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Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC) standard
for radio equipment and services;
Part 23: Specific conditions for IMT-2000 CDMA
Direct Spread (UTRA) Base Station (BS) radio,
repeater and ancillary equipment**



Reference

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Contents

Intellectual Property Rights	5
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	7
3.1 Definitions	7
3.2 Abbreviations	7
4 Test conditions	7
4.1 General	7
4.2 Arrangements for test signals	8
4.2.1 Arrangements for test signals at the input of transmitters.....	8
4.2.2 Arrangements for test signals at the output of transmitters.....	8
4.2.3 Arrangements for test signals at the input of receivers	8
4.2.4 Arrangements for test signals at the output of receivers	8
4.2.5 Arrangements for test signals for repeaters.....	8
4.3 Exclusion bands.....	8
4.3.1 Transmitter exclusion band.....	8
4.3.2 Receiver exclusion band	9
4.4 Narrow band responses of receivers	9
4.5 Normal test modulation	9
5 Performance assessment.....	10
5.1 General	10
5.2 Equipment which can provide a continuous communication link	10
5.2.1 Assessment of BLER in Downlink	10
5.2.2 Assessment of BLER in Uplink	10
5.2.3 Assessment of RF gain variations of repeaters	10
5.3 Equipment which does not provide a continuous communication link	10
5.4 Ancillary equipment	10
5.5 Equipment classification	11
6 Performance criteria	11
6.1 Performance criteria for continuous phenomena applied to Base Stations (BS) and Repeaters.....	11
6.1.1 Base Stations (BS)	11
6.1.2 Repeaters	11
6.2 Performance criteria for transient phenomena for Base Station (BS) and Repeaters	11
6.2.1 Base stations (BS).....	11
6.2.2 Repeaters	11
6.2.2.1 Repeaters, Performance criteria for voltage dips (> 60 %) and interruptions	11
6.3 Performance criteria for ancillary equipment tested on a stand alone basis	12
6.3.1 Performance criteria for continuous phenomena for ancillary equipment	12
6.3.2 Performance criteria for transient phenomena for ancillary equipment.....	12
7 Applicability overview tables.....	12
7.1 Emission.....	12
7.1.1 General.....	12
7.1.2 Special conditions	12
7.2 Immunity	13
7.2.1 General.....	13
7.2.2 Special conditions	13
Annex A (informative): Examples of base station radio equipment for digital cellular radio telecommunications systems within the scope of the present document	14

A.1 Base station equipment for IMT-2000 CDMA Direct Spread (UTRA).....14

Annex B (informative): The EN title in the official languages15

Annex C (informative): Bibliography.....16

History17

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

Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the ETSI standards One-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [3] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC as amended) and Directive 1999/5/EC [2] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive" [2]).

The present document is part 23 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
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Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of "3rd generation" digital cellular (IMT-2000 CDMA Direct Spread) (UTRA) base station equipment, repeaters and associated ancillary equipment in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of radio equipment (base station (BS), and repeaters) are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable test conditions, performance assessment and performance criteria of "3rd generation" digital cellular (IMT-2000 CDMA Direct Spread) (UTRA) base station radio equipment and associated ancillary equipment.

Examples of base station equipment covered by the present document are given in annex A.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in EN 301 489-1 [1], except for any special conditions included in the present document.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

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

- [1] ETSI EN 301 489-1 (V1.6.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [3] 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.
- [4] ETSI TS 125 141 (V7.5.0): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD)".
- [5] ETSI TS 125 142 (V7.3.0): "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (TDD)".
- [6] ETSI TS 125 101 (V7.5.0): "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD)".

- [7] ETSI TS 125 102 (V7.4.0): "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD)".
- [8] ETSI TS 125 143 (V7.2.0): "Universal Mobile Telecommunications System (UMTS); UTRA repeater conformance testing".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 489-1 [1] and the following apply:

International Mobile Telecommunications-2000 (IMT-2000): third generation mobile systems which provide access, by means of one or more radio links, to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN, ISDN, or IP), and to other services which are specific to mobile users

signal and control port: port which carries information or control signals, except from antenna and telecommunication ports

3.2 Abbreviations

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

BLER	Block Error Ratio
BS	Base Station
CRC	Cyclic Redundancy Check
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
FDD	Frequency Division Duplex
IMT-2000	International Mobile Telecommunications 2000
Iub	Interface between RNC and BS
RF	Radio Frequency
RNC	Radio Network Controller
TDD	Time Division Duplex
UARFCN	UTRA Absolute Radio Frequency Channel Number
UTRA	Universal Terrestrial Radio Access

4 Test conditions

For the purpose of the present document, the test conditions of EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for base station equipment are specified in the present document.

