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HARMONISED EUROPEAN STANDARD

**IMT cellular networks;
Harmonised Standard covering the essential requirements
of article 3.2 of the Directive 2014/53/EU;
Part 11: CDMA Direct Spread (UTRA FDD) Repeaters**

Reference

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Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	5
Introduction	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	7
3 Definitions, symbols and abbreviations	7
3.1 Definitions	7
3.2 Symbols.....	8
3.3 Abbreviations	8
4 Technical requirements specifications	9
4.1 Environmental profile.....	9
4.2 Conformance requirements	9
4.2.1 Introduction.....	9
4.2.2 Operating band unwanted emissions	10
4.2.2.1 Definition	10
4.2.2.2 Limit.....	10
4.2.2.2.1 General operating band unwanted emission requirements	10
4.2.2.2.2 Operating band emission mask requirements	11
4.2.2.2.3 Protection of the BS receiver in the operating band	12
4.2.2.2.4 Co-existence with services in adjacent frequency bands	12
4.2.2.2.5 Protection of DTT.....	13
4.2.2.2.6 Limits for operation in Band 32	13
4.2.2.3 Conformance	14
4.2.3 Spurious emissions	14
4.2.3.1 Definition	14
4.2.3.2 Limit.....	14
4.2.3.2.0 General	14
4.2.3.2.1 Spurious emissions	15
4.2.3.2.2 Co-existence with other systems	15
4.2.3.3 Conformance.....	16
4.2.4 Maximum output power.....	16
4.2.4.1 Definition	16
4.2.4.2 Limit.....	17
4.2.4.3 Conformance.....	17
4.2.5 Input intermodulation	17
4.2.5.1 Definition	17
4.2.5.2 Limit.....	17
4.2.5.2.1 General input intermodulation requirement.....	17
4.2.5.2.2 Co-existence with other systems	18
4.2.5.3 Conformance.....	19
4.2.6 Out of band gain	19
4.2.6.1 Definition	19
4.2.6.2 Limits	19
4.2.6.3 Conformance.....	20
4.2.7 Adjacent Channel Rejection Ratio.....	20
4.2.7.1 Definition	20
4.2.7.2 Limit.....	20
4.2.7.3 Conformance.....	20
4.2.8 Output intermodulation.....	20
4.2.8.1 Definition	20
4.2.8.2 Limit.....	21

4.2.8.3	Conformance	21
5	Testing for compliance with technical requirements.....	21
5.1	Environmental conditions for testing	21
5.2	Interpretation of the measurement results	21
5.3	Essential radio test suites.....	23
5.3.0	Introduction.....	23
5.3.1	Operating band unwanted emission	23
5.3.1.1	Initial conditions	23
5.3.1.2	Procedures	23
5.3.1.3	Test requirement	23
5.3.2	Spurious emissions	24
5.3.2.1	Initial conditions	24
5.3.2.2	Procedure	24
5.3.2.3	Test requirement	24
5.3.3	Maximum output power.....	24
5.3.3.1	Initial conditions	24
5.3.3.2	Procedure	25
5.3.3.3	Test requirement	25
5.3.4	Input intermodulation	25
5.3.4.1	Initial conditions	25
5.3.4.2	Procedures.....	25
5.3.4.3	Test requirement	25
5.3.5	Out of band gain	25
5.3.5.1	Initial conditions	25
5.3.5.2	Procedure	26
5.3.5.3	Test requirement	26
5.3.6	Adjacent Channel Rejection Ratio.....	26
5.3.6.1	Initial conditions	26
5.3.6.2	Procedures.....	26
5.3.6.3	Test requirement	26
5.3.7	Output intermodulation.....	27
5.3.7.1	Initial conditions	27
5.3.7.2	Procedures.....	27
5.3.7.3	Test requirement	27
Annex A (normative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	28
Annex B (normative):	Repeater configurations	29
B.1	Power supply	29
B.2	Power supply options	29
B.3	Combining of Repeaters.....	29
Annex C (informative):	Environmental profile specification	30
Annex D (informative):	Bibliography.....	31
History		32

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.10] to provide one voluntary 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 and repealing Directive 1999/5/EC [i.1].

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 11 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.3].

National transposition dates	
Date of adoption of this EN:	20 April 2016
Date of latest announcement of this EN (doa):	31 July 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2017
Date of withdrawal of any conflicting National Standard (dow):	31 January 2018

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).

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Introduction

The present document is part of a set of standards developed by ETSI that are designed to fit in a modular structure to cover radio equipment within the scope of the Radio Equipment Directive [i.1]. The present document is produced following the guidance in ETSI EG 203 336 [i.2] as applicable.

1 Scope

The present document applies to the following equipment types:

- 1) Repeaters for IMT-2000 CDMA Direct Spread (UTRA FDD)

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: UTRA Repeater operating bands

UTRA FDD Band	Direction of transmission	UTRA Repeater operating bands
I	Downlink	2 110 MHz to 2 170 MHz
	Uplink	1 920 MHz to 1 980 MHz
III	Downlink	1 805 MHz to 1 880 MHz
	Uplink	1 710 MHz to 1 785 MHz
VII	Downlink	2 620 MHz to 2 690 MHz
	Uplink	2 500 MHz to 2 570 MHz
VIII	Downlink	925 MHz to 960 MHz
	Uplink	880 MHz to 915 MHz
XV	Downlink	2 600 MHz to 2 620 MHz
	Uplink	1 900 MHz to 1 920 MHz
XVI	Downlink	2 585 MHz to 2 600 MHz
	Uplink	2 010 MHz to 2 025 MHz
XX	Downlink	791 MHz to 821 MHz
	Uplink	832 MHz to 862 MHz
XXII	Downlink	3 510 MHz to 3 590 MHz
	Uplink	3 410 MHz to 3 490 MHz
XXXII (note)	Downlink	1 452 MHz to 1 492 MHz
	Uplink	N/A

NOTE: The down link frequency(ies) of this band are paired with the uplink frequency(ies) of the other FDD band (external) of the dual band configuration.

The present document covers requirements for UTRA FDD Repeater for Releases 4, 5, 6, 7, 8, 9, 10 and 11. This includes the requirements for Repeater operating bands from 3GPP Release 12. In addition, the present document covers requirements for UTRA Repeater in the operating bands specified in ETSI TS 102 735 [i.9].

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.

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 referenced document (including any amendments) applies.

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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] ETSI TS 125 143 (V11.1.0) (02-2013): "Universal Mobile Telecommunications System (UMTS); UTRA repeater conformance testing (3GPP TS 25.143 version 11.1.0 Release 11)".
- [2] IEC 60068-2-1 (2007): "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [3] IEC 60068-2-2 (2007): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".

- [4] ETSI TS 125 141 (V11.12.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141 version 11.12.0 Release 11)".

