of the desired signal received and record the results.
- Step 6 Repeat steps 3 to 5 with the interfering signals configured in channels below the operating channel and in accordance with the operating ChBW of the UUT as defined in table 11.
- 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 any alternative ChBW.

**Table 11: Test parameters for Receiver intermodulation test**

Interfering signal mean power	Offset of interfering signal from the channel edge	Wanted signal mean power	Type of interfering signal
-48 dBm	1,5 × ChBW	$P_{\text{SENS}} + 6 \text{ dB}$	CW signal
-48 dBm	3,5 × ChBW	$P_{\text{SENS}} + 6 \text{ dB}$	Modulation and coding equal to those of the wanted signal

## 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)**

<b>Harmonized Standard EN 302 774</b>						
The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&TTE Directive [i.1]						
<b>Requirement</b>			<b>Requirement Conditionality</b>		<b>Test Specification</b>	
<b>No</b>	<b>Description</b>	<b>Reference: Clause No</b>	<b>U/C</b>	<b>Condition</b>	<b>E/O</b>	<b>Reference: Clause No</b>
1	Transmitter out of band emissions	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	Maximum output power accuracy	4.2.5	U		E	5.4.4
5	Transmitter intermodulation attenuation	4.2.6	U		E	5.4.5
6	Receiver spurious emissions	4.2.7	U		E	5.4.6
7	Receiver adjacent channel rejection	4.2.8	U		E	5.4.7
8	Receiver blocking	4.2.9	U		E	5.4.8
9	Receiver intermodulation response rejection	4.2.10	U		E	5.4.9

**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.

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Annex B (informative):  
Void

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## Annex C (informative): Bibliography

- Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC Directive).
- Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- 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.

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## History

<b>Document history</b>		
V1.1.1	May 2011	Publication
V1.2.0	October 2011	One-step Approval Procedure OAP 20120215: 2011-10-18 to 2012-02-15
V1.2.1	February 2012	Publication