

Draft **ETSI EN 301 908-21** V6.0.1 (2016-01)



**IMT cellular networks;  
Harmonized Standard covering the essential requirements of  
article 3.2 of the Directive 2014/53/EU;  
Part 21: OFDMA TDD WMAN (Mobile WiMAX™)  
FDD User Equipment (UE)**

---

Reference

REN/MSG-TFES-11-21-RED

---

Keywords

FDD, IMT, IMT-2000, mobile, OFDMA, radio,  
regulation, WiMAX, WMAN

**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  
Sous-Préfecture de Grasse (06) N° 7803/88

---

**Important notice**

The present document can be downloaded from:  
<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at  
<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:  
<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

---

**Copyright Notification**

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.  
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2016.  
All rights reserved.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members.  
**3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.  
**GSM®** and the GSM logo are Trade Marks registered and owned by the GSM Association.

# Contents

Intellectual Property Rights .....	6
Foreword.....	6
Modal verbs terminology.....	6
Introduction .....	6
1 Scope.....	7
2 References .....	7
2.1 Normative references .....	7
2.2 Informative references.....	7
3 Definitions, symbols and abbreviations .....	8
3.1 Definitions.....	8
3.2 Symbols.....	9
3.3 Abbreviations .....	9
4 Technical requirements specification.....	10
4.1 Environmental profile.....	10
4.2 Conformance requirements .....	10
4.2.0 General.....	10
4.2.1 Introduction.....	10
4.2.2 Transmitter spectrum emission mask.....	11
4.2.2.1 Definition .....	11
4.2.2.2 Limits .....	11
4.2.2.2.1 Requirements for 5 MHz channel bandwidth.....	11
4.2.2.2.2 Requirements for 10 MHz channel bandwidth.....	12
4.2.2.3 Conformance.....	12
4.2.3 Transmitter Adjacent Channel Leakage power Ratio (ACLR).....	12
4.2.3.1 Definition .....	12
4.2.3.2 Limits .....	12
4.2.3.2.1 ACLR requirements for 5 MHz bandwidth.....	12
4.2.3.2.2 ACLR requirements for 10 MHz bandwidth.....	12
4.2.3.3 Conformance.....	12
4.2.4 Transmitter spurious emissions.....	13
4.2.4.1 Definition .....	13
4.2.4.2 Limits .....	13
4.2.4.2.1 Requirements for 5 MHz channel bandwidth.....	13
4.2.4.2.2 Requirements for 10 MHz channel bandwidth.....	13
4.2.4.2.3 Requirements for UE coexistence .....	14
4.2.4.3 Conformance.....	14
4.2.5 Transmitter Maximum Output Power.....	14
4.2.5.1 Definition .....	14
4.2.5.2 Limits.....	14
4.2.5.3 Conformance.....	14
4.2.6 Transmitter Minimum Output Power.....	14
4.2.6.1 Definition .....	14
4.2.6.2 Limits .....	14
4.2.6.3 Conformance.....	14
4.2.7 Receiver spurious emissions.....	14
4.2.7.1 Definition .....	14
4.2.7.2 Limits.....	15
4.2.7.3 Conformance.....	15
4.2.8 Receiver Adjacent Channel Selectivity (ACS).....	15
4.2.8.1 Definition .....	15
4.2.8.2 Limits.....	15
4.2.8.3 Conformance.....	16
4.2.9 Receiver blocking characteristics .....	16
4.2.9.1 Definition .....	16

4.2.9.2	Limits .....	16
4.2.9.3	Conformance .....	17
4.2.10	Receiver intermodulation characteristics .....	17
4.2.10.1	Definition and applicability .....	17
4.2.10.2	Limits .....	17
4.2.10.3	Conformance .....	17
4.2.11	Receiver spurious response .....	17
4.2.11.1	Definition .....	17
4.2.11.2	Limits .....	18
4.2.11.3	Conformance .....	18
4.2.12	Receiver reference sensitivity level .....	18
4.2.12.1	Definition .....	18
4.2.12.2	Limits .....	18
5	Testing for compliance with technical requirements .....	19
5.1	Environmental conditions for testing .....	19
5.2	Product information .....	19
5.3	Interpretation of the measurement results .....	19
5.4	Essential radio test suites .....	20
5.4.1	Transmitter Spectrum Emission Mask .....	20
5.4.1.1	Method of measurement .....	20
5.4.1.1.1	Initial conditions .....	21
5.4.1.1.2	Procedure .....	21
5.4.1.2	Test requirements .....	21
5.4.2	Transmitter Adjacent Channel Leakage Power Ratio .....	21
5.4.2.1	Method of measurement .....	21
5.4.2.1.1	Initial conditions .....	22
5.4.2.1.2	Procedure .....	22
5.4.2.2	Test requirements .....	23
5.4.3	Transmitter spurious emissions .....	23
5.4.3.1	Method of measurement .....	23
5.4.3.1.1	Initial conditions .....	23
5.4.3.1.2	Procedure .....	24
5.4.3.2	Test requirements .....	24
5.4.4	Transmitter Maximum and Minimum Output Power .....	24
5.4.4.1	Method of measurement .....	24
5.4.4.1.1	Initial conditions .....	25
5.4.4.1.2	Procedure .....	25
5.4.4.2	Test requirements .....	25
5.4.5	Receiver spurious emissions .....	25
5.4.5.1	Method of measurement .....	25
5.4.5.1.1	Initial conditions .....	26
5.4.5.1.2	Procedure .....	26
5.4.5.2	Test requirements .....	26
5.4.6	Receiver Adjacent Channel Selectivity (ACS) .....	26
5.4.6.1	Method of measurement .....	27
5.4.6.1.1	Initial conditions .....	27
5.4.6.1.2	Procedure .....	27
5.4.6.2	Test requirements .....	28
5.4.7	Receiver blocking characteristics .....	28
5.4.7.1	Method of measurement .....	28
5.4.7.1.1	Initial conditions .....	29
5.4.7.1.2	Procedure .....	29
5.4.7.2	Test requirements .....	29
5.4.8	Receiver intermodulation characteristics .....	29
5.4.8.1	Method of measurement .....	29
5.4.8.1.1	Initial conditions .....	30
5.4.8.1.2	Procedure .....	30
5.4.8.2	Test requirements .....	31
5.4.9	Receiver spurious response .....	31
5.4.9.1	Method of measurement .....	31
5.4.9.1.1	Initial conditions .....	31

5.4.9.1.2	Procedure.....	31
5.4.9.2	Test requirements.....	32
5.4.10	Receiver reference sensitivity level.....	32
5.4.10.1	Method of test.....	32
5.4.10.2	Test requirement.....	32
<b>Annex A (normative):</b>	<b>Relationship between the present document and the essential requirements of Directive 2014/53/EU.....</b>	<b>33</b>
<b>Annex B (normative):</b>	<b>Environmental profile specification.....</b>	<b>35</b>
<b>Annex C (informative):</b>	<b>Void.....</b>	<b>36</b>
<b>Annex D (informative):</b>	<b>Bibliography.....</b>	<b>37</b>
History.....		38

---

## Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

---

## Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared in reply to the Commission's standardisation request Commission Implementing Decision C(2015) 5376 final of 04.08.2015 to provide a means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A-1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

The present document is part 21 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.8].