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 referenced 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] 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.
- [i.2] ETSI EG 203 336 (V1.1.1) (08-2015): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.3] ETSI EN 301 908-1 (V11.1.1): "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".
- [i.4] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.5] ETSI TS 136 104 (V11.14.0) (01-2016): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104 version 11.14.0 Release 11)".
- [i.6] Recommendation ITU-R SM.329-12 (09-2012): "Unwanted emissions in the spurious domain".
- [i.7] ETSI EN 301 908-15 (V11.1.1): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 15: Evolved Universal Terrestrial Radio Access (E-UTRA FDD) Repeaters".
- [i.8] ETSI TS 125 104 (V11.12.0) (01-2016): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104 version 11.12.0 Release 11)".
- [i.9] ETSI TS 102 735 (V7.1.0) (01-2010): "Universal Mobile Telecommunications System (UMTS); Band-specific requirements for UMTS Frequency Division Duplex (FDD) operation in the bands 1 900 MHz to 1 920 MHz paired with 2 600 MHz to 2 620 MHz and 2 010 MHz to 2 025 MHz paired with 2 585 MHz to 2 600 MHz".
- [i.10] Commission Implementing Decision C(2015) 5376 final 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.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

donor coupling loss: coupling loss between the Repeater and the donor Base Station

downlink: signal path where Base Station transmits and mobile receives

downlink operating band: part of the operating band designated for downlink (BS transmit)

maximum output power (P_{\max}): mean power level per carrier measured at the antenna connector of the Repeater in specified reference condition

maximum rated output power: maximum rated output power of the repeater is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector

operating band: frequency range that is defined with a specific set of technical requirements, in which UTRA FDD operates

NOTE: The operating band(s) for an UTRA FDD repeater is declared by the manufacturer according to the designations in table 1-1. Operating bands for UTRA are designated with Roman numerals, while the corresponding operating bands for E-UTRA are designated with Arabic numerals. Unless specified, operating band refers to the uplink operating band and downlink operating band.

pass band: frequency range that the Repeater operates in with operational configuration

NOTE: This frequency range can correspond to one or several consecutive nominal 5 MHz channels. If they are not consecutive each subset of channels has to be considered as an individual pass band. The Repeater can have one or several pass bands.

repeater: device that receives, amplifies and transmits the radiated or conducted RF carrier both in the downlink direction (from the Base Station to the mobile area) and in the uplink direction (from the mobile to the Base Station)

uplink: signal path where mobile transmits and Base Station receives

uplink operating band: part of the operating band designated for downlink (BS transmit)

3.2 Symbols

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

Δf	The separation between the centre frequency of first or last 5 MHz channel used in the pass band and the nominal -3 dB point of the measuring filter closest to the carrier frequency
Δf_{\max}	The largest value of Δf used for defining the requirement
F_{filter}	Filter centre frequency
$P_{\text{EM},N}$	Declared emission level for channel N
$P_{\text{EM},B32,\text{ind}}$	Declared emission level in Band 32, ind=a, b, c, d, e
P_{\max}	Maximum output power
P_{out}	Output power

3.3 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACRR	Adjacent Channel Rejection Ratio
BS	Base Station
BTS	Base Transceiver Station
CDMA	Code Division Multiple Access
CW	Continuous Wave
DCS	Digital Cellular System
DTT	Digital Terrestrial Television
DUT	Device Under Test
EFTA	European Free Trade Association
ERM	Electromagnetic compatibility and Radio spectrum Matters
EUT	Equipment Under Test
E-UTRA	Evolved Universal Terrestrial Radio Access
FDD	Frequency Division Duplexing
GSM	Global System for Mobile communications
IEC	International Electrotechnical Commission

IMT	International Mobile Telecommunications
ITU-R	International Telecommunication Union - Radiocommunication
MS	Mobile Station
MSG	Mobile Standards Group
PCCPCH	Primary Common Control Physical CHannel
RF	Radio Frequency
RMS	Root Mean Square
RRC	Root Raised Cosine
RSS	Root Sum Square
SCCPCH	Secondary Common Control Physical CHannel
TDD	Time Division Duplexing
TFES	Task Force for European Standards for IMT
UARFCN	UTRA Absolute Radio Frequency Channel Number
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
UTRA	Universal Terrestrial Radio Access
WCDMA	Wideband Code Division Multiple Access

4 Technical requirements specifications

4.1 Environmental profile

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

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

4.2 Conformance requirements

4.2.1 Introduction

The requirements in the present document are based on the assumption that the operating band (see table 1-1) is shared between systems of the IMT family (for band III and VIII also GSM) or systems having compatible characteristics.

To meet the essential requirement under article 3.2 of Directive 2014/53/EU [i.1] for IMT Repeater, a set of essential parameters in addition to those in ETSI EN 301 908-1 [i.3] have been identified. Table 4.2.1-1 provides a cross reference between these essential parameters and the corresponding technical requirements for equipment within the scope of the present document.

Table 4.2.1-1: Cross references

Essential parameter	Corresponding technical requirements	Corresponding test suites
Transmitter spectrum mask	4.2.2 Operating band unwanted emissions	5.3.1
Transmitter unwanted emissions in the out-of-band domain		
Transmitter and receiver unwanted emissions in the spurious domain	4.2.3 Spurious emissions	5.3.2
Transmitter power accuracy	4.2.4 Maximum output power	5.3.3
Receiver radio-frequency intermodulation	4.2.5 Input intermodulation	5.3.4
Receiver desensitization		
Receiver adjacent signal selectivity	4.2.6 Out of band gain	5.3.5
	4.2.7 Adjacent Channel Rejection Ratio	5.3.6
Transmitter intermodulation attenuation	4.2.8 Output intermodulation	5.3.7

NOTE: Some of the essential parameters of the ETSI EG 203 336 [i.2] are not included into the present document since those requirements are not applicable for repeater equipment.

The supplier shall declare operating band(s) for the Repeater. The technical requirements apply for the declared operating band(s) as outlined for each requirement. For a Repeater supporting more than one operating band, conformance testing for each technical requirement in clause 5 shall be performed.

The technical requirements also apply to Repeater configurations described in annex B.

For a Repeater declared to support Band XX, the manufacturer shall additionally declare the following quantities associated with the applicable test conditions of table 4.2.2.2.5-1 and information in annex G of ETSI TS 125 104 [i.8]:

- $P_{EM,N}$ Declared emission level for channel N
- P_{10MHz} Maximum output Power in 10 MHz

For a Repeater declared to support Band XXXII, the manufacturer shall additionally declare the following quantities associated with the applicable test conditions of tables 4.2.2.2.6-1 and 4.2.2.2.6-2 and information in annex H of ETSI TS 136 104 [i.5]:

- $P_{EM,B32,a}$, $P_{EM,B32,b}$, $P_{EM,B32,c}$, $P_{EM,B32,d}$ and $P_{EM,B32,e}$ Declared emission levels in band XXXII

4.2.2 Operating band unwanted emissions

4.2.2.1 Definition

Unwanted emissions consist of out of band emissions and spurious emissions (Recommendation ITU-R SM.329-12 [i.6]). Out of band emissions are emissions immediately outside the pass band bandwidth resulting from the modulation process and non-linearity in the transmitter, but excluding spurious emissions. 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.

The out of band emissions requirement for repeater is specified both in terms operating band unwanted emissions and protection of the BS receiver in the operating band. The operating band unwanted emissions define all unwanted emissions in the repeater operating band plus the frequency ranges 10 MHz above and 10 MHz below that band. Unwanted emissions outside of this frequency range are limited by a spurious emissions requirement.

Operating band unwanted emissions comprise an emission mask applied outside the repeater passband and a general requirement applied outside the mask but inside the frequency range of the operating band unwanted emissions.

4.2.2.2 Limit

4.2.2.2.1 General operating band unwanted emission requirements

The general operating band unwanted emissions limits are given in table 4.2.2.2.1-1.

Table 4.2.2.2.1-1: General operating band unwanted emissions requirements

Frequency range of operating band	Maximum level	Measurement bandwidth	Notes
≤ 1 GHz	-16 dBm	100 kHz	1, 2
≥ 1 GHz	-15 dBm	1 MHz	2, 3
NOTE 1: Bandwidth as in Recommendation ITU-R SM.329-12 [i.6], section 4.1.			
NOTE 2: Limit based on Recommendation ITU-R SM.329-12 [i.6], section 4.3 and annex 7.			
NOTE 3: Bandwidth as in Recommendation ITU-R SM.329-12 [i.6], section 4.1. Upper frequency as in Recommendation ITU-R SM.329-12 [i.6], section 2.5, table 1.			

