Final draft ETSI EN 302 544-1 V1.1.2 (2009-08)

Harmonized European Standard (Telecommunications series)

Broadband Data Transmission Systems operating in the 2 500 MHz to 2 690 MHz frequency band; Part 1: TDD Base Stations; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

ETSI

Reference

REN/BRAN-0060005-1

Keywords

broadband, cellular, digital, IMT-2000, mobile,
multipoint, radio, regulation, TDD

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

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or
perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF).
In case of dispute, the reference shall be the printing on ETSI printers of the 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:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

ETSI

Contents

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 (http://webapp.etsi.org/IPR/home.asp).

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

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.5] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

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

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

The present document is part 1 of a multi-part deliverable covering the Base Stations (BS) and User Equipment (UE) for Broadband Data Transmission Systems in 2 500 MHz to 2 690 MHz frequency band, as identified below:

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

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

Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive [i.1]. The modular structure is shown in EG 201 399 [i.2].

1 Scope

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

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

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

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

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive may apply to equipment within the scope of the present document. The present document does not address those IMT-2000 systems which are considered in EN 301 908 [i.3].

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

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:

  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;

  - for informative references.

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

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

2.1 Normative references

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

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

[2] ETSI TR 100 028 (parts 1 and 2) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[3] CEPT/ERC/REC 74-01E (2005): "Unwanted Emissions in the Spurious Domain".

2.2   Informative references

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

[i.1]   Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[i.2]   ETSI EG 201 399 (V2.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of candidate Harmonized Standards for application under the R&TTE Directive".

[i.3]   ETSI EN 301 908 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks".

[i.4]   ETSI TR 102 215 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Recommended approach, and possible limits for measurement uncertainty for the measurement of radiated electromagnetic fields above 1 GHz".

[i.5]   Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.

3   Definitions, symbols and abbreviations

3.1   Definitions

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

ACLR Class 1: BS classification that identifies a level of ACLR performance generally appropriate for intra-system operation in contiguous channel assignments

ACLR Class 2: BS classification that identifies a level of ACLR performance appropriate for the boundary between FDD Uplink and TDD and for the boundaries between blocks with unsynchronized TDD usage

ACS Class 1: this class identifies a level of ACS performance appropriate for base stations operating at Pnom $\leq$ 25 dBm

ACS Class 2: this class identifies a level of intra-system ACS performance for base stations operating at Pnom > 25 dBm

ACS Class 3: this class identifies a level of inter-system ACS performance for base stations operating at Pnom > 25 dBm for the boundary between FDD Downlink and TDD and for the boundaries between blocks with unsynchronized TDD usage

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

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

Eval_BW 1: 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

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

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

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

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

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

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

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

nominal maximum output power: maximum nominal mean power level per carrier measured over total allocated channel bandwidth of the base station 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

TDD down-link frame: time interval in which the BS is transmitting and the UE is receiving

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 Pnom carrier power measured in Eval_BW 1
dBm	decibel relative to 1 milliwatt
f	Frequency (of the assigned channel frequency of the wanted signal)
f_b	FDD/TDD border frequency

NOTE: A more precise definition is provided below table 15.

f_c	centre frequency of the assigned channel
GHz	GigaHertz
M_{BS}	Base Station Interface M
M_{MS}	Mobile Station Interface M
MHz	MegaHertz
Nth	receiver thermal noise of the equipment (in dBm)
P	output Power (in dBm)
P_{nom}	nominal maximum output Power (in dBm)
P_{max}	maximum output Power of the base station (in dBm)
P_{SENS5}	Receiver sensitivity level at BER 10^{-6} for a 5 MHz channelized system, corresponding to the most robust modulation and coding rate supported by the technology
P_{SENS10}	Receiver sensitivity level at BER 10^{-6} for a 10 MHz channelized system, corresponding to the most robust modulation and coding rate supported by the technology

3.3   Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AWGN	Additive White Gaussian Noise
BER	Bit Error Ratio
BS	Base Station
FDD	Frequency Division Duplexing
PER	Packet Error Ratio
R&TTE	Radio equipment and Telecommunications Terminal Equipment
RF	Radio Frequency
TDD	Time Division Duplexing
Tx	Transmit, Transmitter
UE	User Equipment
UUT	Unit Under Test

4   Essential requirements specification

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

4.1   Environmental profile

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

4.2   Conformance requirements

4.2.1   Introduction

To meet the essential requirement under article 3.2 of the R&TTE Directive [i.1] six essential parameters have been identified. Table 1 provides a cross reference between these six essential parameters and the corresponding nine 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 Spectrum emissions mask
	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	4.2.5 Maximum output power tolerance
Intermodulation attenuation of the transmitter	4.2.6 Transmit Intermodulation
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 selectivity
	4.2.9 Receiver blocking characteristics
	4.2.10 Receiver intermodulation characteristics

4.2.2 Spectrum emission mask

4.2.2.1 Definition

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

4.2.2.2 Limits

A base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification shall meet the requirement.

The spectrum emissions measured according to clause 5.4.1 shall not exceed the maximum level specified in tables 2 to 9 for the appropriate BS nominal maximum output power (Pnom) and channel widths of 5 MHz and 10 MHz.

4.2.2.2.1 Spectrum emission mask for 5 MHz bandwidth

The spectrum emission mask of the BS applies over the frequency range 0,015 MHz to 10 MHz from the channel edge on both sides of each carrier supported by the BS:

- f_offset is the separation between the channel edge and the centre frequency of the measuring filter.

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth. P is the total mean power of the BS carrier set to operate at Pnom measured in Eval_BW 1 centred in the 5 MHz channel.

Table 2: Test Requirements for spectrum emission mask values for 5 MHz channels,
Pnom $\geq$ 43 dBm

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz $\leq$ f_offset < 0,215 MHz	-12,5 dBm	30 kHz
0,215 MHz $\leq$ f_offset < 1,015 MHz	$-12{,}5\,\text{dBm} - 15\left(\dfrac{\text{f\_offset}}{\text{MHz}} - 0{,}215\right)\text{dB}$	30 kHz
1,015 MHz $\leq$ f_offset < 1,5 MHz	-24,5 dBm	30 kHz
1,5 MHz $\leq$ f_offset < 5,5 MHz	-11,5 dBm	1 MHz, by aggregation of 30 kHz measurements
5,5 MHz $\leq$ f_offset < 10 MHz	-11,5 dBm	1 MHz, by aggregation of 30 kHz measurements

Table 3: Test requirements for spectrum emission mask values for 5 MHz channels,
39 dBm $\leq$ Pnom < 43 dBm

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz $\leq$ f_offset < 0,215 MHz	-12,5 dBm	30 kHz
0,215 MHz $\leq$ f_offset < 1,015 MHz	$-12{,}5\,\text{dBm} - 15\left(\dfrac{\text{f\_offset}}{\text{MHz}} - 0{,}215\right)\text{dB}$	30 kHz
1,015 MHz $\leq$ f_offset < 1,5 MHz	-24,5 dBm	30 kHz
1,5 MHz $\leq$ f_offset < 5,5 MHz	-11,5 dBm	1 MHz, by aggregation of 30 kHz measurements
5,5 MHz $\leq$ f_offset < 10 MHz	P - 54,5 dB	1 MHz, by aggregation of 30 kHz measurements

Table 4: Test requirements for spectrum emission mask values for 5 MHz channels,
31 dBm ≤ Pnom < 39 dBm