<b>National transposition dates</b>	
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

---

## Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

---

## Introduction

The present document is part of a set of standards developed by ETSI that is designed to fit in a modular structure to cover radio equipment within the scope of the Radio Equipment Directive [i.2]. The present document is produced following the guidance in ETSI EG 203 366 [i.3] as applicable.

# 1 Scope

The present document applies to the following radio equipment type:

- Mobile WiMAX™ FDD User Equipment for IMT-OFDMA TDD WMAN.

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

**Table 1-1: Mobile WiMAX™ FDD Operating frequency bands**

Mobile WiMAX™ Band Class Index	Direction of transmission	Mobile WiMAX FDD frequency bands
7G	Transmit	880 MHz to 915 MHz
	Receive	925 MHz to 960 MHz
6C	Transmit	1 710 MHz to 1 785 MHz
	Receive	1 805 MHz to 1 880 MHz

The present document contains requirements to demonstrate that Radio equipment both effectively uses and supports the efficient use of radio spectrum in order 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 Radio Equipment Directive 2014/53/EU [i.2] 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>.

## 2 References

### 2.1 Normative references

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

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

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

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

- [1] WMF-T25-002-R010v06 (2012): "WiMAX Forum® Test Procedures - Mobile Radio Conformance Tests" - Release 1 v06.
- [2] CEPT/ERC/Recommendation 74-01E (Siófok 98, Nice 99, Sesimbra 02, Hradec Kralove 05, Cardiff 11) (01-2011): "Unwanted emissions in the spurious domain".

### 2.2 Informative references

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

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

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] Recommendation ITU-R SM.329-10 (2012): "Unwanted emissions in the spurious domain".

- [i.2] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC Text with EEA relevance.
- [i.3] ETSI EG 203 336 (V1.1.1) (2015): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonized Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.4] ETSI EN 300 019-1-0: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-0: Classification of environmental conditions; Introduction".
- [i.5] 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.6] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.7] Standardisation request M/536: "Commission implementing decision of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council".
- [i.8] ETSI EN 301 908-1 (V11.0.1) (01-2016): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the Directive 2014/53/EU [i.2] 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\_BW1:** 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\_BW2 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 adjacent victim channel

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

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 measured at the antenna connector in a specified reference condition



**mean power:** power (transmitted or received) in a bandwidth when applied to a modulated signal

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 effect 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

**receiver thermal noise power:** equal to  $k \times T \times BW \times F$

**WiMAX™:** trademarked name for the OFDMA TDD WMAN IMT technology

NOTE: WiMAX™ is an example of a suitable technology available commercially. This information is given for the convenience of users of the present document and does not constitute an endorsement by ETSI of this technology.

## 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_BW1
dBm	decibel relative to 1 milliwatt
BW	Assigned channel bandwidth
f	Frequency of measurement
$F_c$	centre frequency of the assigned channel
F	Receiver noise figure
k	Boltzmann's constant
GHz	GigaHertz
$M_{BS}$	Base Station Interface M
MHz	MegaHertz
$M_{MS}$	Mobile Station Interface M
N	Maximum number of antennas in a multiple antenna configuration
$N_{th}$	Receiver thermal noise power expressed in dBm
$P_{SENS}$	Receiver sensitivity level at $BER \leq 10^{-6}$ (or equivalent PER) performance corresponding to the most robust modulation and coding rate supported by the technology
$P_{nom}$	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
T	Ambient temperature in Kelvin

## 3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BER	Bit Error Ratio

BS	Base Station
BW	BandWidth
CW	Continuous Wave
EC	European Commission
EFTA	European Free Trade Association
ERM	Electromagnetic compatibility and Radio spectrum Matters
EUT	Equipment Under Test
FDD	Frequency Division Duplexing
IMT	International Mobile Telecommunications
MS	Mobile Station
MSG	Mobile Standards Group
OFDMA	Orthogonal Frequency-Division Multi Access
PER	Packet Error Ratio
RED	Radio Equipment Directive
RF	Radio Frequency
RMS	Root Mean Square
SM	Spectrum Management
TDD	Time Division Duplex
TFES	Task Force for European Standards for IMT
TPC	Transmit Power Control
UE	User Equipment
UUT	Unit Under Test
WMAN	Wireless Metropolitan Area Network

---

## 4 Technical 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 supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

### 4.2 Conformance requirements

#### 4.2.0 General

This clause describes the conformance requirements for OFDMA FDD WMAN User Equipment (UE).

#### 4.2.1 Introduction

To meet the essential requirement under article 3.2 of the Directive 2014/53/EU [i.2] (Radio Equipment Directive) for IMT User Equipment (UE) six essential parameters in addition to those in ETSI EN 301 908-1 [i.8] have been identified. Table 4.2.1-1 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 4.2.1-1 shall be verified.

**Table 4.2.1-1: Cross references**

Essential parameter	Corresponding technical requirements	Corresponding test suite
Transmitter spectrum mask	4.2.2 Transmitter Spectrum emissions mask 4.2.3 Transmitter adjacent channel leakage power ratio	5.4.1
Transmitter unwanted emissions in the out of band domain		5.4.2
Transmitter unwanted emissions in the spurious domain	4.2.4 Transmitter spurious emissions	5.4.4
Transmitter power limits	4.2.5 Transmitter maximum output power	5.4.4
Transmitter power accuracy	4.2.6 Transmitter minimum output power	5.4.4
Receiver unwanted emissions in the spurious domain	4.2.7 Receiver spurious emissions	5.4.5
Receiver blocking	4.2.9 Receiver Blocking characteristics	5.4.7
Receiver spurious response rejection	4.2.11 Receiver spurious response	5.4.9
Receiver radio-frequency intermodulation	4.2.10 Receiver Intermodulation characteristics	5.4.8
Receiver adjacent signal selectivity	4.2.8 Receiver Adjacent Channel Selectivity (ACS)	5.4.6
Receiver sensitivity	4.2.12 Receiver Reference Sensitivity level	5.4.10
Antenna		

Unless otherwise stated, the transmitter and receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi should be assumed for each antenna port(s). A UE with integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna.

## 4.2.2 Transmitter 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 4.2.2.2.1-1 and 4.2.2.2.2-1 for the appropriate UE maximum output power and nominal channel bandwidths of 5 MHz and 10 MHz.

Integration bandwidth refers to the frequency range over which the emission power is integrated.

$\Delta f$  is defined as the frequency offset in MHz from the channel centre frequency.

#### 4.2.2.2.1 Requirements for 5 MHz channel bandwidth

**Table 4.2.2.2.1-1: Spectrum emission mask requirement**

Segment number	Offset from channel centre frequency ( $\Delta f$ ) (MHz)	Integration bandwidth (kHz)	Allowed emission level within the integration bandwidth (dBm)
1	2,5 to < 3,5	50	-13
2	3,5 to < 7,5	1 000	-10
3	7,5 to < 8,5	1 000	-13
4	8,5 to $\leq$ 12,5	1 000	-25

## 4.2.2.2.2 Requirements for 10 MHz channel bandwidth

**Table 4.2.2.2-1: Spectrum emission mask requirement**

Segment number	Offset from channel centre frequency ( $\Delta f$ ) (MHz)	Integration bandwidth (kHz)	Allowed emission level within the integration bandwidth (dBm)
1	5,0 to < 6,0	50	-13
2	6,0 to < 10	1 000	-10
3	10,0 to < 11,0	1 000	-13
4	11,0 to $\leq$ 25,0	1 000	-25

## 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 the first adjacent channel. The filter pass band, response and nominal bandwidth are set according to Eval\_BW 1 or Eval\_BW 2.