4.2.2.2.2 Operating band emission mask requirements

The requirement shall be met by a Repeater's RF-signal output at maximum gain with WCDMA signals in the pass band of the Repeater, at levels that produce the maximum rated output power per channel, configured in accordance with the manufacturer's specification. Emissions shall not exceed the maximum level specified in tables 4.2.2.2.2-1, 4.2.2.2.2-2, 4.2.2.2.2-3 and 4.2.2.2.2-4 for the appropriate Repeater maximum output power, in the frequency range from $\Delta f = 2,5$ MHz to Δf_{\max} from the 5 MHz channel, where:

- Δf is the separation between the centre frequency of first or last 5 MHz channel used in the pass band and the nominal -3 dB point of the measuring filter closest to the carrier frequency;
- f_{offset} is the separation between the centre frequency of first or last 5 MHz channel in the pass band and the centre of the measuring filter;
- $f_{\text{offset}_{\max}}$ is 12,5 MHz;
- Δf_{\max} is equal to $f_{\text{offset}_{\max}}$ minus half of the bandwidth of the measurement filter.

To select the table of the maximum level for the spectrum emission mask test, use the maximum output power as defined in clause 3.1. If one channel is used for the spectrum emission mask test use this power for the selection. If two channels are used for the spectrum emission mask test use the power of one of these.

Table 4.2.2.2-1: Emission mask values, maximum output power $P \geq 43$ dBm

Frequency offset of measurement filter -3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515 \text{ MHz} \leq f_{\text{offset}} < 2,715 \text{ MHz}$	$-12,5 \text{ dBm} + \Delta P$	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715 \text{ MHz} \leq f_{\text{offset}} < 3,515 \text{ MHz}$	$-12,5 \text{ dBm} - 15 \times \left(\frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{ dB} + \Delta P$	30 kHz
	$3,515 \text{ MHz} \leq f_{\text{offset}} < 4,0 \text{ MHz}$	$-24,5 \text{ dBm} + \Delta P$	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0 \text{ MHz} \leq f_{\text{offset}} < 8,0 \text{ MHz}$	$-11,5 \text{ dBm} + \Delta P$	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\max}$	$8,0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\max}}$	$-11,5 \text{ dBm}$	1 MHz
NOTE: - for carrier frequency $f \leq 3,0$ GHz: $\Delta P = 0$ dB; - for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz: $\Delta P = 0,3$ dB.			

Table 4.2.2.2-2: Emission mask values, maximum output power $39 \leq P < 43$ dBm

Frequency offset of measurement filter -3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515 \text{ MHz} \leq f_{\text{offset}} < 2,715 \text{ MHz}$	$-12,5 \text{ dBm} + \Delta P$	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715 \text{ MHz} \leq f_{\text{offset}} < 3,515 \text{ MHz}$	$-12,5 \text{ dBm} - 15 \times \left(\frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{ dB} + \Delta P$	30 kHz
	$3,515 \text{ MHz} \leq f_{\text{offset}} < 4,0 \text{ MHz}$	$-24,5 \text{ dBm} + \Delta P$	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0 \text{ MHz} \leq f_{\text{offset}} < 8,0 \text{ MHz}$	$-11,5 \text{ dBm} + \Delta P$	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\max}$	$8,0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\max}}$	$P - 54,5 \text{ dB}$	1 MHz
NOTE: - for carrier frequency $f \leq 3,0$ GHz: $\Delta P = 0$ dB; - for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz: $\Delta P = 0,3$ dB.			

Table 4.2.2.2-3: Emission mask values, maximum output power $31 \leq P < 39$ dBm

Frequency offset of measurement filter -3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515 \text{ MHz} \leq f_{\text{offset}} < 2,715 \text{ MHz}$	$P - 51,5 \text{ dB} + \Delta P$	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715 \text{ MHz} \leq f_{\text{offset}} < 3,515 \text{ MHz}$	$P - 51,5 \text{ dB} - 15 \times \left(\frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{ dB} + \Delta P$	30 kHz
	$3,515 \text{ MHz} \leq f_{\text{offset}} < 4,0 \text{ MHz}$	$P - 63,5 \text{ dB} + \Delta P$	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0 \text{ MHz} \leq f_{\text{offset}} < 8,0 \text{ MHz}$	$P - 50,5 \text{ dB} + \Delta P$	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\text{max}}$	$8,0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$P - 54,5 \text{ dB}$	1 MHz
NOTE: - for carrier frequency $f \leq 3,0 \text{ GHz}$: $\Delta P = 0 \text{ dB}$; - for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$: $\Delta P = 0,3 \text{ dB}$.			

Table 4.2.2.2-4: Emission mask values, maximum output power $P < 31$ dBm

Frequency offset of measurement filter -3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Maximum level	Measurement bandwidth
$2,5 \text{ MHz} \leq \Delta f < 2,7 \text{ MHz}$	$2,515 \text{ MHz} \leq f_{\text{offset}} < 2,715 \text{ MHz}$	$-20,5 \text{ dBm} + \Delta P$	30 kHz
$2,7 \text{ MHz} \leq \Delta f < 3,5 \text{ MHz}$	$2,715 \text{ MHz} \leq f_{\text{offset}} < 3,515 \text{ MHz}$	$-20,5 \text{ dBm} - 15 \times \left(\frac{f_{\text{offset}}}{\text{MHz}} - 2,715 \right) \text{ dB} + \Delta P$	30 kHz
	$3,515 \text{ MHz} \leq f_{\text{offset}} < 4,0 \text{ MHz}$	$-32,5 \text{ dBm} + \Delta P$	30 kHz
$3,5 \text{ MHz} \leq \Delta f < 7,5 \text{ MHz}$	$4,0 \text{ MHz} \leq f_{\text{offset}} < 8,0 \text{ MHz}$	$-19,5 \text{ dBm} + \Delta P$	1 MHz
$7,5 \text{ MHz} \leq \Delta f \leq f_{\text{max}}$	$8,0 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$	$-23,5 \text{ dBm}$	1 MHz
NOTE: - for carrier frequency $f \leq 3,0 \text{ GHz}$: $\Delta P = 0 \text{ dB}$; - for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$: $\Delta P = 0,3 \text{ dB}$.			

4.2.2.2.3 Protection of the BS receiver in the operating band

This requirement shall be applied for the protection of UTRA FDD BS receiver in geographic areas in which UTRA-FDD Repeater and UTRA-FDD BS are deployed.

The requirement applies at frequencies that are more than 10 MHz below or more than 10 MHz above the repeater pass band.

This requirement applies to the uplink of the repeater, at maximum gain.

The power of any operating band unwanted emission shall not exceed the limits in table 4.2.2.2.3-1.

Table 4.2.2.2.3-1: Uplink operating band unwanted emissions limits for protection of the BS receiver

Maximum Level	Measurement Bandwidth	Note
-53 dBm	100 kHz	

4.2.2.2.4 Co-existence with services in adjacent frequency bands

This requirement shall be applied for the protection in bands adjacent to band I.

The requirement applies only to the down-link direction of the repeater.

The power of any operating band unwanted emission shall not exceed the limits in table 4.2.2.2.4-1.

