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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 24: Specific conditions for IMT-2000 CDMA
Direct Spread (UTRA and E-UTRA) for
Mobile and portable (UE) radio and ancillary equipment**



Reference

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Foreword

This 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 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 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 24 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 and E-UTRA) mobile and portable (UE) radio terminal 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 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 and E-UTRA) mobile and portable (UE) radio terminal equipment and associated ancillary equipment.

Examples of digital cellular mobile and portable radio 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.

Base station (BS) equipment operating within network infrastructure is outside the scope of the present document. However, the present document does cover mobile and portable equipment that is intended to be operated in a fixed location while connected to the AC mains (see clause 5.5).

The environment 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

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>.

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

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 301 489-1 (V1.8.1): "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] Void.
- [5] Void.
- [6] ETSI TS 134 108 (V6.4.0): "Universal Mobile Telecommunications System (UMTS); Common test environments for User Equipment (UE); Conformance testing (3GPP TS 34.108 Release 6)".

- [7] ETSI TS 125 101: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101 version 7.5.0 Release 7)".
- [8] ETSI TS 134 109: "Universal Mobile Telecommunications System (UMTS); Terminal logical test interface; Special conformance testing functions (3GPP TS 34.109 version 6.2.0 Release 6)".
- [9] Void.
- [10] ITU-T Recommendation P.64 (1999): "Determination of sensitivity/frequency characteristics of local telephone systems".
- [11] ITU-T Recommendation P.76 (1988): "Determination of loudness ratings; fundamental principles".
- [12] ETSI TS 125 102: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (TDD) (3GPP TS 25.102 version 7.4.0 Release 7)".
- [13] ETSI TS 136 101: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 8.4.0 Release 8)".
- [14] ETSI TS 136 508: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing (3GPP TS 36.508 version 8.0.1 Release 8)".
- [15] ETSI TS 136 509: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Special conformance testing function for User Equipment (UE) (3GPP TS 36.509 version 8.0.1 Release 8)".

2.2 Informative references

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] ETSI TR 125 990: "Universal Mobile Telecommunications System (UMTS); Vocabulary (3G TR 25.990 version 3.0.0 Release 1999)".
- [i.2] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 8.7.0 Release 8)".
- [i.3] ETSI ETR 027 (edition 1): "Radio Equipment and Systems (RES); Methods of measurement for private mobile radio equipment".

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:

camped on a cell: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information

NOTE: The services may be limited, and the PLMN may not be aware of the existence of the UE within the chosen cell.

Channel bandwidth: RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell

NOTE: The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

data application ancillary: ancillary which provides send and/or receive data access to UMTS services via UE

End-User data: manufacturer defined data patterns for data transfer testing

NOTE: Represents EUT's typical user application data pattern (e.g. photo, video, text file, message) in its characteristics.

idle mode: state of User Equipment (UE) when switched on but with no Radio Resource Control (RRC) connection

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

maximum average power: average transmitter output power obtained over any specified time interval, including periods with no transmission, when the transmit time slots are at the maximum power setting

maximum throughput: maximum achievable throughput for a reference measurement channel

necessary bandwidth: for a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

traffic mode: state of User Equipment (UE) when switched on and with Radio Resource Control (RRC) connection established

throughput: number of payload bits successfully received per second for a reference measurement channel in a specified reference condition

Universal Terrestrial Radio Access (UTRA): radio access network of the telecommunications system, incorporating mobile cellular and other functionality, that is the subject of specifications produced by 3GPP

User Equipment (UE): "Mobile Station" (MS) which is an entity capable of accessing a set of UTRA services via one or more radio interfaces

NOTE: This entity may be stationary or in motion within the UTRA service area while accessing the UTRA services, and may simultaneously serve one or more users.

3.2 Abbreviations

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

AC	Alternating Current
BER	Bit Error Ratio
BLER	Block Error Ratio
BPF	Band Pass Filter
BS	Base Station
BW	BandWidth
CDMA	Code Division Multiple Access
CF	Centre Frequency
CRC	Cyclic Redundancy Check
DL	Down Link (from BS to UE)
DRX	Discontinuous Reception
DTX	Discontinuous Transmission (see note)
EARFCN	E-UTRA Absolute Radio Frequency Channel Number

NOTE: Refer to Terminology specifications TR 121 905 [i.2] and TR 125 990 [i.1] for further details.

EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
E-UTRA	Evolved Universal Terrestrial Radio Access
FDD	Frequency Division Duplex
IMT-2000	International Mobile Telecommunications 2000
LR	Location Registration
MRP	Mouth Reference Point (artificial head)
MS	Mobile Station

PC	Personal Computer
PLMN	Public Land Mobile Network
RF	Radio Frequency
RRC	Radio Resource Control
SPL	Sound Pressure Level
TDD	Time Division Duplex
TT	Transient phenomena applied to Transmitters
UARFCN	UTRA Absolute Radio Frequency Channel Number

NOTE: Refer to Terminology specifications TR 121 905 [i.2] and TR 125 990 [i.1] for further details.

UE	User Equipment
UL	Up Link (From UE to BS)
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 digital cellular mobile and portable radio equipment are specified in the present document.

4.1 General

Whenever the Equipment Under Test (EUT) is provided with a detachable antenna, the EUT shall be tested with the antenna fitted in a manner typical of normal intended use, unless specified otherwise.

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 or E-UTRA Absolute Radio Frequency Channel Number (UARFCN or EARFCN) to an appropriate number.

A communication link shall be set up with a suitable base station simulator (hereafter called "the test system"). The test system shall be located outside of the test environment.

Where possible the test of the transmitter section and receiver section of the EUT may be carried out simultaneously to reduce test time.

Immunity tests shall be performed in two modes of operation:

- with a communication link established (traffic mode); and
- in the idle mode.

When the EUT is required to be in the traffic mode, a call is set up according to the Generic call set-up procedure and the following conditions shall be met.

For UTRA see TS 134 108 [6] and TS 134 109 [8] Logical Test Interface for details regarding generic call set-up procedure and BER, BLER test loop scenarios; for E-UTRA see TS 136 508 [14] and TS 136 509 [15] for details regarding generic call set-up procedure and throughput test loop scenarios:

- set and send continuously Up power control commands to the UE;
- the DTX shall be disabled;
- Inner Loop or Up Link Power Control shall be enabled;
- for UTRA the transmitting and/or receiving (UL/DL) bit rate for reference test channel shall be 12,2 kbit/s;

- or E-UTRA the transmitting and/or receiving (UL/DL) bit rate for reference test channel shall be the reference measurement channel as specified in annex C in TS 136 101 [13] with parameters specified in tables 7.3.1-1 and 7.3.1-2 in TS 136 101 [13].

When the EUT is required to be in the idle mode the following conditions shall be met:

- UE shall be camped on a cell;
- UE shall perform Location Registration (LR) before the test, but not during the test;
- UE's neighbour cell list shall be empty;
- paging repetition period and DRX cycle shall be set to minimum (shortest possible time interval).

Adequate measures shall be taken to avoid the effect of immunity RF test signals 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 with the following modifications.

Where the equipment incorporates an external 50 Ω RF antenna connector that is normally connected via a coaxial cable, then the wanted signal to establish a communication link shall be delivered from that connector by a coaxial cable.

Where the equipment incorporates an external 50 Ω RF antenna connector, but this port is not normally connected via a coaxial cable, and where the equipment does not incorporate an external 50 Ω RF connector (integral antenna equipment), then the wanted signal, to establish a communication link, shall be delivered from the equipment to an antenna located within the test environment.

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 modifications.

Where the equipment incorporates an external 50 Ω RF antenna connector that is normally connected via a coaxial cable, then the wanted signal to establish a communication link shall be delivered to that connector by a coaxial cable.

Where the equipment incorporates an external 50 Ω RF antenna connector, but this port is not normally connected via a coaxial cable, and where the equipment does not incorporate an external 50 Ω RF connector (integral antenna equipment), then the wanted signal, to establish a communication link, shall be presented to the equipment from an antenna located within the test environment.

For immunity testing the wanted RF signal level at the input of the EUT shall be at least 40 dB above the reference sensitivity level to provide a stable communication link. The reference sensitivity level is defined in TS 125 101 [7] and TS 125 102 [12] or TS 136 101 [13].

For emission testing the wanted RF signal level at the input of the measuring receiver shall be no more than 15 dB above the reference sensitivity level, to ensure that it operates within its dynamic range.

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 with the following modification.