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,215 MHz	P - 51,5 dB	30 kHz
0,215 MHz ≤ f_off < 1,015 MHz	$P - 51,5\,dB - 15\left(\dfrac{f\_offset}{MHz} - 0,215\right)dB$	30 kHz
1,015 MHz ≤ f_offset < 1,5 MHz	P - 63,5 dB	30 kHz
1,5 MHz ≤ f_offset < 5,5 MHz	P - 50,5 dB	1 MHz, by aggregation of 30 kHz measurements
5,5 MHz ≤ f_offset < 10 MHz	P - 54,5 dB	1 MHz, by aggregation of 30 kHz measurements

Table 5: Test requirements for spectrum emission mask values for 5 MHz channels,
Pnom < 31 dBm

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,215 MHz	-20,5 dBm	30 kHz
0,215 MHz ≤ f_offset < 1,015 MHz	$-20,5\,dBm - 15\left(\dfrac{f\_offset}{MHz} - 0,215\right)dB$	30 kHz
1,015 MHz ≤ f_offset < 1,5 MHz	-32,5 dBm	30 kHz
1,5 MHz ≤ f_offset < 5,5 MHz	-19,5 dBm	1 MHz, by aggregation of 30 kHz measurements
5,5 MHz ≤ f_offset < 10 MHz	-23,5 dBm	1 MHz, by aggregation of 30 kHz measurements

4.2.2.2.2   Spectrum emission mask for 10 MHz bandwidth

The spectrum emission mask of the BS applies over the frequency range 0,015 MHz to 20 MHz from the channel edge on both sides of the BS carrier.

- f_offset is the separation between the channel edge and the centre frequency of the measuring filter.

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth. P is the total mean power of the BS carrier set to operate at Pnom measured in Eval_BW 1 centred in the 10 MHz band channel.

The power of any BS emission shall not exceed the levels specified in tables 6 to 9.

Table 6: Test Requirements for spectrum emission mask values for 10 MHz channels,
Pnom ≥ 43 dBm

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,415 MHz	-15,5 dBm	30 kHz
0,415 MHz ≤ f_offset < 2,015 MHz	$-15,5\,dBm - 7,5\left(\dfrac{f\_offset}{MHz} - 0,415\right)dB$	30 kHz
2,015 MHz ≤ f_offset < 3,0 MHz	-27,5 dBm	30 kHz
3,0 MHz ≤ f_offset < 11,0 MHz	-14,5 dBm	1 MHz, by aggregation of 30 kHz measurements
11,0 MHz ≤ f_offset < 20 MHz	-14,5 dBm	1 MHz, by aggregation of 30 kHz measurements

**Table 7: Test requirements for spectrum emission mask values for 10 MHz channels,
39 dBm ≤ Pnom < 43 dBm**

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,415 MHz	-15,5 dBm	30 kHz
0,415 MHz ≤ f_offset < 2,015 MHz	$-15,5\,\text{dBm} - 7,5\left(\dfrac{\text{f\_offset}}{\text{MHz}} - 0,415\right)\text{dB}$	30 kHz
2,015 MHz ≤ f_offset < 3,0 MHz	-27,5 dBm	30 kHz
3,0 MHz ≤ f_offset < 11,0 MHz	-14,5 dBm	1 MHz, by aggregation of 30 kHz measurements
11,0 MHz ≤ f_offset < 20 MHz	P - 57,5 dB	1 MHz, by aggregation of 30 kHz measurements

**Table 8: Test requirements for spectrum emission mask values for 10 MHz channels,
31 dBm ≤ Pnom < 39 dBm**

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,415 MHz	P - 54,5 dB	30 kHz
0,415 MHz ≤ f_offset < 2,015 MHz	$P - 54,5\,\text{dB} - 7,5\left(\dfrac{\text{f\_offset}}{\text{MHz}} - 0,415\right)\text{dB}$	30 kHz
2,015 MHz ≤ f_offset < 3,0 MHz	P - 66,5 dB	30 kHz
3,0 MHz ≤ f_offset < 11,0 MHz	P - 53,5 dB	1 MHz, by aggregation of 30 kHz measurements
11,0 MHz ≤ f_offset < 20 MHz	P - 57,5 dB	1 MHz, by aggregation of 30 kHz measurements

**Table 9: Test requirements for spectrum emission mask values for 10 MHz channels,
Pnom < 31 dBm**

Frequency offset from channel edge of the measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
0,015 MHz ≤ f_offset < 0,415 MHz	-23,5 dBm	30 kHz
0,415 MHz ≤ f_offset < 2,015 MHz	$-23,5\,\text{dBm} - 7,5\left(\dfrac{\text{f\_offset}}{\text{MHz}} - 0,415\right)\text{dB}$	30 kHz
2,015 MHz ≤ f_offset < 3,0 MHz	-35,5 dBm	30 kHz
3,0 MHz ≤ f_offset < 11,0 MHz	-22,5 dBm	1 MHz, by aggregation of 30 kHz measurements
11,0 MHz ≤ f_offset < 20 MHz	-26,5 dBm	1 MHz, by aggregation of 30 kHz measurements

4.2.2.3 Conformance

Conformance tests described in clause 5.4.1 shall be carried out.

4.2.3   Transmitter Adjacent Channel Leakage power Ratio (ACLR)

4.2.3.1   Definition

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

4.2.3.2   Limits

The ACLR of a single carrier BS or a multi-carrier BS with contiguous carrier frequencies shall be equal to or greater than the limits given in tables 10 to 13.

The requirement shall still be met in the presence of switching transients.

4.2.3.2.1   ACLR requirements for 5 MHz Bandwidth

The ACLR shall be equal to or greater than the limits specified in table 10 for ACLR Class 1 and table 11 for ACLR Class 2.

Table 10: BS ACLR for the 5 MHz Bandwidth option - ACLR Class 1

adjacent channel	ACLR limit for Eval_BW 1
$f_c \pm 5$ MHz	44,2 dB
$f_c \pm 10$ MHz	49,2 dB

Table 11: BS ACLR for the 5 MHz Bandwidth option - ACLR Class 2

adjacent channel	ACLR limit for Eval_BW 1	ACLR limit for Eval_BW 2
$f_c \pm 5$ MHz	49,7 dB	52,7 dB
$f_c \pm 10$ MHz	62,2 dB	65,2 dB

4.2.3.2.2   ACLR requirements for 10 MHz bandwidth

The ACLR shall be equal to or greater than the limits specified in table 12 for ACLR Class 1 and table 13 for ACLR Class 2.

Table 12: BS ACLR for the 10 MHz bandwidth option - ACLR Class 1

Adjacent channel	ACLR limit for Eval_BW 1
$f_c \pm 10,0$ MHz	44,2 dB
$f_c \pm 20,0$ MHz	49,2 dB

Table 13: BS ACLR for the 10 MHz bandwidth option - ACLR Class 2

Adjacent channel	ACLR limit for Eval_BW 1	ACLR limit for Eval_BW 2	ACLR limit for Eval_BW 3
$f_c \pm 7,5$ MHz	n/a	n/a	52,7 dB
$f_c \pm 10,0$ MHz	49,7 dB	52,7 dB	n/a
$f_c \pm 20,0$ MHz	62,2 dB	65,2 dB	n/a
NOTE: n/a means not applicable.			

4.2.3.3   Conformance

Conformance tests described in clause 5.4.2 shall be carried out.

