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Candidate Harmonized European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 26: Specific conditions for CDMA 1x spread spectrum
Base Stations, repeaters and ancillary equipment**



Reference

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Foreword

This Candidate 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 Public Enquiry phase of the ETSI standards Two-step Approval Procedure.

The present document has been produced by ETSI in response to a mandate from the European Commission issued under the Council Directive 98/34/EC [4] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulation.

The present document, together with EN 301 489-1 [1], 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 [3] 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").

The present document is part 26 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
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of CDMA 1x spread spectrum 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 CDMA 1x spread spectrum base station radio equipment, repeaters 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>.

- [1] ETSI EN 301 489-1 (V1.5.1): "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] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- [4] 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.
- [5] TIA/EIA/IS-2000.2-1: "Physical Layer Standard for cdma2000[®] Spread Spectrum Systems - Addendum 1".
- [6] TIA-97-E-1: "Base Station Performance Standards for Dual Mode Spread Spectrum Systems".
- [7] ITU-R Recommendation SM.329-10: "Unwanted emissions in the spurious domain".
- [8] TIA/EIA/IS-2000 Series, Release A: "CDMA 2000[®] Series".

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:

CDMA-PAMR: term used to denote a PAMR system, based on TIA/EIA/IS-2000 [8] Spreading Rate 1 specifications

CDMA 1x Spread Spectrum: term used to denote cdma2000 Spread Spectrum Systems and their evolution with spreading rate 1

forward CDMA channel: CDMA channel from a base station to mobile stations

NOTE: The forward CDMA channel contains one or more code channels that are transmitted on a CDMA frequency assignment using a particular pilot PN offset.

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

necessary bandwidth: As defined in ITU-R Recommendation SM.329-10 [7].

Radio Configuration (RC): set of Forward Traffic Channel and Reverse Traffic Channel transmission formats that are characterized by physical layer parameters such as transmission rates, modulation characteristics, and spreading rate

reverse CDMA channel: CDMA channel from the mobile station to the base station

NOTE: From the base station's perspective, the Reverse CDMA Channel is the sum of all mobile station transmissions on a CDMA frequency assignment.

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

traffic channel: communication path between a mobile station and a base station used for user and signalling traffic

3.2 Abbreviations

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

BS	Base Station
CDMA	Code Division Multiple Access
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
FER	Frame Error Rate
ISDN	Integrated Services Digital Network
PAMR	Public Access Mobile Radio
PN	Pseudorandom Number
PSTN	Public Switched Digital Network
RC	Radio Configuration
RF	Radio Frequency

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 TIA-97-E-1 [6]. 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 or more than one repeater, it is sufficient to perform tests relating to connectors of each representative type of port forming part of the EUT.

Precautions should be taken to ensure that the cables connecting antenna connectors to test equipment or termination do not influence the test results.

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 CDMA channel to an appropriate number. A communication link shall be set up with a suitable mobile station simulator (hereafter called "the test system") according to the Radio Configuration (RC) supported by the base station (see clause 1.3 in TIA-97-E-1 [6]) using full data rate only. 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 transmitter part of the EUT shall be commanded to operate at maximum rated transmit power;

NOTE: This may be achieved by disabling the transmitter RF power control.

- adequate measures shall be taken to avoid the effect of the immunity test RF 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.

For immunity testing the wanted RF signal level at the input of the EUT shall be set to no more than 40 dB above the reference sensitivity level as defined in TIA-97-E-1 [6], to provide a stable communications link. The input signal level used in the test shall be noted in the test report.

For emission testing the wanted RF signal level at the input of the measuring receiver shall be set to no more than 15 dB above the reference sensitivity level as defined in TIA-97-E-1 [6], to ensure that it operates within its dynamic range. The input signal level used in the test shall be noted in the test report.

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

The transmitter 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 the transmitter exclusion band shall be the carrier centre frequency $\pm (2,5 \times \text{Necessary Bandwidth})$.

4.3.2 Receiver exclusion band

The exclusion band for receivers and receiver sections of transceivers is the band of frequencies over which no immunity tests with radiated RF are made.

The receiver exclusion band for base stations extends from the lower frequency of the relevant receiver band minus 5 % to the upper frequency of the relevant receiver band plus 5 %.

4.3.3 Repeater exclusion band

The exclusion band for repeaters is the band of frequencies over which no testing is performed.

The larger of the two definitions of exclusion band above in clauses 4.3.1 and 4.3.2 shall be used when testing repeaters. This shall apply to all ports of a repeater.

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 wideband (EMC) phenomenon. Therefore, the test shall be repeated with the unwanted signal frequency increased, and then decreased by 10 MHz;
- if the deviation disappears in either or both of the above 10 MHz 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 12,5 MHz;
- if the deviation still does not disappear with the increased and/or decreased frequency, the phenomenon is considered wideband and therefore an EMC problem and the equipment fails the test.

For immunity tests, narrow band responses shall be 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 setup according to the Radio Configuration (RC) supported by the base station under test using full data rate only (see clause 1.3 in TIA-97-E-1 [6]).