The specific arrangements for test signals at the output of receivers are in annexes B and C.

4.3 Exclusion bands

4.3.1 Transmitter exclusion band

4.3.1.1 UTRA

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:

- 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.

4.3.1.2 E-UTRA

For the purpose of EMC specifications there shall be a transmitter exclusion band.

- Lower carrier frequency used - $2,5 \times \text{BWChannel}$ MHz to upper carrier frequency used + $2,5 \times \text{BWChannel}$ MHz, where BWChannel is the channel bandwidth as defined in TS 136 101 [13].

4.3.2 Receiver exclusion band

The receiver exclusion band for terminals extends from the lower frequency of the allocated receiver band minus 85 MHz to the upper frequency of the allocated receiver band plus 85 MHz. The exclusions bands are as set out in clause 4.3.2.1 (except for FDD Band VII, where the exclusion band begins 50 MHz below the receiver band edge).

4.3.2.1 UTRA/FDD and E-UTRA

- a) Band I 2 025 MHz to 2 255 MHz.
- b) Band III 1 720 MHz to 1 965 MHz.
- c) Band VII 2 535 MHz to 2 775 MHz.
- d) Band VIII 840 MHz to 1 045 MHz.

4.3.2.2 UTRA/TDD

3,84 Mcps, 1,28 Mcps, 7,68 Mcps options:

- 1 815 MHz to 2 005 MHz.
- 1 925 MHz to 2 110 MHz.
- 2 485 MHz to 2 705 MHz.

4.4 Narrow band responses on receivers

4.4.1 UTRA

Responses on receivers or duplex transceivers occurring during the immunity tests 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, it is necessary to establish whether the deviation is due to an unwanted effect on the receiver of the UE or on the test system (narrow band response) or to a wideband (EMC) phenomenon. Therefore, the test shall be repeated with the UARFCN increased or decreased by:
 - FDD bands I, III, VII, VIII and TDD option 3,84 Mcps 25 (DL/UL)
TDD option 1,28 Mcps 8 (DL/UL)
TDD option 7,68 Mcps 50 (DL/UL);
- if the deviation does not disappear, the procedure is repeated with the UARFCN increased or decreased from the original value by:
 - FDD bands I, III, VII, VIII and TDD option 3,84 Mcps 50 (DL/UL)
TDD option 1,28 Mcps 16 (DL/UL)
TDD option 7,68 Mcps 100 (DL/UL);
- if the deviation does not disappear with the increased and/or decreased UARFCN, the phenomenon is considered wideband and therefore an EMC problem and the equipment fails the test.

Narrow band responses are disregarded.

4.4.2 E-UTRA

Responses on receivers or duplex transceivers occurring during the 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, it is necessary to establish whether the deviation is due to an unwanted effect on the receiver of the UE or on the test system (narrow band response) or to a wide band (EMC) phenomenon. Therefore, the test shall be repeated with the unwanted signal frequency increased or decreased by BWChannel MHz, where BWChannel is the channel bandwidth as defined in TS 136 101 [13];
- if the deviation does not disappear, the procedure is repeated the unwanted signal frequency increased or decreased by $2 \times \text{BWChannel}$ MHz, where BWChannel is the channel bandwidth as defined in TS 136 101 [13];
- 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

For transmission of analogue speech or audio signals (voice call mode), immunity tests shall be performed without the application of any external modulation input signal.

The overall audio Up Link (UL) and Down Link (DL) performance of the radio equipment shall be calibrated before the start of the tests. The calibration procedure is explained in clause B.1.

The immunity tests in the data transfer mode shall be performed with the application of an appropriate external modulation input signal such that the performance of the data call can be monitored. For assessment of the data transfer mode, refer to annex C.

5 Performance assessment

5.1 General

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

5.2 Equipment which can provide a continuous communication link

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

5.3 Equipment which does not provide a 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 with the following modification:

Ancillary equipment shall be tested with it connected to a UE in which case compliance shall be demonstrated to the appropriate clauses of the present document.

5.5 Equipment classification

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

6 Performance criteria

The equipment shall meet the performance criteria specified in this clause and clauses 6.1 and 6.2 as appropriate.

The maintenance of a communications link shall be assessed by using an indicator, which may be part of the test system or the equipment under test.

If an equipment is of a specialized nature, that the performance criteria described in the following clauses are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after testing, as required by the present document.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in the following clauses.