Table 4.2.2.2.4-1: UTRA Repeater down-link operating band unwanted emission limits for protection of adjacent band services

Operating Band	Band	Maximum Level	Measurement Bandwidth
I	2 100 MHz to 2 105 MHz	-30 + 3,4 (f - 2 100 MHz) dBm	1 MHz
	2 175 MHz to 2 180 MHz	-30 + 3,4 (2 180 MHz - f) dBm	1 MHz

4.2.2.2.5 Protection of DTT

The following requirement shall apply for protection of DTT. For UTRA Repeater operating in Band XX, the level of emissions in the band 470 MHz to 790 MHz, measured in an 8 MHz filter bandwidth on centre frequencies F_{filter} according to table 4.2.2.2.5-1, shall not exceed the maximum emission level $P_{\text{EM,N}}$ declared by the manufacturer. This requirement applies in the frequency range 470 MHz to 790 MHz even though part of the range falls in the spurious domain.

Table 4.2.2.2.5-1: Declared emissions levels for protection of DTT

Filter centre frequency, F_{filter}	Measurement bandwidth	Declared emission level [dBm]
$F_{\text{filter}} = 8 \cdot N + 306$ (MHz); $21 \leq N \leq 60$	8 MHz	$P_{\text{EM,N}}$

NOTE: Compliance with the declared emission levels above provides the characteristics of the Repeater needed to verify compliance with the corresponding CEPT/ECC technical condition using the method outlined in annex G of ETSI TS 125 104 [i.8].

4.2.2.2.6 Limits for operation in Band 32

For a repeater operating in Band XXXII within 1 452 MHz to 1 492 MHz. The level of unwanted emissions, measured on centre frequencies f_{offset} with filter bandwidth, according to table 4.2.2.2.6-1 shall not exceed the maximum emission level $P_{\text{EM,B32,a}}$, $P_{\text{EM,B32,b}}$ nor $P_{\text{EM,B32,c}}$ declared by the manufacturer.

Table 4.2.2.2.6-1: Declared operating band XXXII unwanted emission within 1 452 MHz to 1 492 MHz

Frequency offset of measurement filter centre frequency, f_{offset}	Declared emission level [dBm]	Measurement bandwidth
5 MHz	$P_{\text{EM,B32,a}}$	5 MHz
10 MHz	$P_{\text{EM,B32,b}}$	5 MHz
$15 \text{ MHz} \leq f_{\text{offset}} \leq f_{\text{offset}_{\text{max, B32}}}$	$P_{\text{EM,B32,c}}$	5 MHz
NOTE: $f_{\text{offset}_{\text{max, B32}}}$ denotes the frequency difference between the lower channel carrier frequency and 1 454,5 MHz, and the frequency difference between the upper channel carrier frequency and 1 489,5 MHz for the set channel position.		

NOTE 1: Compliance with the declared emission levels above provides the characteristics of the repeater needed to verify compliance with the corresponding CEPT/ECC technical condition using the method outlined in annex H of ETSI TS 136 104 [i.5].

For a repeater operating in Band XXXII within 1 452 MHz to 1 492 MHz for the protection of services in spectrum adjacent to the frequency range 1 452 MHz to 1 492 MHz. The level of emissions, measured on centre frequencies F_{filter} with filter bandwidth according to table 4.2.2.2.6-2 shall not exceed the maximum emission level $P_{\text{EM,B32,d}}$ nor $P_{\text{EM,B32,e}}$ declared by the manufacturer. This requirement applies in the frequency range 1 429 MHz to 1 518 MHz even though part of the range falls in the spurious domain.

Table 4.2.2.6-2: Operating band XXXII declared emission outside 1 452 MHz to 1 492 MHz

Filter centre frequency, F_{filter}	Declared emission level [dBm]	Measurement bandwidth
$1\,429,5\text{ MHz} \leq F_{\text{filter}} \leq 1\,448,5\text{ MHz}$	$P_{\text{EM,B32,d}}$	1 MHz
$F_{\text{filter}} = 1\,450,5\text{ MHz}$	$P_{\text{EM,B32,e}}$	3 MHz
$F_{\text{filter}} = 1\,493,5\text{ MHz}$	$P_{\text{EM,B32,e}}$	3 MHz
$1\,495,5\text{ MHz} \leq F_{\text{filter}} \leq 1\,517,5\text{ MHz}$	$P_{\text{EM,B32,d}}$	1 MHz

NOTE 2: Compliance with the declared emission levels above provides the characteristics of the repeater needed to verify compliance with the corresponding CEPT/ECC technical condition using the method outlined in annex H of ETSI TS 136 104 [i.5].

4.2.2.3 Conformance

Conformance tests described in clause 5.3.1 shall be carried out.

4.2.3 Spurious emissions

4.2.3.1 Definition

Unwanted emissions consist of out of band emissions and spurious emissions (Recommendation ITU-R SM.329-12 [i.6]). Out of band emissions are emissions immediately outside the pass band bandwidth resulting from the modulation process and non-linearity in the transmitter, but excluding spurious emissions. 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.

The spurious emission limits apply from 9 kHz to 12,75 GHz (or above, as indicated in table 4.2.3.2.1-1), excluding the frequency range from 10 MHz below the lowest frequency of the repeaters operating band up to 10 MHz above the highest frequency of the repeaters operating band.

The requirements shall apply whatever the type of repeater considered (one or several pass bands). It applies for all configurations foreseen by the manufacturer's specification. The measurements shall apply to both paths uplink and downlink of the Repeater.

Unless otherwise stated, all requirements are measured as mean power (RMS).

4.2.3.2 Limit

4.2.3.2.0 General

The requirements apply to the uplink and downlink of the repeater, at maximum gain, and with the following input signals:

- without UTRA input signal;
- with UTRA input signals in the pass band of the repeater, at levels that produce the maximum rated power output per channel;
- with 10 dB increased UTRA input signals in all channels in the pass band, compared to the input level producing the maximum rated output power.

4.2.3.2.1 Spurious emissions

The power of any spurious emission shall not exceed the limits specified in table 4.2.3.2.1-1.

Table 4.2.3.2.1-1: General spurious emissions limits

Frequency range	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	-36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Note 1
1 GHz ↔ 12,75 GHz	-30 dBm	1 MHz	Note 2
12,75 GHz ↔ 5 th harmonic of the upper frequency edge of the downlink or uplink operating band for downlink or uplink spurious emissions, respectively	-30 dBm	1 MHz	Note 2, Note 3
NOTE 1: Bandwidth as in Recommendation ITU-R SM.329-12 [i.6], section 4.1.			
NOTE 2: Bandwidth as in Recommendation ITU-R SM.329-12 [i.6], section 4.1. Upper frequency as in Recommendation ITU-R SM.329-12 [i.6], section 2.5, table 1.			
NOTE 3: Applies only for Band XXII.			

4.2.3.2.2 Co-existence with other systems

This requirement shall be applied for the protection of UE/MS and BS/BTS receivers of other systems.

The power of any spurious emission shall not exceed the limit specified in table 4.2.3.2.2-1.

Table 4.2.3.2.2-1: Spurious emissions limits for protection of other systems

Protected system	Frequency range for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
GSM900	921 MHz to 960 MHz	-57 dBm	100 kHz	This requirement shall not apply to UTRA FDD repeater operating in band VIII.
	876 MHz to 915 MHz	-61 dBm	100 kHz	This requirement shall not apply to UTRA FDD repeater operating in band VIII, since it is already covered by the requirement in clause 4.2.2.2.3.
DCS1800	1 805 MHz to 1 880 MHz	-47 dBm	100 kHz	This requirement shall not apply to UTRA FDD repeater operating in band III.
	1 710 MHz to 1 785 MHz	-61 dBm	100 kHz	This requirement shall not apply to UTRA FDD repeater operating in band III, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band I, E-UTRA Band 1	2 110 MHz to 2 170 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band I.
	1 920 MHz to 1 980 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band I, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band III, E-UTRA Band 3	1 805 MHz to 1 880 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band III.
	1 710 MHz to 1 785 MHz	-49 dBm	1 MHz	This requirement shall not apply to the uplink of UTRA FDD repeater operating in band III, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band VII, E-UTRA Band 7	2 620 MHz to 2 690 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band VII.
	2 500 MHz to 2 570 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band VII, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band VIII, E-UTRA Band 8	925 MHz to 960 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band VIII.
	880 MHz to 915 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band VIII, since it is already covered by the requirement in clause 4.2.2.2.3.