## 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 4.2.3.2.1-1.

**Table 4.2.3.2.1-1: 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 4.2.3.2.2-1.

**Table 4.2.3.2.2-1: 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
$F_c \pm 10,0$ MHz	29,2	32,2
$F_c \pm 20,0$ MHz	43,2	42,2

## 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. The spurious emission limits are specified in terms of general requirements in line with Recommendation ITU-R SM.329-10 [i.1] and frequency range specific requirements to address inter-system co-existence.

### 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 [2].

The following requirements in tables 4.2.4.2.1-1, 4.2.4.2.2-1 and 4.2.4.2.2-2 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.

#### 4.2.4.2.1 Requirements for 5 MHz channel bandwidth

**Table 4.2.4.2.1-1: Spurious Emission requirement for 5 MHz channel bandwidth**

Segment	Frequency Range	Measurement Bandwidth	Maximum allowed level (dBm)
1	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36
2	$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36
3	$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	100 kHz	-36
4	$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	30 kHz If $12,5 \text{ MHz} \leq  f_c - f  < 50 \text{ MHz}$ 300 kHz If $50 \text{ MHz} \leq  f_c - f  < 60 \text{ MHz}$ 1 MHz If $60 \text{ MHz} \leq  f_c - f $	-30

#### 4.2.4.2.2 Requirements for 10 MHz channel bandwidth

**Table 4.2.4.2.2-1: Spurious Emission requirement for 10 MHz channel bandwidth**

Segment	Frequency Range	Measurement Bandwidth	Maximum allowed level (dBm)
1	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36
2	$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36
3	$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	100 kHz	-36
4	$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	30 kHz If $25 \text{ MHz} \leq  f_c - f  < 100 \text{ MHz}$ 300 kHz If $100 \text{ MHz} \leq  f_c - f  < 120 \text{ MHz}$ 1 MHz If $120 \text{ MHz} \leq  f_c - f $	-30

#### 4.2.4.2.3 Requirements for UE coexistence

**Table 4.2.4.2.3-1: Spurious Emission requirement for UE coexistence**

Mobile WiMAX™ Band (MHz)	Protected Frequency band (MHz)	Measurement bandwidth	Maximum Emission Level (dBm)
880 to 915 1 710 to 1 785	791 to 821	1	-50
	925 to 960	1	-50
	1 805 to 1 880	1	-50
	1 880 to 1 920	1	-50
	1 900 to 1 920	1	-50
	2 010 to 2 025	1	-50
	2 110 to 2 170	1	-50
	2 300 to 2 400	1	-50
	2 570 to 2 690	1	-50

NOTE: As exceptions, measurements with a level up to the applicable requirements defined in table 4.2.4.2-1 are permitted for each assigned WiMAX™ carrier used in the measurement due to 2<sup>nd</sup> or 3<sup>rd</sup> harmonic spurious emissions. An exception is allowed if there is at least one individual sub carrier within the transmission bandwidth for which the 2<sup>nd</sup> or 3<sup>rd</sup> harmonic, i.e. the frequency equal to two or three times the frequency of that sub carrier is within the measurement bandwidth.

#### 4.2.4.3 Conformance

Conformance tests described in clause 5.4.3 shall be carried out.

### 4.2.5 Transmitter Maximum Output Power

#### 4.2.5.1 Definition

The UE maximum output power is measured over total allocated channel bandwidth available at the antenna connector.

#### 4.2.5.2 Limits

The UE maximum output power shall not exceed 23 dBm.

#### 4.2.5.3 Conformance

Conformance tests described in clause 5.4.4 shall be carried out.

### 4.2.6 Transmitter Minimum Output Power

#### 4.2.6.1 Definition

The UE minimum output power is measured over total allocated channel bandwidth available at the antenna connector when the power is set to the minimum value.

#### 4.2.6.2 Limits

The UE minimum output power shall not exceed -22 dBm.

#### 4.2.6.3 Conformance

Conformance tests described in clause 5.4.4 shall be carried out.

### 4.2.7 Receiver spurious emissions

#### 4.2.7.1 Definition

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

### 4.2.7.2 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 [2].

Table 4.2.7.2-1 lists the receiver spurious emission requirements where  $f_c$  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 4.2.7.2-1: Receiver spurious emissions**

Frequency band	Measurement bandwidth	Maximum Level
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	-57 dBm
$1 \text{ GHz} \leq f \leq 12,75 \text{ GHz}$	1 MHz	-47 dBm

### 4.2.7.3 Conformance

Conformance tests described in clause 5.4.5 shall be carried out.

## 4.2.8 Receiver Adjacent Channel Selectivity (ACS)

### 4.2.8.1 Definition

The receiver adjacent and 2<sup>nd</sup> 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 (Nth).

To reference the receiver adjacent and 2<sup>nd</sup> 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, over the channel bandwidth (5 MHz or 10 MHz), corresponding to the most robust modulation and coding rate supported by the technology.

Nth 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.

### 4.2.8.2 Limits

Tables 4.2.8.2-1 and 4.2.8.2-2 specifies the limits and the test parameters for the receiver ACS in the first adjacent channel and 2<sup>nd</sup> adjacent channels for 5 MHz and 10 MHz channel bandwidths, respectively. For an assigned channel bandwidth of 5 MHz, an interferer channel bandwidth of 5 MHz is used and for an assigned channel bandwidth of 10 MHz, an interferer channel bandwidth of 10 MHz is used. The wanted and interferer power levels are evaluated over 95 % of the BW centred on the wanted or adjacent channel as identified in tables 4.2.8.2-1 or 4.2.8.2-2. 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. Alternatively depending on packet sizes supported, equivalent Packet Error Ratio (PER) criteria can be used.

**Table 4.2.8.2-1: Limits and test parameters for receiver adjacent channel selectivity for 5 MHz channel bandwidth**

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

**Table 4.2.8.2-2: Limits and test parameters for receiver adjacent channel selectivity for 10 MHz channel bandwidth**

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

### 4.2.8.3 Conformance

Conformance tests described in clause 5.4.6 shall be carried out.

## 4.2.9 Receiver blocking characteristics

### 4.2.9.1 Definition

The blocking characteristic is a measure of the receiver's 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 spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply to all frequencies except those at which a spurious response occur.

$P_{\text{SENS5}}$  and  $P_{\text{SENS10}}$  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.

### 4.2.9.2 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  $P_{\text{SENS5}}$ .
- Interfering signal with the following parameters.

**Table 4.2.9.2-1: Receiver In-Band Blocking Limits for 5 MHz channel bandwidth**

Centre frequency of interfering signal (MHz)	Interfering signal mean power (dBm)	Wanted signal mean power (dB)	Minimum offset of interfering signal from the channel edge (MHz)	Type of interfering signal
925 to 960	-49	$P_{\text{SENS5}} + 6$	12,5	Modulation and coding equal to wanted signal
1 805 to 1 880	-49	$P_{\text{SENS5}} + 6$	12,5	Modulation and coding equal to 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  $P_{\text{SENS10}}$ .
- Interfering signal with the following parameters.