In addition, the test shall also be performed in idle mode to ensure the transmitter does not unintentionally operate.

The requirements apply to all types of UTRA and E-UTRA (FDD or TDD) for the UE.

6.1 Performance criteria for continuous phenomena

A communication link shall be established at the start of the test, and maintained during the test, clauses 4.1 and 4.2.

In the speech mode, the performance criteria shall be that the Up Link and Down Link speech output levels shall be at least 35 dB less than the recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (annex B).

NOTE: When there is a high level of background audio noise present, the filter bandwidth can be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.

In addition to confirming the above performance in traffic mode, the test shall be performed in idle mode, and the transmitter shall not unintentionally operate.

6.1.1 UTRA

In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in TS 134 109 [8]) is used, it shall not exceed 0,001 during the test sequence;
- if the BLER (as referred in TS 134 109 [8]) is used, it shall not exceed 0,01 during the test sequence.

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

6.1.2 E-UTRA

In the data transfer mode, the performance criteria shall be that the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channel as specified in annex C in TS 136 101 [13] with parameters specified in tables 7.3.1-1 and 7.3.1-2 in TS 136 101 [13] during the test sequence.

6.2 Performance criteria for Transient phenomena

A communications link shall be established at the start of the test, clauses 4.1 and 4.2.

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

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 communication link shall have been maintained.

In addition to confirming the above performance in traffic mode, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

7 Applicability overview tables

7.1 Emission

7.1.1 General

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

7.1.2 Special conditions

No special conditions shall apply to UE in the scope of the present document.

7.2 Immunity

7.2.1 General

EN 301 489-1 [1], table 2 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 1, relate to the immunity test methods used in the EN 301 489-1 [1], clause 9.

Table 1: 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 conditions in EN 301 489-1 [1], clause 9
9.2 Radio frequency electromagnetic field 9.2.2 Test method	When using the max hold detector method (see annex B) at each test frequency step initially an unmodulated test signal shall be applied. Then the test modulation shall be applied.
9.5 Radio frequency, common mode 9.5.2 Test method	There is no exclusion band for the equipment in the scope of the present document. when using the max hold detector method (see annex B) at each test frequency step initially an unmodulated test signal shall be applied. Then the test modulation shall be applied. The procedure used for identifying narrowband responses does not apply to conducted immunity tests in the frequency range 150 kHz to 80 MHz (see clause 4.4).
9.6.3 Performance criteria	During tests with pulses 3a and 3b, the performance criteria TT shall apply, see clause 6.2.

Annex A (informative): Examples of mobile and portable radio and ancillary equipment for digital cellular radio telecommunications systems within the scope of the present document

The present document covers types of mobile and/or portable digital cellular radio telecommunications equipment as set out below.

A.1 Mobile and portable radio equipment, and ancillary equipment for the IMT-2000 CDMA Direct Spread (UTRA)

The present document applies to the 3rd Generation Partnership Project (UTRA) digital cellular mobile and portable radio equipment. Definitions for mobile and portable radio and associated ancillary equipment within the scope of the present document are found in the following functional radio specifications:

- TS 125 101 [7]: "Universal Mobile Telecommunications System (UMTS); UE Radio Transmission and Reception (FDD) (3GPP TS 25.101)".
- TS 125 102 [12]: "Universal Mobile Telecommunications System (UMTS); UTRA (UE) TDD; Radio Transmission and Reception (3GPP TS 25.102)".

A.2 Mobile and portable radio equipment, and ancillary equipment for the Evolved Universal Terrestrial Radio Access (E-UTRA)

- TS 136 101 [13]: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (FDD)".

Annex B (normative): Performance assessment voice call. Audio breakthrough

B.1 Calibration of audio levels

For the portable the audio calibration is performed as follows.

Set the EUT volume to provide the nominal audio level if specified by the manufacturer. If no such level is specified, the centre volume step shall be used.

Prior to the test sequence, the reference level of the speech output signal on both the downlink and uplink shall be recorded on the test instrumentation, as shown in figure B.1. The reference level shall be equivalent to the SPL of 0 dBPa at 1 kHz at the input of the acoustical coupler described in ETR 027 [i.3], for the downlink, and -5 dBPa at 1 kHz at the mouth reference point (MRP) defined in ITU-T Recommendation P.64 [10] for the uplink.