Protected system	Frequency range for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
UTRA FDD Band XV	2 600 MHz to 2 620 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XV.
	1 900 MHz to 1 920 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XV, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band XVI	2 585 MHz to 2 600 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XV.
	2 010 MHz to 2 025 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XVI, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band XX or E-UTRA Band 20	791 MHz to 821 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XX.
	832 MHz to 862 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XX, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band XXII or E-UTRA Band 22	3 510 MHz to 3 590 MHz	-52 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XXII.
	3 410 MHz to 3 490 MHz	-49 dBm	1 MHz	This requirement shall not apply to UTRA FDD repeater operating in band XX, since it is already covered by the requirement in clause 4.2.2.2.3.
UTRA FDD Band XXXII or E-UTRA Band 32	1 452 MHz to 1 496 MHz	-52 dBm	1 MHz	This requirement shall not apply to E-UTRA FDD Repeater operating in band XXXII.
UTRA TDD in Band a), E-UTRA Band 33	1 900 MHz to 1 920 MHz	-52 dBm	1 MHz	This requirement shall not apply to the uplink of UTRA FDD Repeater operating in band I.
		-53 dBm	100 kHz	This requirement is applied only to the uplink of UTRA FDD Repeater operating in band I.
UTRA TDD in Band a), E-UTRA Band 34	2 010 MHz to 2 025 MHz	-52 dBm	1 MHz	
UTRA TDD in Band d), E-UTRA Band 38	2 570 MHz to 2 620 MHz	-52 dBm	1 MHz	This requirement shall not apply to the uplink of UTRA FDD Repeater operating in band VII.
		-53 dBm	100 kHz	This requirement shall apply only to the uplink of UTRA FDD Repeater operating in band VII.
NOTE 1: As set out in the definition in clause 4.2.3.1, the co-existence requirements in this table shall not apply for the 10 MHz frequency range immediately outside the repeaters operating band frequency range of an operating band (see table 1-1). This is also the case when the repeaters operating band frequency range is adjacent to the band for the protected system in the table.				
NOTE 2: Where the table has two entries for the same or overlapping frequency ranges, both limits shall be applied.				
NOTE 3: The requirements of -53 dBm/100 kHz in this table for the uplink direction of the Repeater reflect what can be achieved with present state of the art technology and are based on a coupling loss of 73 dB between a Repeater and a UTRA TDD BS receiver.				

4.2.3.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

For repeaters capable of supporting both UTRA and E-UTRA, conformance to the UTRA spurious emission requirements can also be demonstrated using E-UTRA spurious emission test methods as described in ETSI EN 301 908-15 [i.7].

4.2.4 Maximum output power

4.2.4.1 Definition

Maximum output power, P_{\max} , of the Repeater is the mean power level per carrier measured at the antenna connector in specified reference condition.

4.2.4.2 Limit

In normal conditions, the Repeater maximum output power shall remain within limits specified in table 4.2.4.2-1 relative to the manufacturer's rated output power.

Table 4.2.4.2-1: Repeater output power; normal conditions

Rated output power	Carrier frequency	Limit
$P \geq 43$ dBm	$f \leq 3,0$ GHz	+2,7 dB and -2,7 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,0 dB and -3,0 dB
$39 \leq P < 43$ dBm	$f \leq 3,0$ GHz	+2,7 dB and -2,7 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,0 dB and -3,0 dB
$31 \leq P < 39$ dBm	$f \leq 3,0$ GHz	+2,7 dB and -2,7 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,0 dB and -3,0 dB
$P < 31$ dBm	$f \leq 3,0$ GHz	+3,7 dB and -3,7 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+4,0 dB and -4,0 dB

In extreme conditions, the Repeater maximum output power shall remain within limits specified in table 4.2.4.2-2 relative to the manufacturer's rated output power.

Table 4.2.4.2-2: Repeater output power; extreme conditions

Rated output power	Carrier frequency	Limit
$P \geq 43$ dBm	$f \leq 3,0$ GHz	+3,2 dB and -3,2 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,5 dB and -3,5 dB
$39 \leq P < 43$ dBm	$f \leq 3,0$ GHz	+3,2 dB and -3,2 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,5 dB and -3,5 dB
$31 \leq P < 39$ dBm	$f \leq 3,0$ GHz	+3,2 dB and -3,2 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+3,5 dB and -3,5 dB
$P < 31$ dBm	$f \leq 3,0$ GHz	+4,7 dB and -4,7 dB
	$3,0$ GHz < $f \leq 4,2$ GHz	+5,0 dB and -5,0 dB

4.2.4.3 Conformance

Conformance tests described in clause 5.3.3 shall be carried out.

4.2.5 Input intermodulation

4.2.5.1 Definition

The input intermodulation is a measure of the capability of the Repeater to inhibit the generation of interference in the pass band, in the presence of interfering signals on frequencies other than the pass band.

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 Repeater to maintain the wanted frequency free of internally created interference.

This test applies to uplink and downlink path of the Repeater.

4.2.5.2 Limit

4.2.5.2.1 General input intermodulation requirement

The intermodulation performance should be met when the following signals are applied to the Repeater.

Table 4.2.5.2.1-1: General input intermodulation requirement

f_offset	Interfering signal levels	Type of signals	Measurement bandwidth
3,5 MHz	-40 dBm	2 CW carriers	1 MHz

For the parameters specified in table 4.2.5.2.1-1, the power in the pass band shall not increase with more than the limit in table 4.2.5.2.1-2 at the output of the Repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

Table 4.2.5.2.1-2: General input intermodulation limit

Limit for the increase of power in the pass band
+11,2 dB

4.2.5.2.2 Co-existence with other systems

The intermodulation performance should be met when the following signals are applied to the Repeater.

Table 4.2.5.2.2-1: Input intermodulation requirements for interfering signals in the other system bands

Coexistence with UTRA-FDD	Frequency of interfering signals	Interfering signal levels	Type of signals	Measurement bandwidth	Notes
GSM900	876 MHz to 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in clause 4.2.5.2.1.
GSM1800	1 710 MHz to 1 785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band I, E-UTRA Band 1	1 920 MHz to 1 980 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band I, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band III E-UTRA Band 3	1 710 MHz to 1 785 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band III, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band VII E-UTRA Band 7	2 500 MHz to 2 570 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band VII, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band VIII E-UTRA Band 8	880 MHz to 915 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band VIII, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band XV	1 900 MHz to 1 920 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band XV, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band XVI	2 010 MHz to 2 025 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band XVI, since it is already covered by the requirement in clause 4.2.5.2.1.
UTRA FDD Band XX E-UTRA Band 20	832 MHz to 862 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band XX, since it is already covered by the requirement in clause 4.2.5.2.1.

Coexistence with UTRA-FDD	Frequency of interfering signals	Interfering signal levels	Type of signals	Measurement bandwidth	Notes
UTRA FDD Band XXII E-UTRA Band 22	3 410 MHz to 3 490 MHz	-15 dBm	2 CW carriers	1 MHz	This requirement shall not apply to UTRA FDD Repeater operating in band XXII, since it is already covered by the requirement in clause 4.2.5.2.1.