4.1 General

The equipment shall be tested in normal test environment defined in the conformance testing specification for base stations TS 125 141 [4] (for FDD) or TS 125 142 [5] (for TDD) or in the UTRA repeater conformance testing specification TS 125 143 [8]. The test conditions shall be recorded in the test report.

For emission and immunity tests the test arrangements, etc., as specified in the present document, clauses 4.2 to 4.5, shall apply.

For an EUT which contains more than one BS, it is sufficient to perform tests relating to connectors of each representative type of port forming part of the EUT.

4.2 Arrangements for test signals

The provisions of EN 301 489-1 [1], clause 4.2 shall apply, with the following modifications.

The wanted RF signal nominal frequency shall be selected by setting the UTRA Absolute Radio Frequency Channel Number (UARFCN) to an appropriate number.

A communication link shall be set up with a suitable test system capable of evaluating the EUT using the specified performance criteria at the air interface and/or the Iub interface. The test system shall be located outside of the test environment.

When the EUT is required to be in the transmit/receive mode, the following conditions shall be met:

- the EUT shall be commanded to operate at maximum rated transmit power;
- adequate measures shall be taken to avoid the effect of the unwanted signal on the measuring equipment.

4.2.1 Arrangements for test signals at the input of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.1 shall apply.

4.2.2 Arrangements for test signals at the output of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.2 shall apply.

4.2.3 Arrangements for test signals at the input of receivers

The provisions of EN 301 489-1 [1], clause 4.2.3 shall apply with the following modification.

The wanted input signal level shall be set to a level where the performance is not limited by the receiver noise floor or strong signal effects e.g. 15 dB above the reference sensitivity level as defined in TS 125 141 [4] (for FDD) or TS 125 142 [5] (for TDD), to provide a stable communication link.

4.2.4 Arrangements for test signals at the output of receivers

The provisions of EN 301 489-1 [1], clause 4.2.4 shall apply.

4.2.5 Arrangements for test signals for repeaters

For immunity tests of repeaters, the wanted RF input signal shall be coupled to one antenna port at a level which will result, when measured, in the maximum rated RF output power per channel, as declared by the manufacturer. The test shall either be repeated with a wanted signal coupled to the other antenna port, or a single test shall be performed with the specified input signals being simultaneously coupled to both antenna ports.

4.3 Exclusion bands

4.3.1 Transmitter exclusion band

In the frequency bands including in band emissions and out of band emissions are covered by the RF spectral mask specification and need no further consideration.

For the purpose of EMC specifications this shall be the transmitter exclusion band from:

FDD bands I, III, VII, VIII	Carrier Frequency $\pm 12,5$ MHz
TDD Option 3,84 Mcps	Carrier Frequency $\pm 12,5$ MHz
TDD Option 1,28 Mcps	Carrier Frequency $\pm 4,0$ MHz

TDD Option 7,68 Mcps

Carrier Frequency $\pm 25,0$ MHz

4.3.2 Receiver exclusion band

The receiver exclusion band for terminals extends from the lower frequency of the allocated receiver band minus 20 MHz to the upper frequency of the allocated receiver band plus 20 MHz (except for FDD Band VIII, where the exclusion band ends 10 MHz above the receiver band edge; TDD band 1 900 MHz to 1 920 MHz, where the exclusion band ends 60 MHz above the receiver band edge; and TDD band 2 570 MHz to 2 620 MHz, where the exclusion band ends 70 MHz above the receiver band edge).

The exclusion bands are as set out below:

UTRA/FDD

Band I	1 900 MHz to 2 000 MHz
Band III	1 690 MHz to 1 805 MHz
Band VII	2 480 MHz to 2 590 MHz
Band VIII	860 MHz to 925 MHz

UTRA/TDD 3,84 Mcps, 1,28 Mcps, 7,68 Mcps options

1 880 MHz to 1 980 MHz
1 990 MHz to 2 045 MHz
2 550 MHz to 2 690 MHz

4.4 Narrow band responses of receivers

Responses on receivers or duplex transceivers occurring during the immunity test at discrete frequencies which are narrow band responses (spurious responses), are identified by the following method:

- if during an immunity test the quantity being monitored goes outside the specified tolerances (see clause 6.1), it is necessary to establish whether the deviation is due to a narrow band response or to a wide band (EMC) phenomenon. Therefore, the test shall be repeated with the unwanted signal frequency increased, and then decreased by Δf

FDD bands I, III, VII, VIII and TDD option 3,84 Mcps	$\Delta f = 10,0$ MHz
TDD option 1,28 Mcps	$\Delta f = 3,2$ MHz
TDD option 7,68 Mcps	$\Delta f = 20,0$ MHz;
- if the deviation disappears in either or both of the above Δf offset cases, then the response is considered as a narrow band response;
- if the deviation does not disappear, this may be due to the fact that the offset has made the frequency of the unwanted signal correspond to the frequency of another narrow band response. Under these circumstances the procedure is repeated with the increase and decrease of the frequency of the unwanted signal set to Δf_1 ;