4.2.4   Transmitter spurious emissions

4.2.4.1   Definition

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

4.2.4.2   Limits

The limits of spurious emissions (or more precisely, according latest ITU-R definitions, unwanted emissions in the spurious domain), shall conform to CEPT/ERC/REC 74-01 [3].

The following requirements in tables 14 and 15 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 fc 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 14: Transmitter spurious emissions

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

Table 15: Additional spurious emissions requirements for in-band TDD BS (In-Band) coexistence with FDD BS

Frequency band	Minimum level	Measurement bandwidth
2 500 MHz to f_b	-45 dBm	1 MHz

For Base Stations operating on channel centre frequencies above $2\,570\ MHz + 2,5 \times BW$, f_b is equal to 2 570 MHz. For Base Stations that have an operating frequency range extending below $2\,570\ MHz + 2,5 \times BW$ but not to the lower band limit of 2 500 MHz, f_b is equal to $f_c - 2,5 \times BW$ where f_c is the centre frequency of the lowest carrier and BW is the bandwidth (5 MHz or 10 MHz).

Table 16: Additional spurious emissions requirements for BS (Out of Band)

Band	Maximum level	Measurement bandwidth
876 MHz to 915 MHz	-61 dBm	100 kHz
921 MHz to 960 MHz	-57 dBm	100 kHz
1 710 MHz to 1 785 MHz	-61 dBm	100 kHz
1 805 MHz to 1 880 MHz	-47 dBm	100 kHz
1 900 MHz to 1 920 MHz	-39 dBm	3,84 MHz
1 920 MHz to 1 980 MHz	-49 dBm	1 MHz
2 010 MHz to 2 025 MHz	-39 dBm	3,84 MHz
2 110 MHz to 2 170 MHz	-52 dBm	1 MHz
3 400 MHz to 3 800 MHz	-45 dBm	1 MHz

4.2.4.3   Conformance

Conformance tests described in clause 5.4.3 shall be carried out.

4.2.5   Maximum output power accuracy

4.2.5.1   Definition

The maximum output power accuracy is the difference between the declared Pnom and the actual maximum output power (Pmax). Corresponding tolerance limits are specified here.

4.2.5.2   Limits

In normal conditions, the actual output power (Pmax), shall remain within +2,0 dB and -2,0 dB of the manufacturer's declared nominal maximum output power (Pnom).

In extreme conditions, the actual output power (Pmax), shall remain within +2,5 dB and -2,5 dB of the manufacturer's declared nominal maximum output power (Pnom).

4.2.5.3   Conformance

Conformance tests described in clause 5.4.4 shall be carried out.

4.2.6   Transmit Intermodulation

4.2.6.1   Definition

The transmit intermodulation requirement is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the own transmit signal and an interfering signal reaching the transmitter via the antenna.

The transmit intermodulation level is the power of the intermodulation products when a modulated interference signal is injected into the antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The wanted signal bandwidth shall be 5 MHz and 10 MHz respectively. The interferer has the same bandwidth as the wanted signal.

For 5 MHz channel BW, the centre frequency of the interference signal offset from the subject signal carrier centre frequency shall be at ±5 MHz, ±10 MHz, ±15 MHz (±10 MHz, ±20 MHz, ±30 MHz for 10 MHz channel BW) but exclude interference frequencies that are partially or completely outside of the declared operating frequency band of the base station.

4.2.6.2   Limits

With the test signal applied the spectrum emission mask, ACLR and spurious emission requirements, at 3rd and 5th intermodulation frequencies not overlapping the interfering signal, shall continue to meet the limits in clauses 4.2.2.2, 4.2.3.2 and 4.2.4.2.

4.2.6.3   Conformance

Conformance tests described in clause 5.4.5 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 BS antenna connector.

The requirements apply to all BS with separate RX and TX antenna port. The test shall be performed when both TX and RX are operating with the TX port terminated.

For all BS with common RX and TX antenna port the transmitter spurious emission as specified in clause 4.2.4 is valid.

The following requirements in table 17 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 centre carrier frequency. In the following fc 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.

4.2.7.2 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/REC 74-01 [3]. The power of any spurious emissions shall not exceed the limits given in table 17.

Table 17: General receiver spurious emission requirements

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

4.2.7.3 Conformance

Conformance tests described in clause 5.4.6 shall be carried out.

4.2.8 Receiver Adjacent Channel Selectivity (ACS)

4.2.8.1 Definition

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

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

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 18 to 20 list the limits and the test parameters for the receiver ACS in the first adjacent channel and 2nd adjacent channels for 5 MHz and 10 MHz channel bandwidths, respectively. For an assigned channel bandwidth of 5 MHz, and interferer channel bandwidth of 5 MHz is used and for an assigned channel bandwidth of 10 MHz, and interferer channel bandwidth of 10 MHz is used. All the measurements are done over 95 % of the channel. The compliant system shall be able to meet a Bit Error Ratio (BER) $< 10^{-6}$ (or equivalent PER) with the interference levels specified in the tables. Please note that depending on some assumed packet sizes, equivalent Packet Error Ratio (PER) criteria can be used alternatively.

Table 18: Limits and test parameters for receiver ACS Class 1

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
ACS limit (dB)		33	47
Power (dBm)	P_{SENS} + 3	Nth + 33	Nth + 47
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

Table 19: Limits and test parameters for receiver ACS Class 2

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
ACS limit (dB)		40	50
Power (dBm)	P_{SENS} + 3	Nth + 40	Nth + 50
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

Table 20: Limits and test for receiver ACS Class 3

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
ACS limit (dB)		46	56
Power (dBm)	P_{SENS} + 3	Nth + 46	Nth + 56
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

NOTE: P_{SENS} in tables 18 to 20 depends on the channel bandwidth ($P_{SENS} = P_{SENS5}$ for 5 MHz and $P_{SENS} = P_{SENS10}$ for 10 MHz channel bandwidths).

4.2.8.3   Conformance

Conformance tests described in clause 5.4.7 shall be carried out.

4.2.9   Receiver blocking characteristics

4.2.9.1   Definition

The blocking characteristics are a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies to interfering signals with centre frequency within the ranges specified in tables 20 and 21, using a 1 MHz step size.

4.2.9.2   Limits

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

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

ETSI

Table 21: Blocking for 5 MHz channel bandwidth

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
2 500 MHz to 2 690 MHz	-40 dBm	P_{SENS5} + 6 dB	12,5 MHz	Modulation and coding equal to those of the wanted signal
2 480 MHz to 2 500 MHz 2 690 MHz to 2 710 MHz	-40 dBm	P_{SENS5} + 6 dB	12,5 MHz	Modulation and coding equal to those of the wanted signal
1 MHz to 2 480 MHz 2 710 MHz to 12 750 MHz	-15 dBm	P_{SENS5} + 6 dB	—	CW carrier

Table 22: Blocking for 10 MHz channel bandwidth

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
2 500 MHz to 2 690 MHz	-40 dBm	P_{SENS10} + 6 dB	25 MHz	Modulation and coding equal to those of the wanted signal
2 480 MHz to 2 500 MHz 2 690 MHz to 2 710 MHz	-40 dBm	P_{SENS10} + 6 dB	25 MHz	Modulation and coding equal to those of the wanted signal
1 MHz to 2 480 MHz 2 710 MHz to 12 750 MHz	-15 dBm	P_{SENS10} + 6 dB	—	CW carrier

4.2.9.3   Conformance

Conformance tests described in clause 5.4.8 shall be carried out.