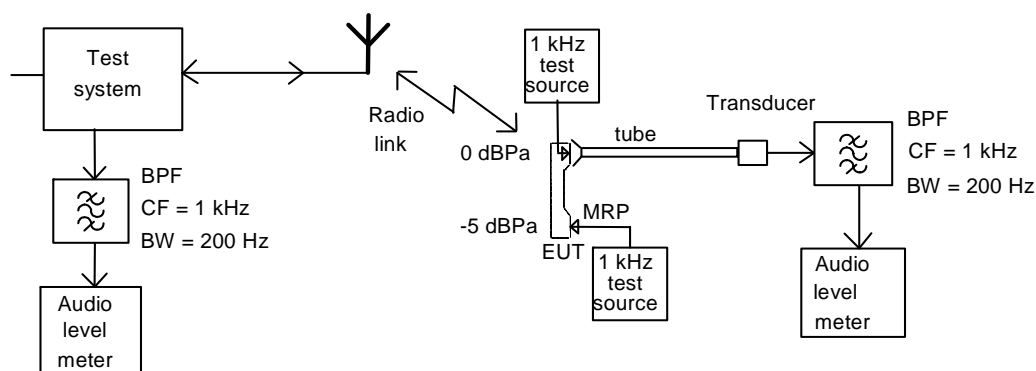
NOTE 1: The MRP is defined with respect to an artificial head defined in ITU-T Recommendation P.76 [11]. The handset should be mounted on the artificial head such that the ear piece is centred at the artificial ear.

NOTE 2: If the equipment does not include acoustical transducers (e.g. a microphone or loudspeaker) the manufacturer should specify the equivalent electrical reference levels.

The voice processor may often apply noise and echo cancellation algorithms, which attempt to eliminate or reduce steady state audio signals as e.g. the 1 kHz calibration signals. These algorithms may be disabled during the calibration procedure. Specialized test software may be required. If the algorithms cannot be disabled then the reference level shall be measured using a max-hold detection on the audio level meter in order to determine the level before the noise and echo cancellation algorithms become effective.

In handsfree applications an external loudspeaker is used. The SPL from the external loudspeaker is normally much higher than from the earpiece of the portable in order to overcome a high ambient noise level. The downlink reference level shall be increased in order to compensate for the difference. Alternatively, the distance between the loudspeaker and the measuring microphone shall be adjusted during the measurement procedure in accordance with the manufacturer's specification. It is important that the dynamic range of the test instrumentation is not exceeded.

Normally no corrections are made to the uplink reference level. In case it is not possible to perform the above calibration (e.g. a PC card with headset) the manufacturer shall specify the distance between the MRP and the microphone.



NOTE: The EUT is in position during calibration of the uplink, but not during calibration of the downlink where the EUT is replaced by the 1 kHz test audio source. During calibration of the uplink the mouthpiece shall be placed with respect to the MRP in a way representing intended use.

Figure B.1: Audio breakthrough measurement, calibration set-up for portable equipment

B.2 Measurement of audio levels

When the audio levels are measured during testing the EUT software shall be configured for voice applications. If the algorithms for noise and echo cancellation are not disabled, then the level shall be measured using a max-hold detection on the audio level meter in order to determine the level before the noise and echo cancellation algorithms become effective.

The level of the output signal from the downlink speech channel of the EUT at the mobile or portable's ear piece shall be assessed by measuring the Sound Pressure Level (SPL) as shown in figure B.2. When an external loudspeaker is used the acoustical coupler shall be fixed to the loudspeaker in the position used during the calibration. The level of the decoded output signal from the uplink speech channel of the EUT at the analogue output of the test system shall be measured. Pick up of extraneous background noise by the microphone of the EUT shall be minimized.

NOTE: If the equipment is designed for use with external transducers, they should be included in the test configuration. If the equipment does not include acoustical transducers the line voltage developed across specified termination impedance may be measured.