FDD bands I, III, VII, VIII and TDD option 3,84 Mcps	$\Delta f_1 = 12,5$ MHz
TDD option 1,28 Mcps	$\Delta f_1 = 4,0$ MHz
TDD option 7,68 Mcps	$\Delta f_1 = 25,0$ MHz;
- if the deviation does not disappear with the increased and/or decreased frequency, the phenomenon is considered wide band and therefore an EMC problem and the equipment fails the test.

Narrow band responses are disregarded.

4.5 Normal test modulation

A communication link shall be set up with a suitable base station system test equipment. The normal test modulation should be a bearer with the characteristics of data rate shown in table 1.

If the test is not performed using one of these bearers, (for example none of them are supported by the BS), the characteristics of the bearer used shall be declared by the manufacturer and recorded in the test report.

Table 1: Bearer information data rate

Bearer Information Data Rate
12,2 kbit/s
64 kbit/s
144 kbit/s
384 kbit/s

5 Performance assessment

5.1 General

The provision of EN 301 489-1 [1], clause 5.1 shall apply with the following modifications.

The characteristics of the bearer shall be recorded in the test report.

The information about the bandwidth of the IF amplifier immediately preceding the demodulator as set out in EN 301 489-1 [1] clause 5.1 is not applicable for radio equipment in the scope of the present document.

5.2 Equipment which can provide a continuous communication link

The provision of EN 301 489-1 [1], clause 5.2 shall apply.

5.2.1 Assessment of BLER in Downlink

In order to assess the BLER of the bearer used during the immunity tests, the output of the transmitter shall be connected to an equipment which meets the requirements for the BLER assessment of TS 125 101 [6] in case of FDD and TS 125 102 [7] in case of TDD. The level of the signal supplied to the equipment should be within the range for which the assessment of BLER is not impaired. Power control shall be off during the immunity testing.

5.2.2 Assessment of BLER in Uplink

The value of the BLER at the output of the receiver reported by the BS shall be monitored at Iub-interface by using a suitable test equipment.

5.2.3 Assessment of RF gain variations of repeaters

The parameter used for the performance assessment of a repeater is the RF gain within the operating frequency band.

5.3 Equipment which does not provide a continuous communication link

The provision of EN 301 489-1 [1], clause 5.3 shall apply.

5.4 Ancillary equipment

The provision of EN 301 489-1 [1], clause 5.4 shall apply.

5.5 Equipment classification

The provision of EN 301 489-1 [1], clause 5.5 shall apply.

6 Performance criteria

6.1 Performance criteria for continuous phenomena applied to Base Stations (BS) and Repeaters

The BLER calculation shall be based on evaluating the CRC on each transport block.

6.1.1 Base Stations (BS)

During immunity tests of the BS Uplink and Downlink paths the observed BLER shall be less than 1×10^{-2} and the BS shall operate as intended. If the Uplink and Downlink paths are evaluated as one loop then the criteria is less than 2×10^{-2} .

After each test case the BS shall operate as intended with no loss of user control functions or stored data, the communications link shall be maintained.

6.1.2 Repeaters

The RF gain of the EUT shall be measured throughout the period of exposure to the phenomenon. The RF gain measured during the test shall not deviate from the gain measured before the test by more than ± 1 dB.

At the conclusion of the test the EUT shall operate as intended with no loss of user control functions or stored data.

6.2 Performance criteria for transient phenomena for Base Station (BS) and Repeaters

6.2.1 Base stations (BS)

During immunity tests of the BS Uplink and Downlink paths, the observed BLER may temporarily be greater than 1×10^{-2} . If the Uplink and Downlink paths are evaluated as one loop then the criteria may temporarily be greater than 2×10^{-2} .

After each test case the BS shall operate as intended with no loss of user control functions or stored data, the communications link shall be maintained.

6.2.2 Repeaters

The RF gain of the EUT shall be measured before the test and after each exposure. At the conclusion of each exposure the gain of the EUT shall not have changed by more than ± 1 dB. At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the gain of the EUT shall not have changed by more than ± 1 dB.

6.2.2.1 Repeaters, Performance criteria for voltage dips (> 60 %) and interruptions

Temporary loss of function is allowed, provided that the function is self-recoverable or can be restored by the operation of controls.

6.3 Performance criteria for ancillary equipment tested on a stand alone basis

The provision of EN 301 489-1 [1], clause 6.4 shall apply. In addition, the provisions of clauses 6.3.1 and 6.3.2 of the present document shall apply.