**Table 4.2.9.2-2: Receiver In-Band Blocking Limits for 10 MHz channel bandwidth**

Centre frequency of interfering signal (MHz)	Interfering signal mean power (dBm)	Wanted signal mean power (dB)	Minimum offset of interfering signal from the channel edge (MHz)	Type of interfering signal
925 to 960	-49	$P_{\text{SENS10}} + 6$	25	Modulation and coding equal to wanted signal
1 805 to 1 880	-49	$P_{\text{SENS10}} + 6$	25	Modulation and coding equal to wanted signal



### 4.2.9.3 Conformance

Conformance tests described in clause 5.4.7 shall be carried out.

## 4.2.10 Receiver intermodulation characteristics

### 4.2.10.1 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.

### 4.2.10.2 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 4.2.10.2-1: Receiver intermodulation characteristics for 5 MHz channel bandwidth**

Interfering signal mean power	Offset of interfering signal centre frequency 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 4.2.10.2-2: 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

### 4.2.10.3 Conformance

Conformance tests described in clause 5.4.8 shall be carried out.

## 4.2.11 Receiver spurious response

### 4.2.11.1 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 4.2.10.2-1 and 4.2.10.2-2 are not met.

### 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  $P_{SENS5}$ .

**Table 4.2.11.2-1: Receiver spurious response for 5 MHz channel bandwidth**

Centre frequency of interfering signal (MHz)	Interfering signal mean power (dBm)	Wanted signal mean power (dB)	Minimum offset of interfering signal from the channel edge (MHz)	Type of interfering signal
925 to 960	-44	$P_{SENS5} + 6$	10	Modulation and coding equal to wanted signal
1 805 to 1 880	-44	$P_{SENS5} + 6$	10	Modulation and coding equal to 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  $P_{SENS10}$ .

**Table 4.2.11.2-2: Receiver spurious response for 10 MHz channel bandwidth**

Centre frequency of interfering signal (MHz)	Interfering signal mean power (dBm)	Wanted signal mean power (dB)	Minimum offset of interfering signal from the channel edge (MHz)	Type of interfering signal
925 to 960	-44	$P_{SENS10} + 6$	20	Modulation and coding equal to wanted signal
1 805 to 1 880	-44	$P_{SENS10} + 6$	20	Modulation and coding equal to wanted signal

### 4.2.11.3 Conformance

Conformance tests described in clause 5.4.9 shall be carried out.

## 4.2.12 Receiver reference sensitivity level

### 4.2.12.1 Definition

The reference sensitivity power level is the minimum mean power received at the UE / MS receiver input connector at which a reference performance requirement shall be met for specified reference measurement channels.

### 4.2.12.2 Limits

The reference sensitivity level is the minimum mean power received at the UE / MS receiver input connector at which the Packet Error Rate (PER) shall not exceed a specific value.

The reference sensitivity level requirement tests are defined within WiMAX Forum® document WMF-T25-002-R010v06 [1].

The limits are detailed in the items below in the document:

- Clause 9.1.10: MS receiver sensitivity.
- Appendix 1 (This section provides generic test packets, receiver sensitivity requirements, Bit Error Rate (BER) to Packet Error Rate (PER) conversion and Qualitative tests versus Functional tests methodology).
- Appendix 3 (A 3.1 Measuring PER for MS. A 3.2 Measuring PER for BS).

---

## 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 ETSI EN 300 019-1-0 [i.4].

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 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 ( $P_{\text{nom}}$ ) from the equipment and power class;
- the operational environmental profile(s) applicable to the equipment;
- the TPC range(s);
- the receiver sensitivity levels  $P_{\text{SENS5}}$  and  $P_{\text{SENS10}}$ ;
- The equipment receiver thermal noise power  $N_{\text{th}}$  (in dBm).

### 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 documented 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 5.3-1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor)  $k = 1,96$  (which provides a confidence level of 95 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)). Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.6] or ETSI TR 102 215 [i.5].

Table 5.3-1 is based on such expansion factors.

**Table 5.3-1: Maximum measurement uncertainty of the test system**

Parameter	Conditions	Uncertainty
Maximum output power tolerance		±0,7 dB
Spectrum emission mask		±1,5 dB
Transmitter adjacent channel leakage power ratio	-	±0,8 dB
Transmitter spurious emissions	9 kHz < f ≤ 4 GHz	±2,0 dB
	4 GHz < f ≤ 12,75 GHz	±4,0 dB
Transmitter Minimum Output Power		±1,1 dB
Receiver Adjacent Channel Selectivity		±1,0 dB
Receiver Blocking Characteristics		±1,3 dB
Receiver Spurious Response		±1,3 dB
Receiver Intermodulation Characteristics		±1,4 dB
Receiver spurious emissions	30 MHz ≤ f ≤ 4,0 GHz	±2,0 dB
	4 GHz < f ≤ 12,75 GHz	±4,0 dB
NOTE 1: For RF tests it should be noted that the uncertainties in table 5.3-1 apply to the test system operating into a nominal 50 Ω load and do not include system effects due to mismatch between the EUT and the test system.		
NOTE 2: If the test system for a test is known to have a measurement uncertainty greater than that specified in table 5.3-1, this equipment can still be used provided that an adjustment is made as follows: any additional uncertainty in the test system over and above that specified in table 5.3-1 should be used to tighten the test requirements - making the test more stringent to pass (for some tests, e.g. receiver tests, this may require modification of stimulus signals). This procedure will ensure that a test system not compliant with table 5.3-1 does not increase the probability of passing an EUT that would otherwise have failed a test if a test system compliant with table 5.3-1 had been used.		

## 5.4 Essential radio test suites

All tests are carried out under normal environmental conditions unless otherwise specified.

### 5.4.1 Transmitter Spectrum Emission Mask

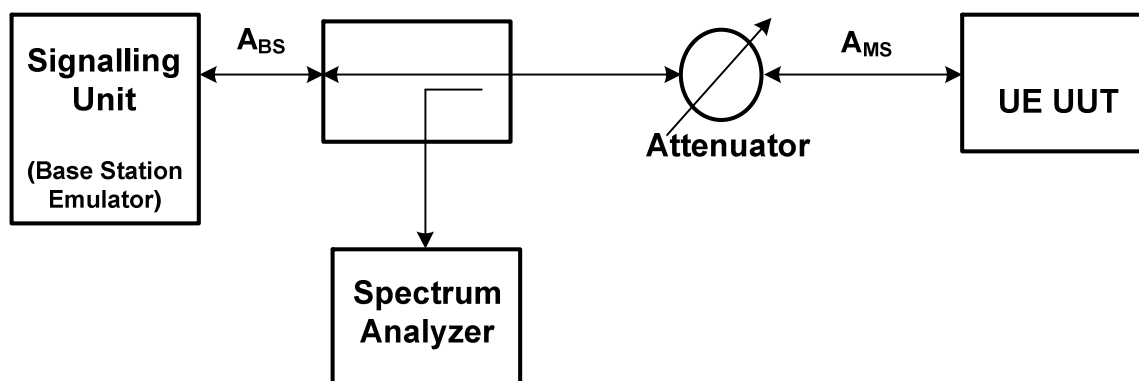
The purpose of this test is to verify compliance of UE equipment to the spectrum mask emission requirements of clause 4.2.2.