For the parameters specified in table 4.2.5.2.2-1, the power in the pass band shall not increase with more than the limit in table 4.2.5.2.2-2 at the output of the Repeater as measured in the centre of the pass band, compared to the level obtained without interfering signals applied.

Table 4.2.5.2.2-2: Co-existence with other systems input intermodulation limit

Limit for the increase of power in the pass band
+11,2 dB

4.2.5.3 Conformance

Conformance tests described in clause 5.3.4 shall be carried out.

4.2.6 Out of band gain

4.2.6.1 Definition

Out of band gain refers to the gain of the Repeater immediately outside the pass band. The measurements shall apply to both paths uplink and downlink of the Repeater.

4.2.6.2 Limits

The intended use of a Repeater in a system is to amplify the in band signals and not to amplify the out of band emission of the donor Base Station.

In the intended application of the Repeater, the out of band gain is less than the donor coupling loss.

The Repeater minimum donor coupling loss shall be declared by the manufacturer. This is the minimum required attenuation between the donor BS and the Repeater for proper Repeater operation.

The gain outside the pass band shall not exceed the maximum level specified in table 4.2.6.2-1, where:

- f_{offset} is the distance from the centre frequency of the first or last 5 MHz channel within the pass band.

Table 4.2.6.2-1: Out of band gain limits 1

Frequency offset from the carrier frequency, f_{offset}	Maximum gain
$2,7 \text{ MHz} \leq f_{\text{offset}} < 3,5 \text{ MHz}$	60,5 dB
$3,5 \text{ MHz} \leq f_{\text{offset}} < 7,5 \text{ MHz}$	45,5 dB
$7,5 \text{ MHz} \leq f_{\text{offset}} < 12,5 \text{ MHz}$	45,5 dB
$12,5 \text{ MHz} \leq f_{\text{offset}}$	35,5 dB

For $12,5 \text{ MHz} \leq f_{\text{offset}}$ the out of band gain shall not exceed the maximum gain of table 4.2.6.2-1 or the maximum gain stated in table 4.2.6.2-2 whichever is lower.

Table 4.2.6.2-2: Out of band gain limits 2

Repeater maximum output power as in clause 4.2.2	Carrier frequency	Maximum gain
P < 31 dBm	f ≤ 3,0 GHz	Out of band gain ≤ minimum donor coupling loss + 0,5 dB
	3,0 GHz < f ≤ 4,2 GHz	Out of band gain ≤ minimum donor coupling loss + 0,8 dB
31 dBm ≤ P < 43 dBm	f ≤ 3,0 GHz	Out of band gain ≤ minimum donor coupling loss + 0,5 dB
	3,0 GHz < f ≤ 4,2 GHz	Out of band gain ≤ minimum donor coupling loss + 0,8 dB
P ≥ 43 dBm	f ≤ 3,0 GHz	Out of band gain ≤ minimum donor coupling loss - (P - 43 dBm) + 0,5 dB
	3,0 GHz < f ≤ 4,2 GHz	Out of band gain ≤ minimum donor coupling loss - (P - 43 dBm) + 0,8 dB

NOTE: The donor coupling loss is considered with 12,5 MHz ≤ f_offset.

4.2.6.3 Conformance

Conformance tests described in clause 5.3.5 shall be carried out.

4.2.7 Adjacent Channel Rejection Ratio

4.2.7.1 Definition

Adjacent Channel Rejection Ratio (ACRR) is the ratio of the RRC weighted gain per carrier of the Repeater in the pass band to the RRC weighted gain of the Repeater on an adjacent channel.

The requirement shall apply to the uplink and downlink of Repeater where the donor link is maintained via antennas (over the air Repeater).

4.2.7.2 Limit

The ACRR shall be higher than the value specified in table 4.2.7.2-1.

Table 4.2.7.2-1: Repeater ACRR

Repeater maximum output power as in clause 4.2.2	Channel offset from the centre frequency of the first or last 5 MHz channel within the pass band	ACRR limit
P ≥ 31 dBm	5 MHz	32,3 dB
P ≥ 31 dBm	10 MHz	32,3 dB
P < 31 dBm	5 MHz	19,3 dB
P < 31 dBm	10 MHz	19,3 dB

4.2.7.3 Conformance

Conformance tests described in clause 5.3.6 shall be carried out.

4.2.8 Output intermodulation

4.2.8.1 Definition

The output intermodulation requirement is a measure of the ability of the Repeater to inhibit the generation of intermodulation products signals created by the presence of an interfering signal reaching the Repeater via the output port.

The output intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the output port at a level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the wanted signal, but within the frequency band allocated for UTRA FDD downlink as specified in clause 1.

The requirement is applicable for downlink signals.

4.2.8.2 Limit

The output intermodulation level shall not exceed the out of band emission of clause 4.2.2.2 nor the downlink spurious emission requirements clause 4.2.3.2.

4.2.8.3 Conformance

Conformance tests described in clause 5.3.7 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

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

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

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated. For guidance on the use of other test conditions to be used in order to show compliance reference can be made to ETSI TS 125 143 [1], clause 5.4.

5.2 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 an 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 5.2-1.

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 confidence levels 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.4], in particular in annex D of the ETSI TR 100 028-2 [i.4].

Table 5.2-1 is based on this expansion factors.

Table 5.2-1: Maximum uncertainty of the test system

Parameter	Conditions	Uncertainty
Operating band unwanted emission (except Protection of the BS receiver in the operating band)	$f \leq 3,0$ GHz $3,0$ GHz < $f \leq 4,2$ GHz Due to carrier leakage for measurements specified in a 1 MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower bandwidth measurements may be necessary in order to achieve the above accuracy. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according to ETSI TS 125 141 [4].	$\pm 1,5$ dB $\pm 1,8$ dB
Protection of the BS receiver in the operating band	for results > -60 dBm for results < -60 dBm	$\pm 2,0$ dB $\pm 3,0$ dB

Parameter	Conditions	Uncertainty
Spurious emissions	For "Spurious emissions": $f \leq 2,2 \text{ GHz}$ $2,2 \text{ GHz} < f \leq 4 \text{ GHz}$ $f > 4 \text{ GHz}$	$\pm 1,5 \text{ dB}$ $\pm 2,0 \text{ dB}$ $\pm 4,0 \text{ dB}$
	In UTRA and co-existence receive bands: for results > -60 dBm for results < -60 dBm	$\pm 2,0 \text{ dB}$ $\pm 3,0 \text{ dB}$
	The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according to ETSI TS 125 141 [4].	
Maximum output power	$f \leq 3,0 \text{ GHz}$ $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$	$\pm 0,7 \text{ dB}$ $\pm 1,0 \text{ dB}$
Input intermodulation characteristics	Formula: $\sqrt{(CW1_level_error)^2 + (2 \cdot CW2_level_error)^2 + (measurement_error)^2}$ RSS: CW1 level error, 2 x CW2 level error, and measurement error (using all errors = $\pm 0,5 \text{ dB}$).	$\pm 1,2 \text{ dB}$
Out of band gain	$f \leq 3,0 \text{ GHz}$ $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$ 5 MHz offset	$\pm 0,5 \text{ dB}$ $\pm 0,8 \text{ dB}$
	Calibration of test set-up shall be made without DUT in order to achieve the accuracy.	
Output intermodulation	Spectrum emissions mask.	$\pm 2,1 \text{ dB}$
	$\sqrt{(2 \cdot Interference_level_error)^2 + (Spectrum_emission_measurement_error)^2}$	
	RSS: 2x Interference signal level error and Spectrum emission measurement level error. (1 dB interference signal level error is assumed).	
	Due to carrier leakage for measurements specified in a 1 MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower bandwidth measurements may be necessary in order to achieve the above accuracy.	
	The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according to ETSI TS 125 141 [4].	
	For "Spurious emissions": $f \leq 2,2 \text{ GHz}$ $2,2 \text{ GHz} < f \leq 4 \text{ GHz}$ $f > 4 \text{ GHz}$	$\pm 1,5 \text{ dB}$ $\pm 2,0 \text{ dB}$ $\pm 4,0 \text{ dB}$
	In UTRA and co-existence receive bands: for results > -60 dBm for results < -60 dBm	$\pm 2,0 \text{ dB}$ $\pm 3,0 \text{ dB}$
The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according to ETSI TS 125 141 [4].		
The interference signal shall have a spurious emission level at least 10 dB below the spurious levels required in clause 4.2.3.2.		
Adjacent Channel Rejection Ratio		$\pm 0,7 \text{ dB}$
NOTE 1: For RF tests it should be noted that the uncertainties in table 5.2-1 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 5.2-1, 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 5.2-1 is used to tighten the Test Requirements - making the test harder 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 5.2-1 does not increase the probability of passing an EUT that would otherwise have failed a test if a Test System compliant with table 5.2-1 had been used.		