6.3.1 Performance criteria for continuous phenomena for ancillary equipment

The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible performance loss. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

6.3.2 Performance criteria for transient phenomena for ancillary equipment

The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below the performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible performance loss. During the test, degradation of performance is however allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

7 Applicability overview tables

7.1 Emission

7.1.1 General

EN 301 489-1 [1], table 2 contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

7.1.2 Special conditions

The following special conditions set out in table 2, relate to the emission test methods used in the EN 301 489-1 [1], clause 8.

Table 2: Special conditions for EMC emission measurements

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 8		
8.3 DC power input/output ports 8.3.3 Limits	For this type of equipment the limits below apply.		
	Frequency range	Quasi-peak	Average
	0,15 MHz to 0,5 MHz	79 dB μ V	66 dB μ V
	> 0,5 MHz to 30 MHz	73 dB μ V	60 dB μ V

7.2 Immunity

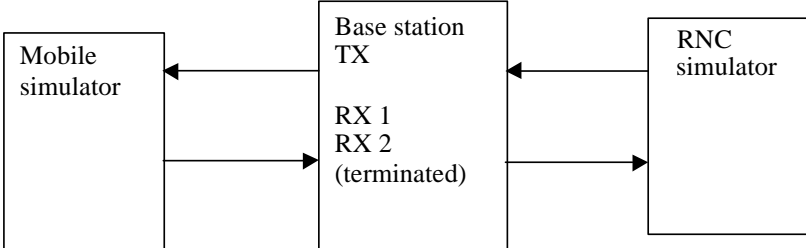
7.2.1 General

EN 301 489-1 [1], table 3, contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

7.2.2 Special conditions

The following special conditions set out in table 3 relate to the immunity test configurations set out in EN 301 489-1 [1], clause 9.1.

Table 3: Special conditions for EMC immunity measurements

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test configuration in EN 301 489-1 [1], clause 9.1
9.1 Test configuration	<p>Immunity tests on the entire base station shall be performed by establishing communication links at the air-interface, e.g. with the mobile simulator, and the lub-interface, e.g. with an RNC simulator, and evaluating the BLER. Immunity tests shall be performed on both the Uplink and Downlink paths. The tests shall also include both the air-interface and lub-interface. BLER evaluation may be carried out at either interface, where appropriate, and the measurements for the Uplink and Downlink paths may be carried out as a single path looped at either the air-interface or lub-interface. In case of looping is used care has to be taken that the BLER information does not change due to looping. The BLER evaluation shall be based on the number of transmitted blocks i.e. including possible deleted blocks.</p>  <pre> graph LR MS[Mobile simulator] <--> BS[Base station TX] subgraph BS_Box [Base station TX] RX1[RX 1] RX2[RX 2 (terminated)] end RNC[RNC simulator] <--> BS_Box </pre>

Annex A (informative): Examples of base station radio equipment for digital cellular radio telecommunications systems within the scope of the present document

The present document covers types of base station digital cellular radio telecommunications equipment as set out below.

A.1 Base station equipment for IMT-2000 CDMA Direct Spread (UTRA)

The present document applies to 3rd Generation Partnership Project (UTRA) radio equipment intended for use in digital cellular mobile radio services. Definitions for base station equipment within the scope of the present document are found in the following functional radio specification:

- ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); UTRA (BS) FDD; Radio transmission and Reception (3GPP TS 25.104)";
- ETSI TS 125 105: "Universal Mobile Telecommunications System (UMTS); UTRA (BS) TDD; Radio transmission and Reception (3GPP TS 25.105)";
- ETSI TS 125 106: "Universal Mobile Telecommunications System (UMTS); UTRA Repeater Radio transmission and Reception (3GPP TS 25.106)".

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

Language	EN title
Bulgarian	
Czech	
Danish	
Dutch	
English	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 23: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) Base Station (BS) radio, repeater and ancillary equipment
Estonian	
Finnish	
French	
German	
Greek	
Hungarian	
Icelandic	
Italian	
Latvian	
Lithuanian	
Maltese	
Norwegian	
Polish	
Portuguese	
Romanian	
Slovak	
Slovenian	
Spanish	
Swedish	

Annex C (informative): Bibliography

- ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); UTRA (BS) FDD; Radio transmission and Reception (3GPP TS 25.104)".
- ETSI TS 125 105: "Universal Mobile Telecommunications System (UMTS); UTRA (BS) TDD; Radio transmission and Reception (3GPP TS 25.105)".
- ETSI TS 125 106: "Universal Mobile Telecommunications System (UMTS); UTRA Repeater Radio transmission and Reception (3GPP TS 25.106)".

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