4.2.10   Receiver intermodulation characteristics

4.2.10.1   Definition and applicability

Third and higher order mixing of the 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

P_{SENS5} and P_{SENS10} are the sensitivity levels at BER $\leq 10^{-6}$, for 5 MHz and 10 MHz channels respectively, corresponding to the most robust modulation and coding rate supported by the base station.

BER performance requirement at BER $\leq 10^{-6}$ (or equivalent PER) shall be met when the following signals are coupled to BS 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 23: Receiver intermodulation characteristics for 5 MHz channel bandwidth

Interfering signal mean power	Minimum offset of interfering signal from the channel edge	Type of interfering signal
-48 dBm	7,5 MHz	CW signal
-48 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 BS 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 24: 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
-48 dBm	15 MHz	CW signal
-48 dBm	35 MHz	Modulation and coding equal to those of the wanted signal

4.2.10.3   Conformance

Conformance tests described in clause 5.4.9 shall be carried out.

5   Testing for compliance with technical requirements

5.1   Environmental conditions for testing

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

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

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

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 (Pnom) from the equipment;

- the operational environmental profile(s) applicable to the equipment;

- the BS ACLR Class applicable to the equipment;

- the BS ACS Class applicable to the equipment;

- conversion relationship between BER and PER, if required;

- the receiver sensitivity levels P_{SENS5} and P_{SENS10} and the receiver thermal noise Nth.

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 25.

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 [2] or TR 102 215 [i.4] as appropriate and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provides a confidence level of 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Table 25 is based on such expansion factors.

Table 25: Maximum measurement uncertainty

Parameter		Conditions	Uncertainty
5.4.4	Maximum output power tolerance	Normal	±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   Essential radio test suites

5.4.1   Spectrum emission mask

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

5.4.1.1   Method of test for BS spectral emission mask

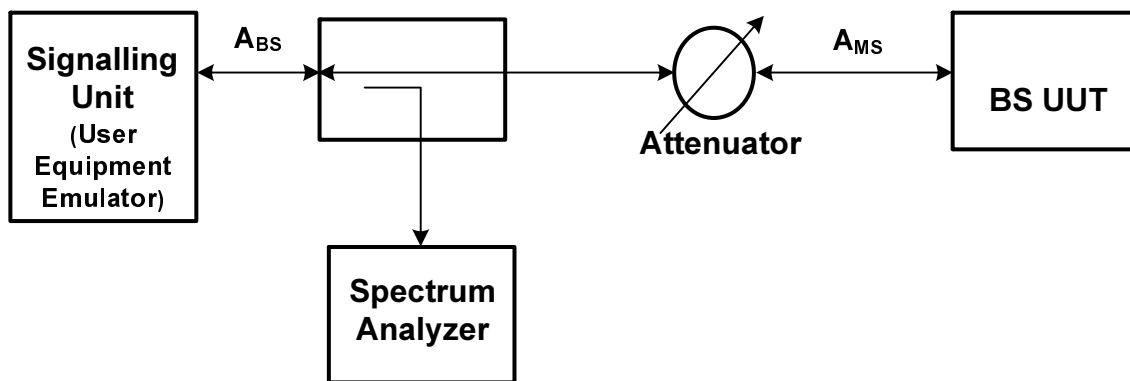Figure 1 shows the test setup for testing BS spectrum emission masks.

Figure 1: Test setup for spectral mask emission testing of base station

5.4.1.1.1   Initial conditions

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

Spectrum Emission mask shall be measured during the transmitting part of the TDD frame only. The equipment shall be configured to operate with continuous modulation mode switching at the maximum switching speed permitted by the system, with equal duty cycle for all modulation orders, and with all training bursts or reference signals active as in normal operation.

In spectrum analyzer, set the resolution bandwidth according to tables 2 to 9 and also set the video bandwidth to value of three times the resolution bandwidth. True RMS detector shall be used.

5.4.1.1.2   Procedure

Step 1   Set the RF channel to the lowest channel centre frequency from the declared range.

Step 2   Make sure the data link connection has been established between BS UUT and Signalling Unit.

Step 3   The BS UUT is configured to continuously transmit at Pnom as measured over the 5 MHz or 10 MHz of allocated bandwidth.

Step 4   Measure and note the signal spectrum over the range specified in clause 4.2.2.2. Tables 2 to 9 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 2 to 4 at the middle and highest RF channel centre frequencies from the declared range.

Step 6   Repeat Steps 1 to 5 for all modulation schemes supported by the equipment under test.

Step 7   End of test.

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

1)   If single transmit antenna is a valid mode of operation, Steps 1 to 7 shall be performed on a selected single antenna port with Pnom transmit level.

2)   To test the mode with multiple antenna enabled:

   a)   Steps 1 to 7 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at Pnom - $10 \times \log_{10} N$ level).

   b)   The measurement results of Step 4 are combined (measured power levels are added).

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

5.4.2   Transmitter Adjacent Channel Leakage power Ratio (ACLR)

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

5.4.2.1   Method of test for BS ACLR

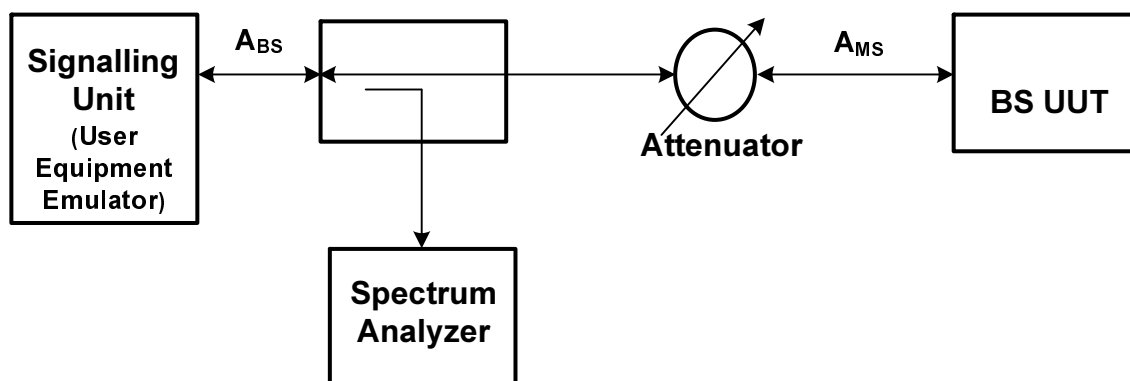Figure 2 shows the test setup for testing BS ACLR.

Figure 2: Test Setup for ACLR Testing of Base Station

5.4.2.1.1   Initial conditions

This test can be conducted for any or both of 5 MHz and 10 MHz bandwidths. The UUT shall be configured to operate at the Pnom level declared for the equipment.

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

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

5.4.2.1.2   Procedure

Eval_BW 1 and Eval_BW 2 Test Case.

Step 1   Set the RF channel to the lowest channel centre frequency from the declared range.

Step 2   Make sure the data link connection has been established between BS UUT and Signalling Unit.

Step 3   The BS UUT is configured to continuously transmit at Pnom.

Step 4   Measure the aggregated power measured over a frequency range equal to 4,75 MHz and 9,5 MHz (for 5 MHz and 10 MHz cases respectively) centred on the assigned channel frequency.

Step 5   Average over a sufficient number of transmitted bursts to obtain a stable reading.

