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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 IMT-2000 CDMA
Multi-carrier Base Stations 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).

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].

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1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of 3rd Generation digital cellular (IMT-2000 Multi-carrier) base station equipment 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 Multi-carrier) 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 the part 1 of this standard, 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: "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] 3GPP2 C.S0002-A (2000): "Physical Layer Standard for cdma2000 Spread Spectrum Systems, Release A".
- [6] 3GPP2 C.S0010-A (2001): "Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations".
- [7] ITU-R Recommendation SM.329-9: "Spurious Emissions".

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:

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.329-9 [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
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 3GPP2 C.S0010-A [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, 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 3GPP2 C.S0010-A [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 3GPP2 C.S0010-A [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 3GPP2 C.S0010-A [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.

4.3 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 allocated receiver band minus 5 % to the upper frequency of the allocated receiver band plus 5 %.

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 3GPP2 C.S0010-A [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 3GPP2 C.S0002-A [5] and 3GPP2 C.S0010-A [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.

5.3 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)

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 3GPP2 C.S0010-A [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.

6.2 Performance criteria for transient phenomena for Base Stations (BS)

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 % with 95 % confidence.

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.

6.3 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 1, relate to the emission test methods used in the EN 301 489-1 [1], clause 8.

Table 1: 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 8.3.3 DC power input/output ports Limits	The frequency range 20 kHz to 150 kHz is excluded.

7.2 Immunity

7.2.1 General

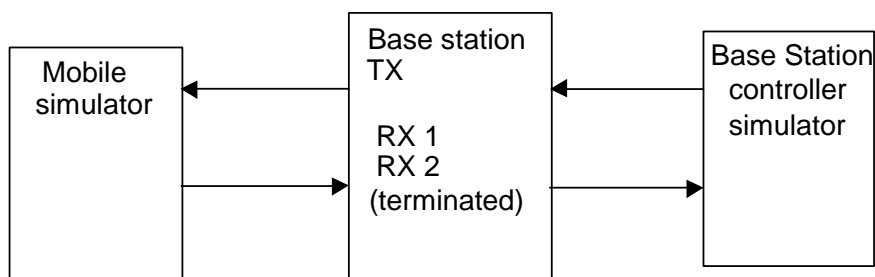
EN 301 489-1 [1], table 3, contains the applicability of EMC immunity tests to the relevant ports of radio and/or associated ancillary equipment.

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 for digital cellular radio telecommunications systems within the scope of the present document

The present document covers types of base stations for digital cellular radio telecommunications systems as 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. Definitions for base station equipment within the scope of the present document are found in the following functional radio specification:

3GPP2 C.S0010-A [6]: "Recommended Minimum Performance Standards for Base Stations Supporting Dual Mode Spread Spectrum Systems".

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
Danish	Elektromagnetisk kompatibilitet og radiospektrum-anliggender (ERM); Elektromagnetisk kompatibilitet (EMC) for radioudstyr og tjenester; Del 26: Særlige krav til IMT-2000 CDMA multibærebølge basisstationer og hjælpeudstyr
Dutch	Elektromagnetische compatibiliteit en radiospectrumzaken (ERM); Elektromagnetische compatibiliteitsnorm (EMC) voor radioapparatuur en radiodiensten; Deel 26: Specifieke voorwaarden voor IMT-2000 CDMA Multicarrier basisstations en hulpapparatuur
English	Electromagnetic compatibility and radio spectrum matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 26: Specific conditions for IMT-2000 CDMA multi-carrier base stations and ancillary equipment
Finnish	Sähkömagneettinen yhteensopivuus ja radiospektriasiat (ERM); sähkömagneettinen yhteensopivuusstandardi (EMC) radiolaitteille ja järjestelmille; Osa 26: Erityisedot IMT-2000 CDMA monikantoaalotekniikkaa käyttäville tukiasemille ja apulaitteille
French	Compatibilité électromagnétique et spectre radioélectrique (ERM); Norme de compatibilité électromagnétique (CEM) pour équipement de communication radio et services; Partie 26: Conditions spécifiques pour l'IMT-2000; Accès multiple à répartition par code (AMRC) multiporteuses pour stations de base et équipements auxiliaires
German	Elektromagnetische Verträglichkeit und Funkspektrumsangelegenheiten (ERM); Elektromagnetische Verträglichkeit (EMV) für Funkgeräte und Funkdienste; Teil 26: Spezielle Anforderungen für IMT-2000 CDMA Multi-Carrier Basisstationen und Zusatzeinrichtungen
Greek	Ηλεκτρο μαγνητική συμβατότητα και θέματα ραδιοφάσματος (ERM); Πρότυπο ηλεκτρομαγνητικής συμβατότητας (EMC) που αφορά ραδιοεξοπλισμό και ραδιοϋπηρεσίες; Μέρος 26: Είδικες συνθήκες για IMT-2000 CDMA πολυφερωντικούς σταθμούς βάσης και βοηθητικό εξοπλισμό
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 base a portante multipla e apparecchiature ausiliarie per IMT-2000 CDMA
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 estações base multiportadoras e equipamento auxiliar do IMT-2000 CDMA
Spanish	Compatibilidad electromagnética y cuestiones de espectro de radiofrecuencia (ERM); compatibilidad electromagnética (EMC) estándar para equipos radio y servicios; parte 26: Condiciones específicas para IMT-2000 CDMA Estaciones de Base multi portadora y equipos auxiliares
Swedish	Elektromagnetisk kompatibilitet och radiospektrumfrågor (ERM); Elektromagnetisk kompatibilitetsstandard (EMC) för radioutrustning och tjänster; Del 26: Specifika villkor för IMT-2000 CDMA flerbårigs basstationer och tillhörande utrustning

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