#### 5.4.1.1 Method of measurement

Figure 5.4.1.1-1 shows the test setup for testing UE spectrum emission masks.

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  $P_{nom}$  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  $P_{nom}$  (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).



**Figure 5.4.1.1-1: Test Setup for UE transmitter spectrum emission mask measurement**

#### 5.4.1.1.1 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; 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 shall 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.

#### 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 Signaling Unit.
- Step 3 The spectrum analyser shall be correctly configured to measure the spectral mask. The UE UUT is configured to transmit at  $P_{nom}$  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 4.2.2.2.1-1 (or table 4.2.2.2.2-1) according to 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 and 4 at the middle and highest RF channel centre frequencies from the declared range.
- Step 6 Repeat steps 2 to 5 for all modulation schemes supported by the equipment under test.
- Step 7 End of test.

#### 5.4.1.2 Test requirements

For the UE UUT the signal spectrum recorded in the steps above for each of the RF channel centre frequencies shall meet the requirements of clause 4.2.2.2 for the appropriate channel bandwidth supported.

### 5.4.2 Transmitter Adjacent Channel Leakage Power Ratio

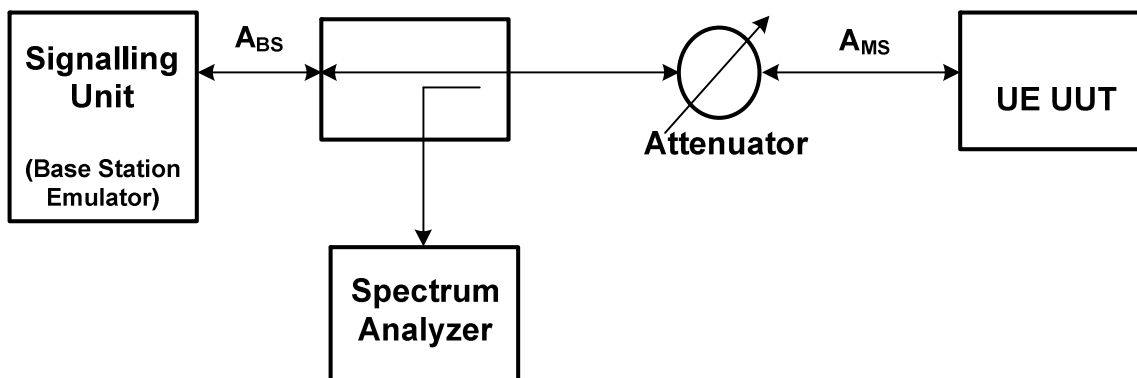
The purpose of this test to verify compliance of UE equipment to the transmitter adjacent leakage power ratio requirements of clause 4.2.2.

#### 5.4.2.1 Method of measurement

Figure 5.4.2.1-1 shows the test setup for testing UE ACLR.

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.
- 2) To test the mode with multiple antenna enabled:
  - a) Steps 1 to 7 shall be repeated when all antenna are enabled (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).



**Figure 5.4.2.1-1: 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 under normal environmental conditions.

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 shall 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.

#### 5.4.2.1.2 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 Signaling Unit.
- Step 3 The spectrum analyser shall be correctly configured to measure the aggregated power. 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 BW1 measurement and to 3,84 MHz and 7,68 MHz (for 5 MHz and 10 MHz cases respectively) for EVAL BW2 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 centre frequency.
- Step 7 Average over a sufficient number of transmitted bursts to obtain a stable reading.



In spectrum analyser, set the measurement bandwidth as specified in the relevant tables 4.2.4.2.1-1, 4.2.4.2.2-1 and 4.2.4.2.2-2 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 from the declared range.
- Step 2 Make sure the data link connection has been established between UE UUT and Signaling 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 4.2.4.2.1-1, 4.2.4.2.2-1 and 4.2.4.2.2-2 according to the specified measurement bandwidths in the tables.
- Step 5 Repeat steps 2 to 4 at middle and highest RF channel centre frequencies from the declared range.
- Step 6 End of test.

#### 5.4.3.2 Test requirements

For the UE UUT the transmitter spurious emission levels recorded in the steps above for each of the RF channel centre frequencies shall meet the requirements of clause 4.2.4.2.

### 5.4.4 Transmitter Maximum and Minimum Output Power

The purpose of this test is to verify compliance of UE equipment transmitter maximum output power and minimum transmit power control in support of the requirements of clauses 4.2.5 and 4.2.6.

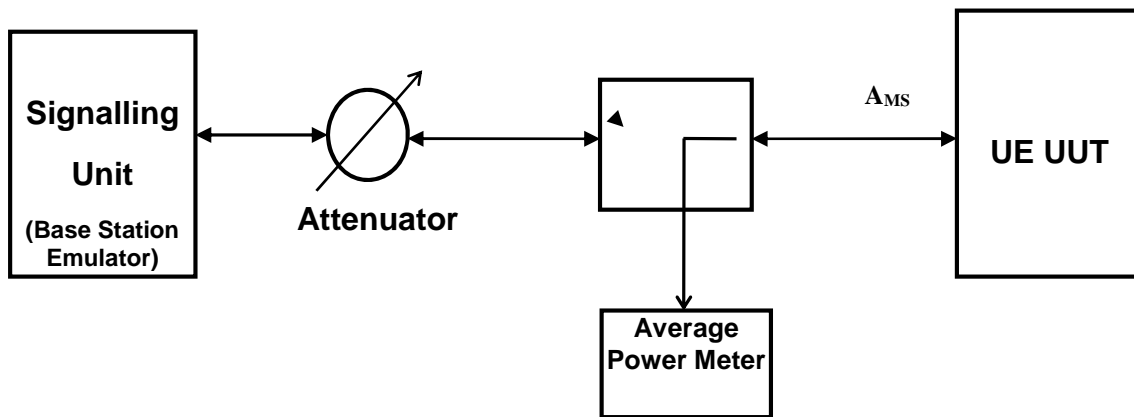
#### 5.4.4.1 Method of measurement

Figure 5.4.4.1-1 shows the test setup for testing UE nominal maximum and minimum output transmitter power.

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 below shall be performed on a selected single antenna port.
- 2) To test the mode with multiple antenna enabled:
  - a) Steps 1 to 9 below shall be repeated when all antenna are enabled (e.g. each antenna is transmitting at  $P_{nom} - 10\log_{10}(N)$  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).





**Figure 5.4.4.1-1: Test Setup for UE maximum and minimum transmitter output power**

#### 5.4.4.1.1 Initial conditions

The UUT shall be configured to operate at the  $P_{nom}$  level declared for the equipment under normal environmental conditions.