5.3 Essential radio test suites

5.3.0 Introduction

This clause describes the test suites for UTRA FDD.

5.3.1 Operating band unwanted emission

5.3.1.1 Initial conditions

Test environment: Normal; see ETSI TS 125 143 [1], clause 5.4.1.

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Connect a signal generator to the input port of the Repeater for tests of Repeaters with a pass band corresponding to one 5 MHz channel. If the pass band corresponds to two or more 5 MHz carriers, two signal generators with a combining circuit or one signal generator with the ability to generate several WCDMA carriers is connected to the input. The signals shall be de-correlated as described in ETSI TS 125 141 [4], clause 6.1.1.6.3 of equal power.
- 2) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.
- 3) Measurements with an offset from the carrier centre frequency between 4,0 MHz and $(f_{\text{offset}_{\text{max}}} - 500 \text{ kHz})$ shall use a 1 MHz measurement bandwidth. The 1 MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements.
- 4) Detection mode: True RMS.

5.3.1.2 Procedures

- 1) Set the Repeater to maximum gain.
- 2) Set the signal generator(s) to generate signal(s) in accordance to test model 1, ETSI TS 125 141 [4], at level(s) which produce the manufacturer specified maximum output power at maximum gain.
- 3) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.
- 4) Increase the input power with 10 dB compare to the level obtained in step 2).
- 5) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.
- 6) If the pass band corresponds to more than two consecutive nominal 5 MHz channels, repeat step 2) to 5) with any combination of two WCDMA modulated signals of equal power in the repeaters pass band.
- 7) Switch of the signal generator.
- 8) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

5.3.1.3 Test requirement

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

5.3.2 Spurious emissions

5.3.2.1 Initial conditions

Test environment: Normal; see ETSI TS 125 143 [1], clause 5.4.1.

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Connect a signal generator to the input port of the Repeater for tests of Repeaters with a pass band corresponding to one 5 MHz channel. If the pass band corresponds to two or more 5 MHz carriers, two signal generators with a combining circuit or one signal generator with the ability to generate several WCDMA carriers is connected to the input. The signals shall be de-correlated as described in ETSI TS 125 141 [4], clause 6.1.1.6.3 of equal power.
- 2) Detection mode: True RMS.

5.3.2.2 Procedure

- 1) Set the Repeater to maximum gain.
- 2) Set the signal generator(s) to generate signal(s) in accordance to test model 1, ETSI TS 125 141 [4], at level(s) which produce the manufacturer specified maximum output power at maximum gain.
- 3) The detecting device shall be configured with a measurement bandwidth as stated in the tables.
- 4) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.
- 5) Increase the input power with 10 dB compare to the level obtained in step 2).
- 6) If the pass band corresponds to more than two consecutive nominal 5 MHz channels, repeat steps 2) to 5) with any combination of two WCDMA modulated signals of equal power in the repeaters pass band.
- 7) Switch off the signal generator.
- 8) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

5.3.2.3 Test requirement

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

5.3.3 Maximum output power

5.3.3.1 Initial conditions

Test environment: Normal: see ETSI TS 125 143 [1];

In addition, on one UARFCN only, the test shall be performed under extreme power supply conditions as defined in clause B.1.

NOTE: Tests under extreme power supply also test extreme temperature, see ETSI TS 125 143 [1].

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Connect the signal generator equipment to the Repeater input port.
- 2) Connect the power measuring equipment to the Repeater output port.

5.3.3.2 Procedure

- 1) Set the signal generator to transmit a signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model 1 in ETSI TS 125 141 [4].
- 2) Adjust the input power to the Repeater to create the maximum nominal Repeater output power at maximum gain.
- 3) Measure the mean power at the RF output port over a certain slot.
- 4) Increase the power with 10 dB compare to the level obtained in step 2).
- 5) Measure the mean power at the RF output port over a certain slot.

5.3.3.3 Test requirement

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

5.3.4 Input intermodulation

5.3.4.1 Initial conditions

Test environment: Normal: see ETSI TS 125 143 [1].

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Set the Repeater to maximum gain.
- 2) Connect two signal generators with a combining circuit or one signal generator with the ability to generate several CW carriers to the input.
- 3) Connect a spectrum analyser to the output of the Repeater. Set the resolution bandwidth to 1 MHz in the centre of the pass band. Set averaging to 1 s.

5.3.4.2 Procedures

- 1) Adjust the frequency of the input signals, either below or above the pass band, so that the lowest order intermodulation product is positioned in the centre of the pass band, according to clause 4.2.5.2.
- 2) Take the measurement of the rise of the output signal.
- 3) Repeat the measurement for the opposite path of the Repeater.

5.3.4.3 Test requirement

The results obtained shall be compared to the limits in clause 4.2.5.2 in order to prove compliance.

5.3.5 Out of band gain

5.3.5.1 Initial conditions

Test environment: Normal; see ETSI TS 125 143 [1].

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) The test shall be performed with an offset between CW-signal and the first or last 5 MHz channel within the pass band of 2,7 MHz, 3 MHz, 3,5 MHz, 5 MHz, 7,5 MHz, 10 MHz, 12,5 MHz, 15 MHz and 20 MHz, excluding other pass bands. In addition the test shall also be performed for all harmonic frequencies of the Repeaters pass band up to 12,75 GHz, for carrier frequency $f \leq 3,0$ GHz, or up to the 5th harmonic of the upper frequency edge of the downlink or uplink operating band, for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$.

5.3.5.2 Procedure

- 1) Set the Repeater to maximum gain.
- 2) Set the signal generator to generate a CW-signal, applied to the input port of the Repeater. The power level of the RF input signal shall be at least 5 dB below the power level which, when applied within the pass band, would produce the maximum rated output power, as declared by the manufacturer. This is to ensure that the equipment is operating in the linear output range.
- 3) The average output power in each case shall be measured using a spectrum analyser connected to the output port of the Repeater and the net gain shall be recorded and compared to tables 4.2.6.2-1 or 4.2.6.2-2 whichever is lower.
- 4) With the same input power as in step 1) set the Repeater gain to the minimum specified by the manufacturer.
- 5) The average output power in each case shall be measured using a spectrum analyser connected to the output port of the Repeater and the net gain shall be recorded and compared to tables 4.2.6.2-1 or 4.2.6.2-2 whichever is lower.