Step 6   Measure the aggregated power measured over a frequency range equal to 4,75 MHz and 9,5 MHz (for 5 MHz and 10 MHz cases respectively) for Eval_BW 1 measurement and to 3,84 MHz and 7,68 MHz (for 5 MHz and 10 MHz cases respectively) for Eval_BW 2 measurement centred on the first lower adjacent channel frequency which is 5 MHz (10 MHz for 10 MHz channel bandwidth) apart from operating RF channel centre frequency.

Step 7   Average over a sufficient number of transmitted bursts to obtain a stable reading.

Step 8   Calculate the ACLR by: (Power according to Step 4) / (Power according to Step 6).

Step 9	Repeat Steps 3 to 7 for the 2nd adjacent (lower) RF channel (centre frequency 10 MHz for the 5 MHz channel bandwidth and 20 MHz for 10 MHz channel bandwidth, respectively, below the assigned channel frequency of the transmitted signal) and also for the first and 2nd adjacent (upper) RF channel.
Step 10	Run Steps 1 to 6 at the middle and highest RF channel centre frequencies from the declared range.
Step 11	End of test.

Eval_BW 3 Test Case.

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

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

1) If single transmit antenna is a valid mode of operation, Steps 1 to 18 shall be performed on a selected single antenna port with Pnom transmit level.

2) To test the mode with multiple antenna enabled:

   a) Steps 1 to 18 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at Pnom - $10 \times \log_{10} N$ level).

   b) Step 4 is modified to include total combined power (measured power levels are added over N antenna).

   c) Step 12 is modified to include total combined power (measured power levels are added over N antenna).

   d) Step 14 is modified to include total combined power (measured power levels are added over N antenna).

   e) Step 6 is modified to include total combined power (measured power levels are added over N antenna).

5.4.3   Transmitter spurious emissions

The purpose of this test to verify compliance of BS equipment to the spurious emission requirements of clause 4.2.4.

5.4.3.1   Method of test

Figure 3 shows the test setup for testing BS transmitter spurious emission.
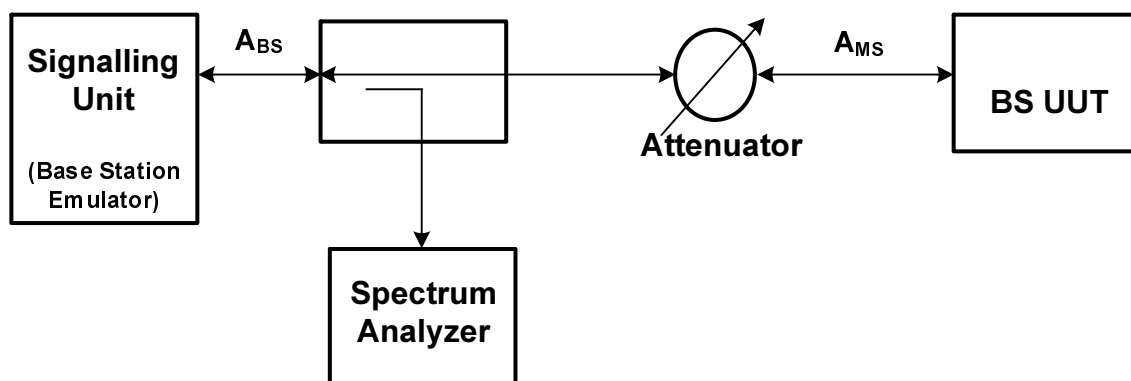
Figure 3: Test Setup for BS Transmitter Spurious Emission Testing of Base Station

5.4.3.1.1   Initial conditions

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

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

In spectrum analyzer, set the measurement bandwidth as specified in the relevant row of table 14, table 15 or table 16 of clause 4.2.4.2. Set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

Spurious emissions shall be measured during the transmitting part of the TDD frame only. For systems implementing dynamic change of the modulation order, the equipment shall be configured to operate with continuous modulation mode switching at the TDD down-link frame rate, with equal duty cycle for all modulation orders in down-link and up-link, and with all training bursts or reference signals active as in normal operation.

5.4.3.1.2   Procedure

Step 1   Set the RF channel at lowest channel centre frequency.

Step 2   Make sure the data link connection has been established between BS UUT and Signalling Unit.

Step 3   The BS UUT is configured to continuously transmit at its Pnom output power as measured over the 5 MHz or 10 MHz of allocated bandwidth.

Step 4   Measure and note the BS transmitter spurious emissions over the range specified in clause 4.2.4.2 table 14 according to the specified measurement bandwidths in the table.

Step 5   Repeat Steps 2 to 4 at middle and highest RF channel centre frequencies from the declared range.

Step 6   End of test.

In the case that BS 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 Pnom transmit level.

2)   To test the mode with multiple antenna enabled:

   a)   Steps 1 to 6 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at Pnom - $10 \times \log_{10} N$ level).

   b)   The measurement results of Step 4 are combined (measured power levels are added).

Results of step b) are compared with the requirement thresholds.

5.4.4   Maximum output power accuracy

The purpose of this test to verify compliance of BS declared maximum output power (Pnom) in support of requirement clause 4.2.5.

5.4.4.1   Method of test

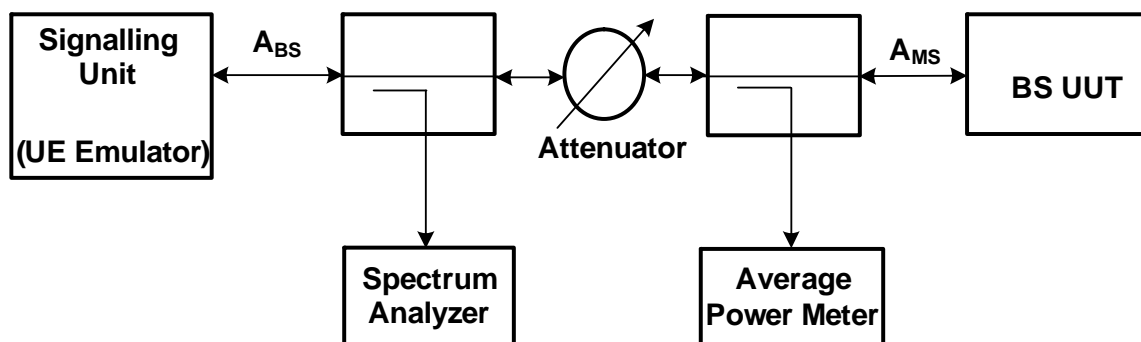Figure 4 shows the test setup for measuring BS maximum output power.

Figure 4: Test Setup for BS maximum output power

5.4.4.1.1   Initial conditions

The UUT shall be configured to operate at its declared maximum output power (Pnom).

5.4.4.1.2   Procedure

Step 1   Set the RF channel to the lowest channel centre frequency from the declared range. Output power shall be measured during the transmitting part of the TDD frame only.

Step 2   Make sure the data link connection has been established between BS UUT and Signalling Unit.

Step 3   The BS UUT is configured to continuously transmit at its declared maximum output power (Pnom) as measured over the 5 MHz or 10 MHz of allocated bandwidth.

Step 4   Measure and note the actual maximum output power level (Pmax) for compliance with maximum output power tolerance to the declared nominal maximum output power (Pnom) of clause 4.2.5.

Step 5   Repeat Steps 3 and 4 at the middle and highest RF channel centre frequencies from the declared range.

