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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

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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	
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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.

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

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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

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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
$P_{EM,N}$	Declared emission level for channel N
$P_{EM,B32,ind}$	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_offset_{max} is 12,5 MHz;
- Δf_{max} is equal to f_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 4.2.2.2.2-1: Emission mask values, maximum output power 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 MHz ≤ Δf < 2,7 MHz	2,515 MHz ≤ f_offset < 2,715 MHz	-12,5 dBm + ΔP	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715 MHz ≤ f_offset < 3,515 MHz	$-12,5\,\text{dBm} - 15 \times \left(\frac{\text{f\_offset}}{\text{MHz}} - 2,715\right)\text{dB} + \Delta P$	30 kHz
	3,515 MHz ≤ f_offset < 4,0 MHz	-24,5 dBm + ΔP	30 kHz
3,5 MHz ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0 MHz	-11,5 dBm + ΔP	1 MHz
7,5 MHz ≤ Δf ≤ f_{max}	8,0 MHz ≤ f_offset < f_offset_{max}	-11,5 dBm	1 MHz
NOTE: - for carrier frequency f ≤ 3,0 GHz: ΔP = 0 dB; - for carrier frequency 3,0 GHz < f ≤ 4,2 GHz: ΔP = 0,3 dB.			

Table 4.2.2.2.2-2: Emission mask values, maximum output power 39 ≤ 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 MHz ≤ Δf < 2,7 MHz	2,515 MHz ≤ f_offset < 2,715 MHz	-12,5 dBm + ΔP	30 kHz
2,7 MHz ≤ Δf < 3,5 MHz	2,715 MHz ≤ f_offset < 3,515 MHz	$-12,5\,\text{dBm} - 15 \times \left(\frac{\text{f\_offset}}{\text{MHz}} - 2,715\right)\text{dB} + \Delta P$	30 kHz
	3,515 MHz ≤ f_offset < 4,0 MHz	-24,5 dBm + ΔP	30 kHz
3,5 MHz ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0 MHz	-11,5 dBm + ΔP	1 MHz
7,5 MHz ≤ Δf ≤ f_{max}	8,0 MHz ≤ f_offset < f_offset_{max}	P - 54,5 dB	1 MHz
NOTE: - for carrier frequency f ≤ 3,0 GHz: ΔP = 0dB; - for carrier frequency 3,0 GHz < f ≤ 4,2 GHz: ΔP = 0,3 dB.			