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 Ensure the data link connection has been established between UE UUT and Signaling Unit.
- Step 3 The UE UUT shall be configured to continuously transmit at the declared  $P_{nom}$ .
- Step 4 Measure and note the measured power level for compliance with maximum output power in clause 4.2.5.
- Step 5 Configure the Signaling Unit to instruct the UE UUT to decrease the transmit power down to the point that the power cannot be reduced further.
- Step 6 Measure and note the measured power level for compliance with minimum output power in clause 4.2.6.
- Step 7 Repeat steps 3 to 6 at the middle and highest RF channel centre frequencies from the declared range.
- Step 8 Repeat steps 2 to 7 for all modulation schemes supported by the UE UUT.
- Step 9 Repeat steps 1 to 8 under extreme environmental conditions TL/VL, TL/VH, TH/VL and TH/VH. (See annex B.)
- Step 10 End of test.

#### 5.4.4.2 Test requirements

For the UE UUT the maximum and minimum power levels recorded in the steps above for each of the RF channel centre frequencies and environmental conditions shall meet the requirements of clauses 4.2.5 and 4.2.6.

### 5.4.5 Receiver spurious emissions

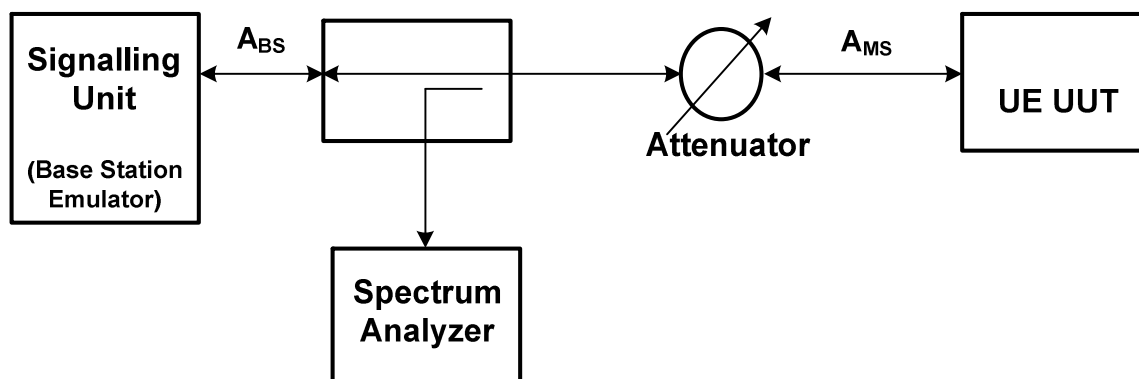
The purpose of this test to verify compliance of UE equipment to the transmitter spurious emission requirements of clause 4.2.8.

#### 5.4.5.1 Method of measurement

Figure 5.4.5.1-1 shows the test setup for testing UE receiver spurious emission.

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 (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).



**Figure 5.4.5.1-1: Test Setup for UE receiver spurious emission measurement**

#### 5.4.5.1.1 Initial conditions

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 analyser, set the measurement bandwidth as specified in the relevant table 4.2.7.2-1 of clause 4.2.7. Set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

#### 5.4.5.1.2 Procedure

- Step 1 Set the RF channel at lowest channel centre frequency from the declared range.
- Step 2 Ensure the data link connection has been established between UE UUT and Signaling 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 4.2.7 table 4.2.7.2-1 according to the specified measurement bandwidths in the tables.
- Step 5 Repeat steps 2 to 4 at middle and highest RF channel centre frequencies from the declared range.
- Step 6 End of test.

#### 5.4.5.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.7.2 in order to show compliance.

### 5.4.6 Receiver Adjacent Channel Selectivity (ACS)

The purpose of this test to verify compliance of UE equipment to receiver adjacent channel selectivity requirements of clause 4.2.8.

### 5.4.6.1 Method of measurement

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

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

Figure 5.4.6.1-1 shows the test setup for testing UE receiver adjacent channel selectivity.

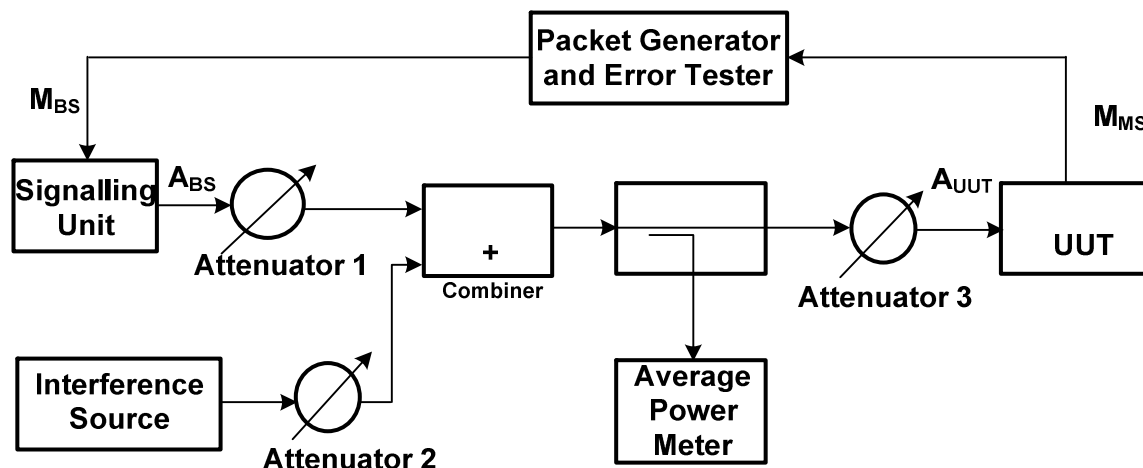


Figure 5.4.6.1-1: Test setup for UE receiver adjacent channel selectivity measurement

#### 5.4.6.1.1 Initial conditions

Set the interfering source to the first adjacent channel operating frequency in accordance with tables 4.2.8.2-1 or 4.2.8.2-2. Set the interfering signal source bandwidth to be the same as the in-channel operating bandwidth. Turn the interfering source off.

#### 5.4.6.1.2 Procedure

##### Test case for 5 MHz channel bandwidth

- Step 1 Set the UUT and signalling unit to the RF channel corresponding to the lowest channel centre frequency from the declared range.
- Step 2 Adjust the received signal level at  $A_{UUT}$  to be 3 dB above the sensitivity level  $P_{SENS5}$  for 5 MHz.
- Step 3 Turn on the interfering source and configure it to transmit at  $F_c - 5$  MHz from the nominal (desired) operation frequency.
- Step 4 Increase the interfering source power to the interference level in table 4.2.8.2-1.
- Step 5 Perform a BER measurement and record the results.
- Step 6 Turn the interference source off.
- Step 7 Set the interfering source to the second adjacent channel operating frequency. Repeat steps 2 to 6 above for the test cases shown in table 4.2.9.2-1.
- Step 8 Reset the interfering source to the first adjacent channel operating frequency and repeat the steps 2 to 7 at the middle and highest RF channel centre frequencies from the declared frequency range.
- Step 9 End of test.