5.3.5.3 Test requirement

The results obtained shall be compared to the limits in clause 4.2.6.2 in order to prove compliance.

5.3.6 Adjacent Channel Rejection Ratio

5.3.6.1 Initial conditions

Test environment: Normal; see ETSI TS 125 143 [1].

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Connect a signal generator to the input port of the Repeater.
- 2) Connect a power measuring equipment to the output port of the Repeater.
- 3) The measurement device characteristics shall be:
 - measurement filter bandwidth: defined in clause 4.2.7.1;
 - detection mode: true RMS voltage or true average power.

5.3.6.2 Procedures

- 1) Set the signal generator to transmit a signal modulated with a combination of PCCPCH, SCCPCH and Dedicated Physical Channels specified as test model 1 in ETSI TS 125 141 [4] at the first or last 5 MHz channel within the pass band.
- 2) Adjust the input power to the Repeater to create the maximum rated Repeater output power at maximum gain.
- 3) Measure the RRC filtered mean power at the RF output port over a certain slot.
- 4) Set the signal generator to transmit the same signal and the same input power at one of the channel offsets according to table 4.2.7.2-1.
- 5) Measure the RRC filtered mean power at the RF output port over a certain slot.
- 6) Calculate the ratio of the measured power in the pass band to the measured power at the channel offset.
- 7) Repeat step 4) to 6) until all channel offsets in table 4.2.7.2-1 are measured.

5.3.6.3 Test requirement

The results obtained shall be compared to the limits in clause 4.2.7-2 in order to prove compliance.

5.3.7 Output intermodulation

5.3.7.1 Initial conditions

Test environment: Normal; see ETSI TS 125 143 [1].

A measurement set-up is shown in ETSI TS 125 143 [1], annex A.

- 1) Connect a signal generator to the input port of the Repeater for tests of Repeaters with a pass band corresponding to one 5 MHz channel. Connect a signal generator to the circulator on the output port and make sure the signal generator power is directed to the Repeater output port.
- 2) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.
- 3) Measurements with an offset from the carrier centre frequency between 4,0 MHz and ($\Delta f_{\max} - 500$ kHz) shall use a 1 MHz measurement bandwidth. The 1 MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements.
- 4) Detection mode: True RMS.

5.3.7.2 Procedures

- 1) Set the Repeater to maximum gain.
- 2) Set the signal generator at the Repeater input port (subject signal) to generate a signal in accordance to test model 1, ETSI TS 125 141 [4], clause 6.1.1.1, at the level which produce the manufacturer specified maximum output power at maximum gain.
- 3) Set the signal generator at the Repeater output port (interference signal) to generate a signal in accordance to test model 1, ETSI TS 125 141 [4], clause 6.1.1.1, at the level producing signal power corresponding to 30 dB below the manufacturer specified maximum output power at the Repeater output port with the specified frequency offset from the wanted signal.
- 4) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value. Measurements in the band of the interfering signal shall be excluded. The measurements can be limited to the power of all third and fifth order intermodulation products.
- 5) Repeat from clause 3 until interference signals ± 5 MHz, ± 10 MHz and ± 15 MHz frequency offset from the wanted signal has been tested. Note that interfering signals outside the UTRA-FDD operating band, as specified in clause 1 need not be tested.

5.3.7.3 Test requirement

The results obtained shall be compared to the limits in clause 4.2.8.2 in order to prove compliance.

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

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.10] to provide one voluntary 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 and repealing Directive 1999/5/EC [i.1].

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

Harmonised Standard ETSI EN 301 908-11				
The following requirements are relevant to the presumption of conformity under the article 3.2 of the Directive 2014/53/EU [i.1]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Operating band unwanted emission	4.2.2	U	
2	Spurious emissions	4.2.3	U	
3	Maximum output power	4.2.4	U	
4	Input intermodulation	4.2.5	U	
5	Out of band gain	4.2.6	U	
6	Adjacent Channel Rejection Ratio	4.2.7	U	
7	Output intermodulation	4.2.8	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): Repeater configurations

B.1 Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by manufacturer's declaration for the equipment under test.

Upper voltage limit:

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, in accordance with the methods described in IEC 60068-2-1 [2] Test Ab/Ad and IEC 60068-2-2 [3] Test Bb/Bd: Dry Heat.

Lower voltage limit:

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, in accordance with the methods described in IEC 60068-2-1 [2] Test Ab/Ad and IEC 60068-2-2 [3] Test Bb/Bd: Dry Heat.

B.2 Power supply options

If the Repeater is supplied with a number of different power supply configurations, it may not be necessary to test RF parameters for each of the power supply options, provided that it can be demonstrated that the range of conditions over which the equipment is tested is at least as great as the range of conditions due to any of the power supply configurations.

B.3 Combining of Repeaters

If the Repeater is intended for combination with additional apparatus connected to a Repeater port and this combination is supplied as a system, the combination of Repeater together with the additional apparatus shall also fulfil the Repeater requirements. E.g. if the Repeater is intended for combination such that multiple Repeaters amplify the same signals into the same ports the combination shall also fulfil the Repeater requirements.

An example of such a configuration is shown in figure B.3-1.

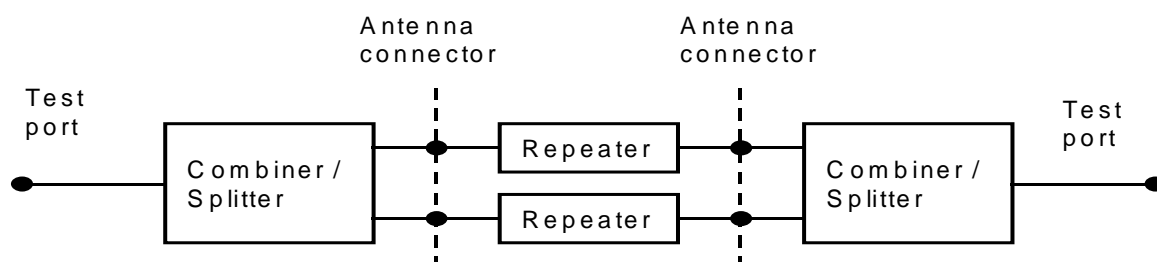


Figure B.3-1: Example of Repeater configuration

Annex C (informative): Environmental profile specification

The following environmental conditions may be declared by the supplier:

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

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

Annex D (informative): Bibliography

- CEPT/ERC/REC 74-01 (Siófok 1998, Nice 1999, Sesimbra 2002, Hradec Kralove 2005, Cardiff 2011): "Unwanted emissions in the spurious domain".
- Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- Directive 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).
- Commission Decision 2008/477/EC of 13 June 2008 on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.
- Commission Decision 2010/267/EU of 6 May 2010 on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.
- Commission Decision (EU) 2015/750 of 8 May 2015 on the harmonisation of the 1 452-1 492 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Union.
- Regulation (EU) No 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation amending Council Directives 89/686/EEC and 93/15/EEC and Directives 94/9/EC, 94/25/EC, 95/16/EC, 97/23/EC, 98/34/EC, 2004/22/EC, 2007/23/EC, 2009/23/EC and 2009/105/EC of the European Parliament and of the Council and repealing Council Decision 87/95/EEC and Decision No1673/2006/EC of the European Parliament and of the Council.
- ECC Decision (15)01: "Harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz including a paired frequency arrangement (Frequency Division Duplex 2x30 MHz) and an optional unpaired frequency arrangement (Supplemental Downlink)", Approved 06 March 2015.
- 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.
- Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.

History

Document history		
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