5 Performance assessment

5.1 General

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

The information about the bandwidth of the IF filter immediately preceding the demodulator as set out in EN 301 489-1 [1], clause 5.1 is not applicable to 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 FER in Forward Link (Downlink)

For immunity testing, the output of the transmitter shall be connected to a test system which meets the requirements for the FER assessment in accordance with TIA/EIA/IS-2000.2-1 [5] and TIA-97-E-1 [6]. The power control of the transmitter shall be disabled. The level of the signal supplied to the test system shall be attenuated such that it is within the range for which the assessment of FER is not impaired.

5.2.2 Assessment of FER in Reverse Link (Uplink)

The value of the FER at the output of the receiver reported by the BS shall be monitored using a suitable test system.

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

6.1.1 Base Stations (BS)

During the immunity test, the observed Frame Error Rate (FER) of the BS forward link and reverse link shall not exceed 1,0 % with 95 % confidence (see clause 6.8 in TIA-97-E-1 [6]), and the BS shall operate as intended. However, in the case of PAMR base stations the observed Frame Error Rate (FER) of the BS forward link and reverse link shall not exceed 2,0% with 95% confidence (see clause 6.8 in TIA-97-E-1 [6]), and the BS shall operate as intended.

After each test case, the BS shall operate as intended with no loss of user control function, or stored data, the communication 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 Stations (BS) and repeaters.

6.2.1 Base Stations

During each individual exposure in the test sequence, the observed Frame Error Rate (FER) of the BS forward link and reverse link may temporarily exceed 1,0 %. However, in the case of PAMR base stations, during each individual exposure in the test sequence, the observed Frame Error Rate (FER) of the BS forward link and reverse link may temporarily exceed 2,0 %.

After each test case, the BS shall operate as intended with no loss of user control function, or stored data, the communication 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.

7.2 Immunity

7.2.1 General

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

7.2.2 Special conditions

The following special conditions set out in table 2, relate to the immunity test methods and performance criteria used in EN 301 489-1 [1], clause 9.1.

Table 2: 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	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 base station controller/simulator, see figure 1. Immunity tests shall be performed on both the forward link and reverse link. The tests shall also include both the air-interface and base station controller interface. FER evaluation may be carried out at either interface, where appropriate, and the measurements for the forward link and reverse link may be carried out as a single path looped at either the air-interface or base station controller interface. In the case of looping, care should be taken to ensure that the FER information is not compromised.

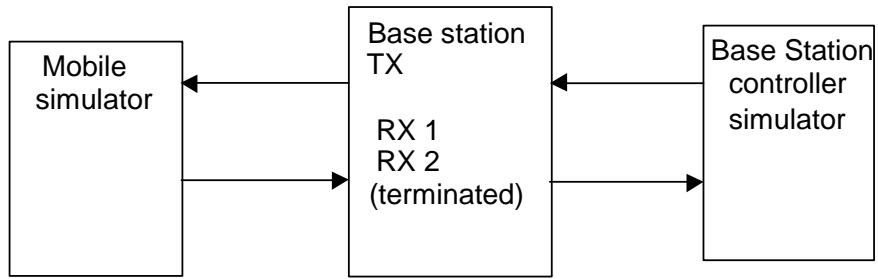


Figure 1: Communication link set up for BS immunity measurement

Annex A (informative): Examples of base station radio equipment within the scope of the present document

The present document covers types of base stations and repeaters using CDMA 1x spread spectrum technology and associated ancillary equipments set out below.

A.1 Base station equipment for the IMT-2000 CDMA Multi-carrier system

The present document applies to IMT-2000 CDMA Multi-carrier radio equipment intended for use in digital cellular mobile radio services operating in any of the Band Classes described in TIA-97-E-1 [6]. Definitions for base station equipment within the scope of the present document are found in the following functional radio specification:

TIA-97-E-1: "Base Station Performance Standards for Dual Mode Spread Spectrum Systems" [6].

A.2 Base station equipment for the CDMA -PAMR system

The present document applies to CDMA-PAMR radio equipment operating in one or more of the band classes defined in TIA-97-E-1 [6] depending upon national regulations. Definitions for base station equipment within the scope of the present document are found in the following functional radio specification:

TIA-97-E-1: "Base Station Performance Standards for Dual Mode Spread Spectrum Systems" [6].

A.3 Repeaters

The present document applies to non-frequency converting repeaters intended for use in CDMA 1x spread spectrum networks.

Annex B (informative): Bibliography

3GPP2 C.S0013-A: "Loopback Service Options (LSO) for cdma2000 Spread Spectrum Systems".

3GPP2 C.S0026: "Test Data Service Option (TDSO) for cdma2000 Spread Spectrum Systems".

3GPP2 C.S0025: "Markov Service Option (MSO) for cdma2000 Spread Spectrum Systems".