Step 6   End of test.

In the case that BS 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 Pnom transmit level.

2)   To test the mode with multiple antenna enabled:

   a)   Steps 1 to 6 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at Pnom - $10 \times \log_{10} N$ level).

   b)   Step 4 is modified to include total combined power (measured power levels are added over N antenna).

5.4.5 Transmitter Intermodulation

The purpose of this test to verify compliance of BS transmitter intermodulation requirements of clause 4.2.6.

5.4.5.1 Method of test

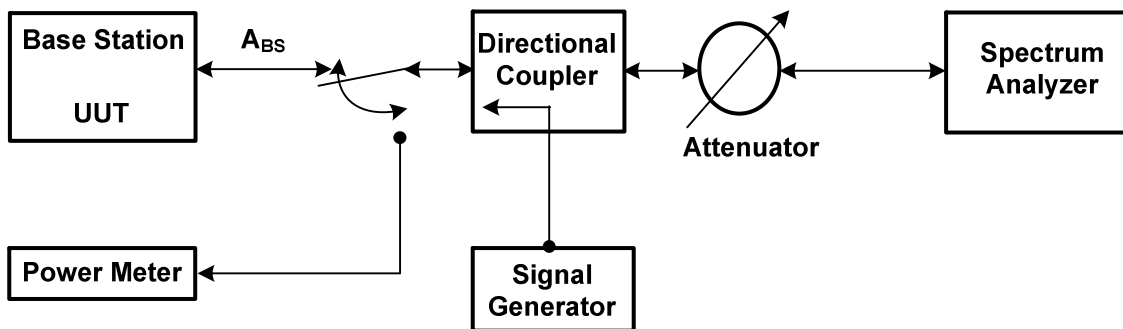Figure 5 shows the test setup for testing BS transmitter intermodulation requirement.

Figure 5: Test Setup for BS transmitter intermodulation requirement

5.4.5.1.1 Initial conditions

Configure the signal generator to produce an interference signal with a mean power level of 30 dB lower at the BS UUT antenna connector than that of the BS UUT transmitted signal. The interference signal shall be like-modulated as the BS transmitted signal, and the active time slots of both signals shall be synchronized.

For 5 MHz channel bandwidth case, the frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the BS transmitted signal.

For 10 MHz channel bandwidth case, the frequency of the interference signal shall be ±10 MHz, ±20 MHz and ±30 MHz offset from the BS transmitted signal.

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

5.4.5.1.2 Procedure

Apply the test procedures for out of band described in clauses 5.4.1.1 and 5.4.2.1 and for transmitter spurious emissions as described in clause 5.4.3.1 at the frequencies of all third and fifth order intermodulation products. The frequency band occupied by the interference signal is excluded from the measurements.

5.4.5.1.3 Test requirements

The conformance requirements for out of band as specified in clauses 4.2.2.2 and 4.2.3.2 and for transmitter spurious emissions as specified in clause 4.2.4.2 shall be met at the frequencies of all third and fifth order intermodulation products.

5.4.6 Receiver spurious emissions

The purpose of this test is to verify compliance of BS equipments to the transmitter adjacent channel leakage power ration requirements of clause 4.2.7.

5.4.6.1 Method of test

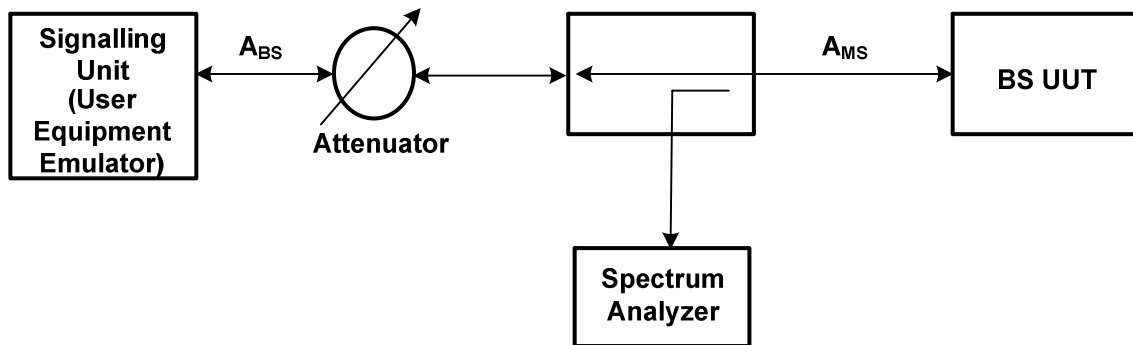Figure 6 shows the test setup for testing BS receiver spurious emission.

Figure 6: Test Setup for Receiver Spurious Emission Testing of Base station

5.4.6.1.1   Initial conditions

In the spectrum analyzer, set the measurement bandwidth as specified in the relevant table 17 of clause 4.2.7. Set the video bandwidth to value of three times the measurement bandwidth. True RMS detector shall be used.

5.4.6.1.2   Procedure

Step 1   Set the RF channel at lowest channel centre frequency.

Step 2   Make sure the data link connection has been established between BS UUT and Signalling Unit.

Step 3   The BS UUT is configured to transmit at its Pnom output power as measured over the 5 MHz or 10 MHz of allocated bandwidth.

Step 4   Measure and note the BS receiver spurious emissions over the range specified in clause 4.2.7 table 17 according to the specified measurement bandwidths in the tables. The receiver spurious emissions should be only measured during the receive part of the TDD frame.

Step 5   Repeat Steps 2 to 4 at middle and highest RF channel centre frequencies from the declared range.

Step 6   End of test.

In the case that BS 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 Pnom transmit level.

2)   To test the mode with multiple antenna enabled:

   a)   Steps 1 to 6 shall be repeated when all antenna are enabled with a total transmit power of Pnom (e.g. each antenna is transmitting at Pnom - $10 \times \log_{10} N$ level).

   b)   Step 3 is modified to include total combined power (measured power levels are added over N antenna).

   c)   Step 4 is modified to include total combined power (measured power levels are added over N antenna).

5.4.7   Receiver adjacent channel selectivity

The purpose of this test is to verify compliance of BS equipments to the transmitter adjacent channel leakage power ratio requirements of clause 4.2.8.

5.4.7.1   Method of test

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

Figure 7 shows the test setup for testing BS receiver adjacent channel selectivity.
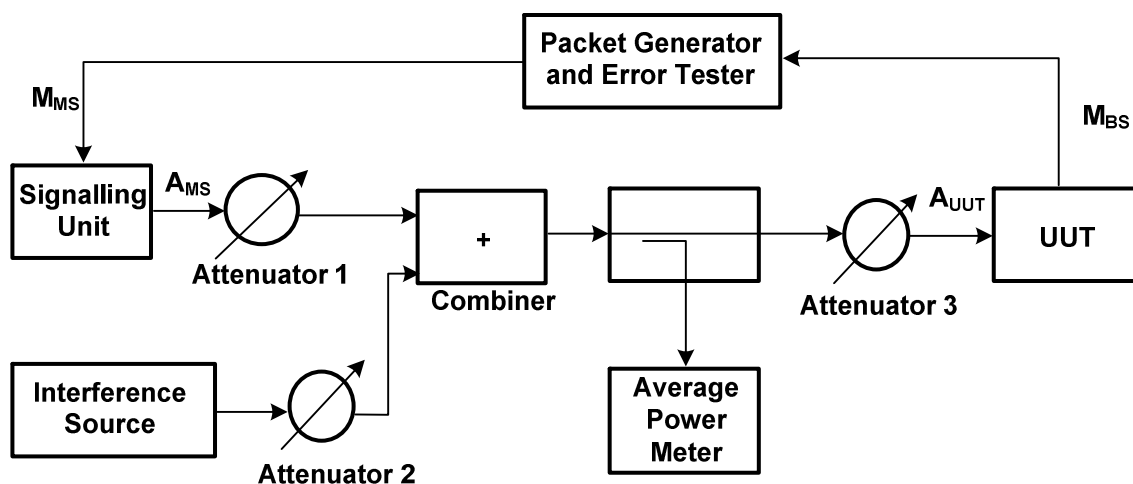
Figure 7: Test setup for receiver adjacent channel selectivity test