### Test case for 10 MHz channel bandwidth

- Step 1 Set the UUT and signalling unit to the RF channel corresponding to the lowest channel centre frequency from the declared range.
- Step 2 Adjust the received signal level at  $A_{UUT}$  to be 3 dB above the sensitivity level  $P_{SENS10}$  for 10 MHz.
- Step 3 Turn on the interfering source and configure it to transmit at  $F_c - 10$  MHz from the nominal (desired) operation frequency.
- Step 4 Increase the interfering source power to the interference level in table 4.2.8.2-2.
- Step 5 Perform a BER measurement and record the results.
- Step 6 Turn the interference source off.
- Step 7 Set the interfering source to the second adjacent channel operating frequency. Repeat steps 2 to 6 above for the test cases shown in table 4.2.8.2-2.
- Step 8 Reset the interfering source to the first adjacent channel operating frequency and repeat the steps 2 to 7 at the middle and highest RF channel centre frequencies from the declared frequency range.
- Step 9 End of test.

### 5.4.6.2 Test requirements

For the UE UUT the worst case BER measurement recorded in steps above for each of the RF channel centre frequencies shall meet the requirements of clause 4.2.8.2.

### 5.4.7 Receiver blocking characteristics

The purpose of this test is to verify compliance of UE equipment to the receiver blocking characteristics requirements of clause 4.2.9.

#### 5.4.7.1 Method of measurement

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

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

Figure 5.4.7.1-1 shows the test setup of the receiver blocking test.

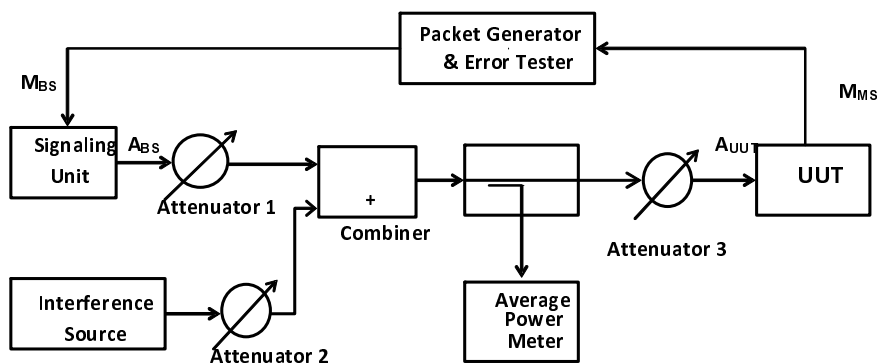


Figure 5.4.7.1-1: Test Setup for UE receiver blocking measurement

#### 5.4.7.1.1 Initial conditions

Set the interfering signal source bandwidth to be the same as the in-channel operating bandwidth and operating on an interfering source centre frequency in accordance with tables 4.2.9.2-1 or 4.2.9.2-2 according to the system channel bandwidth under test. Set the interfering signal mean power to the level identified in tables 4.2.9.2-1 or 4.2.9.2-2.

Turn the interfering source off.

#### 5.4.7.1.2 Procedure

- Step 1 Set the UUT and signalling unit to the RF channel corresponding to the 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  $P_{SENS10}$ .
- Step 3 Turn on the interfering source.
- Step 4 Step the interfering signal generator frequency through the frequency range indicated in tables 4.2.9.2-1 or 4.2.9.2-2 according to the system channel bandwidth under test, 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 Record any interfering signal centre frequency at which the blocking requirement is not met.
- 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 End of test.

#### 5.4.7.2 Test requirements

For the UE UUT the worst case BER measurement recorded in the steps above for each step of the interfering signal and at each of the RF channel centre frequencies shall meet the requirements of clause 4.2.9.2.

### 5.4.8 Receiver intermodulation characteristics

The purpose of this test is to verify compliance of UE equipment to the receiver intermodulation characteristic requirements of clause 4.2.10.

#### 5.4.8.1 Method of measurement

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

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

Figure 5.4.8.1-1 shows the test setup for the receiver intermodulation test.

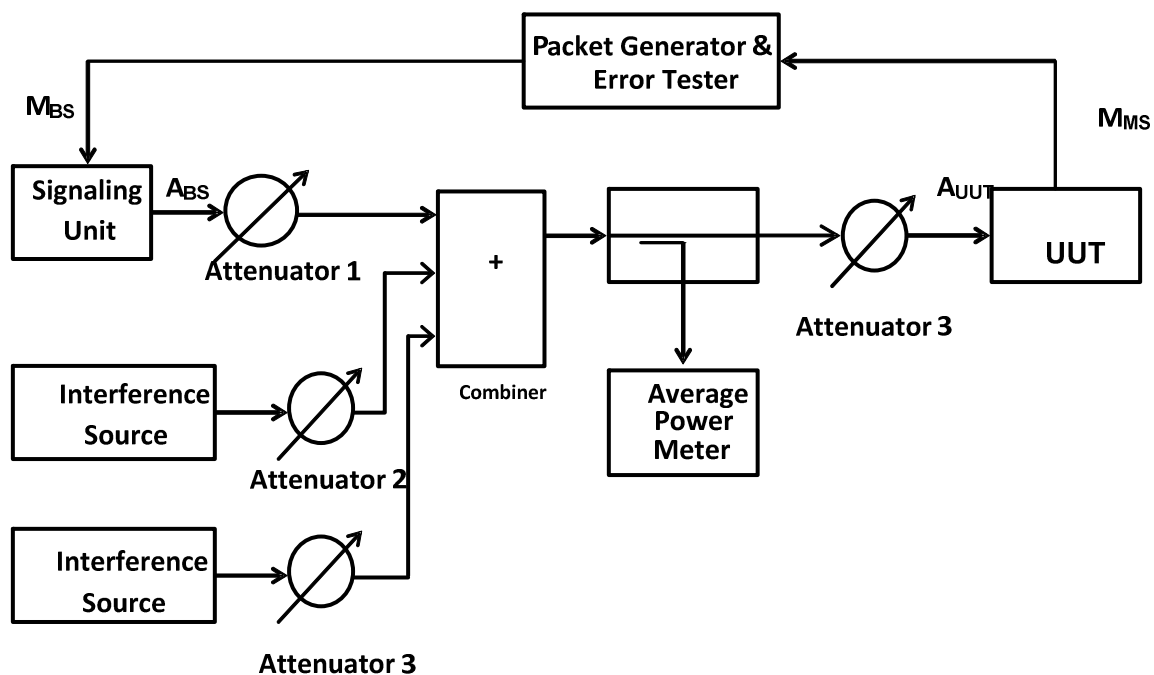


Figure 5.4.8.1-1: Test setup for receiver intermodulation response measurement

#### 5.4.8.1.1 Initial conditions

Set the modulated interfering signal source bandwidth to be the same as the in-channel operating bandwidth. Set the interfering source centre frequency to have a positive frequency offset from the upper wanted channel edge in accordance with tables 4.2.10.2-1 or 4.2.10.2-2 according to the system channel bandwidth under test. Set the modulated interfering signal mean power to the level identified in tables 4.2.10.2-1 or 4.2.10.2-2 according to the system channel bandwidth under test.

Set the CW interfering signal frequency to have a positive frequency offset from the upper wanted channel edge in accordance with tables 4.2.10.2-1 or 4.2.10.2-2 according to the system channel bandwidth under test. Set the CW interfering signal mean power to the level identified in tables 4.2.10.2-1 or 4.2.10.2-2 according to the system channel bandwidth under test.

Turn the interfering sources off.