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

Language	EN title
Czech	Otázky elektromagnetické kompatibility a rádiového spektra; Normy elektromagnetické kompatibility pro rádiová zařízení a služby; Částka 26: Zvláštní podmínky pro základnové stanice, zesilovace a jejich příslušenství využívající rozprostřeného spektra CDMA 1x
Danish	Elektromagnetisk kompatibilitet og radiospektrum-anliggender (ERM); Elektromagnetisk kompatibilitet (EMC) for radioudstyr og tjenester; Del 26: Særlige krav til CDMA 1x spread spectrum basisstationer, repeatere og hjælpeudstyr
Dutch	Elektromagnetische compatibiliteit en radiospectrumzaken (ERM); Elektromagnetische compatibiliteitsnorm (EMC) voor radioapparatuur en radiodiensten; Deel 26: Specifieke condities voor CDMA 1X Spread Spectrum basisstations, repeaters en hulpapparatuur.
English	Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 26: Specific conditions for CDMA 1x spread spectrum base stations, repeaters and ancillary equipment
Estonian	Elektromagnetilise ühilduvuse ja raadiospektri küsimused (ERM); Raadioseadmete ja teenuste elektromagnetilise ühilduvuse (EMC) standard; Osa 26: Hajaspektriga CDMA 1x baasjaamade, repiiterite ja lisaseadmete eritingimused Elektromagnetilise ühilduvuse ja raadiospektri küsimused (ERM); Raadioseadmete ja teenuste elektromagnetilise ühilduvuse (EMC) standard; Osa 26: Hajaspektriga CDMA 1x baasjaamade, repiiterite ja lisaseadmete eritingimused
Finnish	Sähkömagneettinen yhteensopivuus ja radiospektriasiat (ERM); sähkömagneettinen yhteensopivuusstandardi (EMC) radiolaitteille ja järjestelmille; Osa 26: : Erityisehdot CDMA 1x -hajaspektritekniikkaa käyttäville tukiasemille, toistimille ja niiden oheislaitteille
French	Compatibilité électromagnétique et spectre radioélectrique (ERM); Norme de compatibilité électromagnétique (CEM) pour équipement de communication radio et services; Partie 26: Conditions spécifiques pour stations de base et équipements auxiliaires utilisant le CDMA 1x à étalement de spectre
German	Elektromagnetische Verträglichkeit und Funkspektrumangelegenheiten (ERM); Elektromagnetische Verträglichkeit (EMV) für Funkgeräte und Funkdienste; Teil 26: Spezielle Anforderungen für CDMA 1x Spread Spectrum Basisstationen, Repeater und Zusatzeinrichtungen
Greek	Ηλεκτρομαγνητική συμβατότητα και θέματα ραδιοφάσματος (ERM); Πρότυπο ηλεκτρομαγνητικής συμβατότητας (EMC) που αφορά ραδιοεξοπλισμό και ραδιουπηρεσίες; Μέρος 26: Ειδικές συνθήκες για CDMA 1x σταθμούς βάσης ευρέως φάσματος, αναμεταδότες και βοηθητικό εξοπλισμό.
Hungarian	Elektromágneses kompatibilitási és rádió spektrum ügyek; Elektomágneses kompatibilitási szabvány rádiókészülékekhez és szolgáltatásokhoz; Rész 26: Speciális feltételek CDMA 1x Szórt Spektrumú alapállomásokhoz, jelerősítőkhoz és kiegészítő berendezésekhez.
Italian	Compatibilità elettromagnetica e Questioni relative allo spettro delle radiofrequenze (ERM); Norma di Compatibilità elettromagnetica (EMC) per apparecchiature e servizi radio; Parte 26 Condizioni specifiche per stazioni basi, ripetitori e apparecchiature ausiliarie per CDMA 1x Spread Spectrum
Latvian	
Lithuanian	
Maltese	
Polish	Kompatybilność elektromagnetyczna i sprawy widma radiowego (ERM); Standard kompatybilności elektromagnetycznej (EMC) dla sprzętu radiowego i usług; Część 26; Warunki szczególne dla systemów z wielodostepem kodowanym 1x widma rozproszonego Stacje bazowe, wzmacniacz i sprzęt pomocniczy
Portuguese	Assuntos de espectro radioelétrico e compatibilidade electromagnética (ERM); norma de compatibilidade electromagnética (EMC) para equipamento de rádio e serviços; parte 26: Condições específicas para as estações de base, repetidores e equipamento auxiliar do CDMA 1x Spread Spectrum
Slovak	Otázky elektromagnetickej kompatibility a rádiového spektra, Normy elektromagnetickej kompatibility pre rádiové zariadenia a služby, Časť 26: Špecifické podmienky pre CDMA 1x rozprestrené spektrum bázové stanice, opakovače a ich príslušenstvo
Slovenian	
Spanish	Compatibilidad electromagnética y cuestiones de espectro de radiofrecuencia (ERM); compatibilidad electromagnética (EMC) estándar para equipos radio y servicios; parte 26: Condiciones específicas para estaciones de base, repetidores y equipos auxiliares de espectro ensanchado con CDMA 1x
Swedish	Elektromagnetisk kompatibilitet och radiospektrumfrågor (ERM); Elektromagnetisk kompatibilitetsstandard (EMC) för radioutrustning och tjänster; Del 26: Specifika villkor för CDMA 1x spread spectrum basstationer, repeaters och tillhörande utrustning

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