5.4.7.1.1   Procedure

Test case for 5 MHz channel bandwidth

Step 1	Adjust the received signal level at A_{UUT} to be 3 dB above the sensitivity level P_{SENS5} for 5 MHz under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
Step 2	Turn on the interfering source and configure it to transmit at f_c - 5 MHz from the nominal (desired) operation frequency.
Step 3	Increase the interfering source power to the interference level in table 18, 19 or 20 for 5 MHz.
Step 4	Perform a BER measurement and record the results.
Step 5	Turn the interference source off.
Step 6	Repeat step 1 to step 5 above for the test cases shown in table 18, 19 or 20.
Step 7	Repeat the test procedure for the low, middle, and high channel of the declared frequency range.

Test case for 10 MHz channel bandwidth

Step 1	Adjust the received signal level at A_{UUT} to be 3 dB above the sensitivity level P_{SENS10} under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
Step 2	Turn on the interfering source and configure it to transmit at f_c - 10 MHz from the nominal (desired) operation frequency.
Step 3	Increase the interfering source power to the interference level in table 18, 19 or 20.
Step 4	Perform a BER measurement and record the results.
Step 5	Turn the interference source off.
Step 6	Repeat step 1 to step 5 above for the test cases shown in table 18, 19 or 20.
Step 7	Repeat the test procedure for the low, middle, and high channel of the declared frequency range.

Table 26: Test parameters for receiver ACS Class 1

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
Power (dBm)	P_{SENS} + 3	Nth + 33	Nth + 47
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

Table 27: Test parameters for receiver ACS Class 2

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
Power (dBm)	P_{SENS} + 3	Nth + 40	Nth + 50
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

Table 28: Test parameters for receiver ACS Class 3

Description	In-channel	Interferer on 1st adjacent channel	Interferer on 2nd adjacent channel
Power (dBm)	P_{SENS} + 3	Nth + 46	Nth + 56
Centre frequency (MHz) for 5 MHz channel bandwidth	f_c	$f_c \pm 5$ MHz	$f_c \pm 10$ MHz
Centre frequency (MHz) for 10 MHz channel bandwidth	f_c	$f_c \pm 10$ MHz	$f_c \pm 20$ MHz

NOTE: P_{SENS} in tables 26 to 28 depends on the channel bandwidth ($P_{SENS} = P_{SENS5}$ for 5 MHz and $P_{SENS} = P_{SENS10}$ for 10 MHz channel bandwidths).

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

5.4.8   Receiver blocking characteristics

The purpose of this test is to verify compliance of BS equipments to the transmitter adjacent channel leakage power ratio requirements of clause 4.2.9.

5.4.8.1   Method of test

Interfering source shall be a conforming unsynchronized signal with the same signalling technology as the in-channel signal. Figure 8 shows the test setup of the receiver blocking test.

5.4.8.1.1   Initial conditions

Set the desired received signal BW as defined in test case 1 of table 29.

5.4.8.1.2   Procedure

Step 1   Set the desired received signal at lowest channel centre frequency from the declared range.

Step 2   Adjust the received signal level at A_{UUT} to be 6 dB above the sensitivity level P_{SENS5} or P_{SENS10} under AWGN channel condition. Note: the signal level is measured over the time period of the data burst only within the downlink transmission.

Step 3   Turn on the interfering source and configure it to transmit as defined in table 29.

Step 4   Step the interfering signal generator frequency through the frequency range indicated in table 29
                with a step size of 1 MHz.

Step 5   Measure the BER (or equivalent PER) of the desired signal received for each step of the interfering
                frequency and record the results.

Step 6   Turn the interference source off.

Step 7   Repeat the test procedure at middle and highest channel centre frequencies for the desired received
                signal from the declared range.

Step 8   Repeat the test procedure for remaining test cases defined in table 29.

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

Table 29: Test parameters for receiver blocking for 5 MHz and 10 MHz BW

| Test case	Centre frequency of interfering signal	Desired signal and interfering signal bandwidth	Interfering signal mean power	Desired signal mean power	Minimum offset of interfering signal from the channel edge
1	2 500 MHz to 2 690 MHz	5 MHz	-40 dBm	P_{SENS5} + 6 dB	12,5 MHz
2	2 480 MHz to 2 500 MHz 2 690 MHz to 2 710 MHz	5 MHz	-40 dBm	P_{SENS5} + 6 dB	12,5 MHz
3	1 MHz to 2 480 MHz 2 710 MHz to 12 750 MHz	5 MHz	-15 dBm	P_{SENS5} + 6 dB	-
4	2 500 MHz to 2 690 MHz	10 MHz	-40 dBm	P_{SENS10} + 6 dB	25 MHz
5	2 480 MHz to 2 500 MHz 2 690 MHz to 2 710 MHz	10 MHz	-40 dBm	P_{SENS10} + 6 dB	25 MHz
6	1 MHz to 2 480 MHz 2 710 MHz to 12 750 MHz	10 MHz	-15 dBm	P_{SENS10} + 6 dB	-
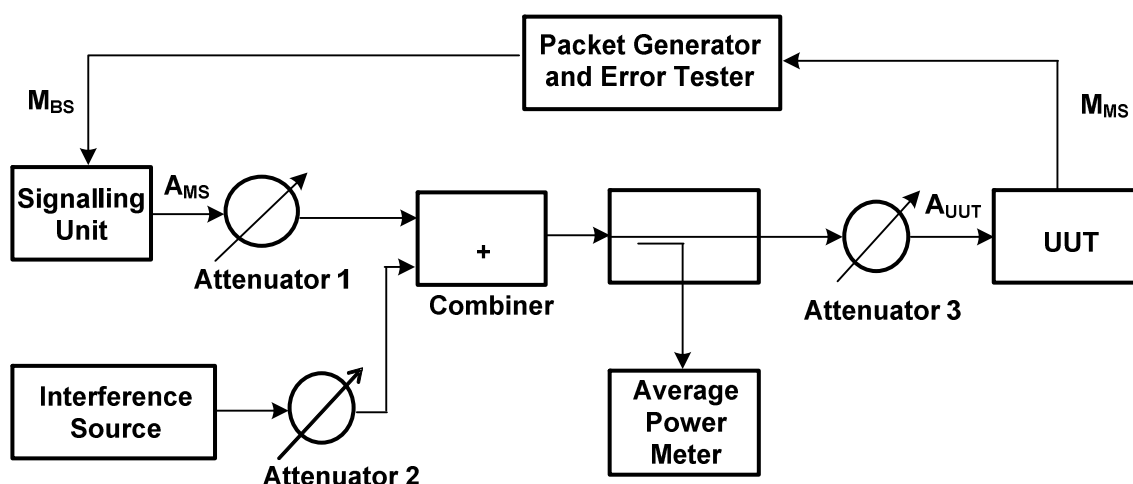
Figure 8: Test setup for receiver blocking test

5.4.9 Receiver intermodulation characteristics

The purpose of this test is to verify compliance of BS equipments to the transmitter adjacent channel leakage power ratio requirements of clause 4.2.10.