#### 5.4.8.1.2 Procedure

- Step 1 Set the UUT and signalling unit to the RF channel corresponding to the lowest channel centre frequency from the declared range.
- Step 2 Adjust the received signal level at  $A_{UU}$  to be 6 dB above the sensitivity level  $P_{SENS} + 6$  dB. 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.
- Step 4 Measure the BER of the desired signal received and record the results.
- Step 5 Turn the interfering sources off.
- Step 6 Reconfigure the interfering sources to transmit with negative frequency offsets from the lower wanted channel edge as defined in tables 4.2.10.2-1 or 4.2.10.2-2 according to the system channel bandwidth under test.
- Step 7 Turn on the interfering sources.
- Step 8 Measure the BER of the desired signal received and record the results.

- Step 9 Turn the interfering sources off.
- Step 10 Repeat the test procedure at middle and highest channel centre frequencies for the desired received signal from the declared range.
- Step 11 End of test.

### 5.4.8.2 Test requirements

For the UE UUT the worst case BER measurement recorded in the steps above for each of the RF channel centre frequencies shall meet the requirements of clause 4.2.10.2.

## 5.4.9 Receiver spurious response

The purpose of this test is to verify compliance of UE equipment to the receiver spurious response requirements of clause 4.2.11.

### 5.4.9.1 Method of measurement

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.

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

Figure 5.4.9.1-1 shows the test setup for the receiver spurious response test.

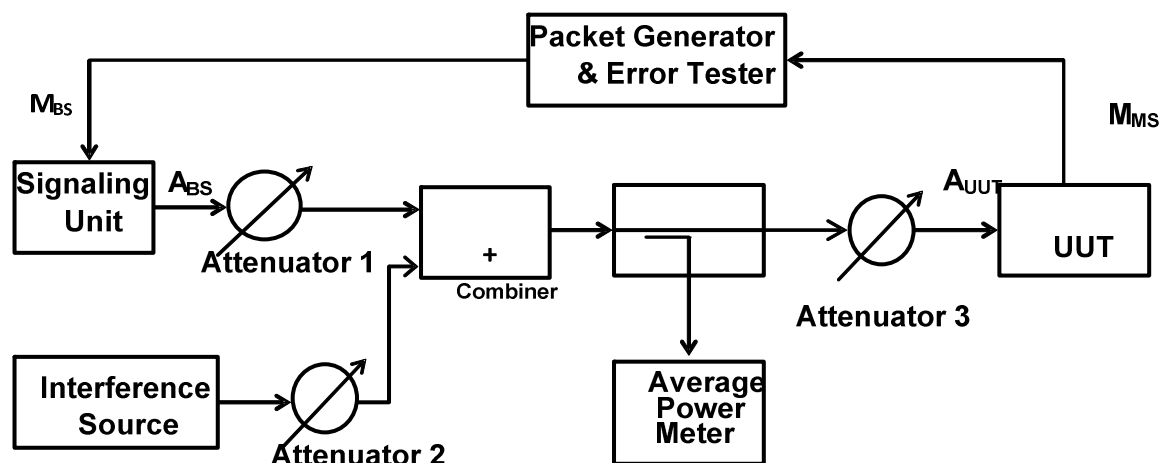


Figure 5.4.9.1-1: Test setup for receiver spurious response measurement

#### 5.4.9.1.1 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 at which the blocking test failed.

#### 5.4.9.1.2 Procedure

- Step 1 Set the desired received signal frequency to the frequency used for the receiver blocking test, as described in clause 5.4.7.1.1 at which the blocking test requirements were not met.
- Step 2 Adjust the received signal level at  $A_{UUT}$  to be 6 dB above the sensitivity level  $P_{SENS5}$  or  $P_{SENS10}$  according to the channel bandwidth under test. Note the signal level is measured over the time period of the data burst only within the downlink transmission.

- 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 5.4.7.1.2 step 6 at which the blocking test requirements were not met.
- Step 4 Set the power level of the interferer according to either tables 4.2.11.2-1 or 4.2.11.2-2 as appropriate.
- Step 5 Measure the BER of the desired signal received for each frequency of the interferer signal and record the results.
- Step 6 Repeat the test procedure at all frequencies which the blocking test requirements were not met.
- Step 7 End of test.

#### 5.4.9.2 Test requirements

For the UE UUT the measured receiver spurious emission levels recorded in the steps above for each of the RF channel centre frequencies shall meet the requirements of clause 4.2.11.2.

### 5.4.10 Receiver reference sensitivity level

#### 5.4.10.1 Method of test

The test requirement is in WiMAX Forum<sup>®</sup> document WMF-T25-002-R010v06 [1].

All of the items below are found in this document:

- Clause 9.1.10: MS receiver sensitivity.
- Appendix 1 (This section provides generic test packets, receiver sensitivity requirements, Bit Error Rate (BER) to Packet Error Rate (PER) conversion and Qualitative tests versus Functional tests methodology).
- Appendix 3 (A 3.1 Measuring PER for MS. A 3.2 Measuring PER for BS).

#### 5.4.10.2 Test requirement

The results obtained shall meet the limits defined in [1] in order to show compliance.



## Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared in reply to the Commission's standardisation request Commission Implementing Decision C(2015) 5376 final of 04.08.2015 to provide a means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment.

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A-1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

**Table A-1: Relationship between the present document and the essential requirements of Directive 2014/53/EU**

<b>Harmonised Standard ETSI EN 301 908-21</b>				
The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.2]				
<b>Requirement</b>			<b>Requirement Conditionality</b>	
<b>No</b>	<b>Description</b>	<b>Reference: Clause No</b>	<b>U/C</b>	<b>Condition</b>
1	Transmitter Spectrum Emission Mask	4.2.2	U	
2	Transmitter Adjacent Channel Leakage Power Ratio	4.2.3	U	
3	Transmitter Spurious Emissions	4.2.4	U	
4	Transmitter Maximum Output Power	4.2.5	U	
5	Transmitter Minimum Output Power	4.2.6	U	
6	Receiver Spurious Emissions	4.2.7	U	
7	Receiver Adjacent Channel Selectivity (ACS)	4.2.8	U	
8	Receiver Blocking Characteristics	4.2.9	U	
9	Receiver Intermodulation Characteristics	4.2.10	U	
10	Receiver Spurious Response	4.2.11	U	
11	Receiver reference sensitivity level	4.2.12	U	

### Key to columns:

#### Requirement:

**No** A unique identifier for one row of the table which may be used to identify a requirement.

**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 shall 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 requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

---

## Annex B (normative): Environmental profile specification

The following environmental conditions may be declared by the manufacturer:

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

Where an extreme environment is required then the various combinations of extreme temperatures together with the extreme voltages are shown below:

- Low extreme Temperature/Low extreme Voltage (TL/VL);
- Low extreme Temperature/High extreme Voltage (TL/VH);
- High extreme Temperature/Low extreme Voltage (TH/VL);
- High extreme Temperature/High extreme Voltage (TH/VH).

---

Annex C (informative):  
Void

---

## Annex D (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).
- ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104)".
- 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).
- WiMAX Forum® Air Interface specifications; WiMAX Forum® T23-005-R015v05.

---

## History

<b>Document history</b>		
V5.2.1	September 2011	Publication
V6.0.1	January 2016	EN Approval Procedure AP 20160420: 2016-01-21 to 2016-04-20