5.4.9.1 Method of test

Interfering sources shall consist of a CW signal and a conforming unsynchronized signal with the same signalling technology as the in-channel signal. Figure 9 shows the test setup for the receiver intermodulation test.

5.4.9.1.1 Initial conditions

Set the desired received signal BW as defined in test case 1 of table 30.

5.4.9.1.2 Procedure

Step 1	Set the desired received signal at lowest channel centre frequency from the declared range.
Step 2	Adjust the received signal level at A_{UUT} to be 6 dB above the sensitivity level P_{SENS} + 6 dB under AWGN channel condition. Note the signal level is measured over the time period of the data burst only within the downlink transmission.
Step 3	Turn on the interfering sources and configure to transmit as defined in table 30 with positive offset with respect to the desired signal.
Step 4	Measure the BER (or equivalent PER) of the desired signal received and record the results.
Step 5	Reconfigure interfering sources to transmit as defined in table 30 with negative offset with respect to the desired signal.
Step 6	Measure the BER (or equivalent PER) of the desired signal received and record the results.
Step 7	Turn the interference source off.
Step 8	Repeat the test procedure at middle and highest channel centre frequencies for the desired received signal from the declared range.
Step 9	Repeat the test procedure for remaining test cases defined in table 30.

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

Table 30: Test parameters for receiver intermodulation for 5 MHz and 10 MHz BW

| Test case	Desired signal bandwidth	Desired signal mean power	Interfering signal mean power	Offset of interfering signal from the channel edge	Type of interfering signal
1	5 MHz	P_{SENS5} + 6 dB	-48 dBm	7,5 MHz	CW signal
			-48 dBm	17,5 MHz	Modulation and coding equal to those of the wanted signal
2	10 MHz	P_{SENS10} + 6 dB	-48 dBm	15 MHz	CW signal
			-48 dBm	35 MHz	Modulation and coding equal to those of the wanted signal
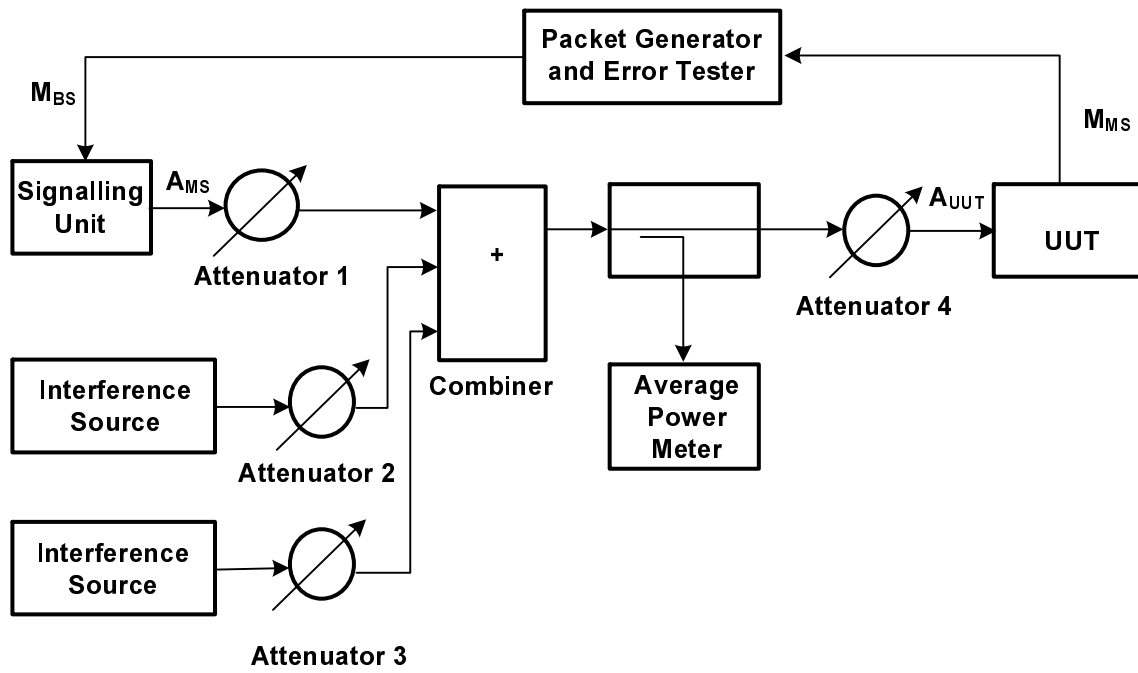
Figure 9: Test setup for receiver intermodulation test

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

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

- it provides a statement of all the requirements in words and by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);

- it provides a statement of all the test procedures corresponding to those requirements by cross reference to (a) specific clause(s) in the present document or to (a) specific clause(s) in (a) specific referenced document(s);

- it qualifies each requirement to be either:

  - Unconditional: meaning that the requirement applies in all circumstances; or

  - Conditional: meaning that the requirement is dependant on the manufacturer having chosen to support optional functionality defined within the schedule.

- in the case of Conditional requirements, it associates the requirement with the particular optional service or functionality;

- it qualifies each test procedure to be either:

  - Essential: meaning that it is included with the Essential Radio Test Suite and therefore the requirement shall be demonstrated to be met in accordance with the referenced procedures;

  - Other: meaning that the test procedure is illustrative but other means of demonstrating compliance with the requirement are permitted.

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

Harmonized Standard EN 302 544-1 The following requirements and test specifications are relevant to the presumption of conformity under the article 3.2 of the R&TTE Directive						
Requirement			**Requirement Conditionality**		**Test Specification**	
No	**Description**	**Reference: Clause No**	**U/C**	**Condition**	**E/O**	**Reference: Clause No**
1	Spectrum emission mask	4.2.2	U		E	5.4.1
2	Transmitter adjacent channel leakage power ratio	4.2.3	U		E	5.4.2
3	Transmitter spurious emissions	4.2.4	U		E	5.4.3
4	Maximum output power tolerance	4.2.5	U		E	5.4.4
5	Transmit Intermodulation	4.2.6	U		E	5.4.5
6	Receiver spurious emissions	4.2.7	U		E	5.4.6
7	Receiver adjacent channel selectivity	4.2.8	U		E	5.4.7
8	Receiver blocking characteristics	4.2.9	U		E	5.4.8
9	Receiver intermodulation characteristics	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.

Annex B (informative):
The EN title in the official languages

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

For this reason the title translation concerning the present document can be consulted via the e-approval application.

Annex C (informative):
Bibliography

- CEPT ECC/DEC/(05)05: "ECC Decision of 18 March 2005 on harmonized utilization of spectrum for IMT-2000/UMTS systems operating within the band 2 500 - 2 690 MHz".

- Commission Decision 2008/477/EC of 13 June 2008 on the harmonization of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

- Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).

- Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).

History

Document history		
V1.1.1	February 2009	Publication
V1.1.2	August 2009	One-step Approval Procedure OAP 20091224: 2009-08-26 to 2009-12-24