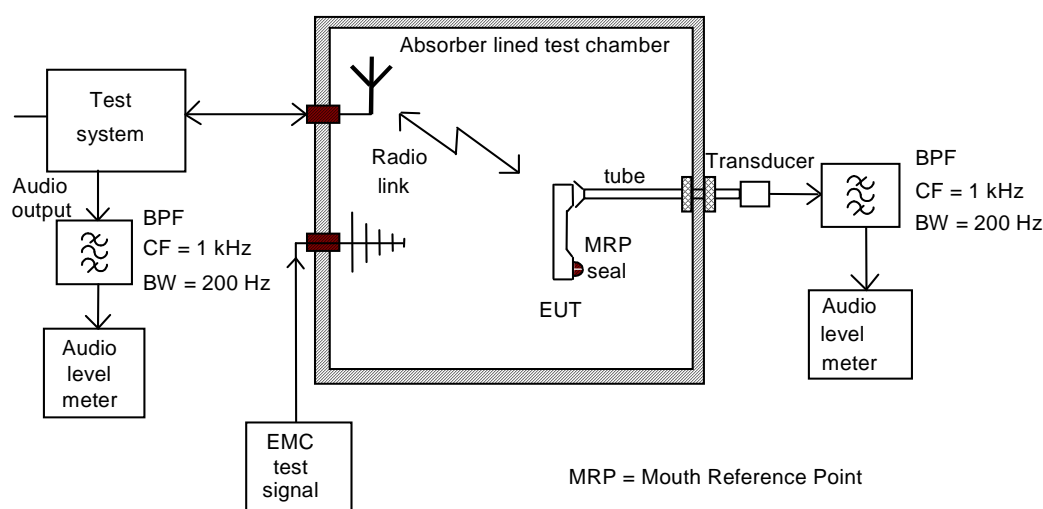


Figure B.2: Audio breakthrough measurement, test set-up for portable equipment

Annex C (normative): Performance assessment of data transfer call. Error Ratios

C.1 Calibration of data transfer

C.1.1 UTRA

For the EUT, calibration of the data transfer may be performed by assessing the Bit Error Ratio (BER), Block Error Ratio (BLER) or End-User data error ratio before applying the RF immunity test signal (defined in EN 301 489-1 [1], clauses 9.2 and 9.5).

C.1.2 E-UTRA

For the EUT, calibration of the data transfer may be performed by assessing the throughput percentage before applying the RF immunity test signal (defined in EN 301 489-1 [1] clauses 9.2 and 9.5).

C.2 Assessment of data transfer

C.2.1 UTRA. Derivation of Error Ratios

The manufacturer shall provide the method for calculating the Error Ratio. Known data patterns shall be transferred bi-directionally from end-to-end (the whole of the UL and DL will be exercised). Performance assessment shall be made at each frequency step. Comparison between transmitted known data and received data shall result in the Error Ratio.

The data patterns used should be of sufficient length to give valid results and should be equivalent to the used channel bit rate.

Possible data patterns for assessing the Error Ratio are BER, BLER and User Data. Detailed description of BER and BLER can be found from TS 134 109 [8].

End-User Data may be used where BER and BLER measurements are not appropriate, and is a manufacturer's decision (see below).

EXAMPLE: In the cases when the EUT consists of UE with data application ancillary and the data application ancillary itself does not support a loopback function that can be applied for the assessment of BER or BLER, as specified in TS 134 109 [8]. This would lead into a situation where the data application ancillary is not exercised, i.e. the data transfer loop is not end-to-end.

The characteristics of the End-User Data used for testing (format, size, typical data throughput rate, additional error corrections, etc.) and the necessary test equipment shall be delivered to enable the assessment of the EUT.

Following formula may apply to End-User Data:

$$\text{ErrorRatio} = \left(\frac{\text{erroneuos(bits, bytes, symbols, etc.)}}{\text{total number of (bits, bytes, symbols, etc.)}} \times 100 \right) = n \%$$

(In case that high Error Ratios exist, ensure that errors are a consequence of EMC stress.)

C.2.2 E-UTRA. Derivation of Throughput Percentages

Known data patterns shall be transferred bi-directionally from end-to-end (the whole of the UL and DL will be exercised). Performance assessment shall be made at each frequency step. Comparison between maximum throughput and achieved throughput shall result in the throughput percentage.

The data patterns used should be of sufficient length to give valid results and should be equivalent to the used channel bit rate.

C.3 EUT without data application ancillary

Data monitoring Devices are here considered as part of the Test System. Arrangements should be made by the manufacturer, if needed, to couple the Data monitoring Device by a method which does not affect the radiated electromagnetic field (e.g. ultrasonic or optical).

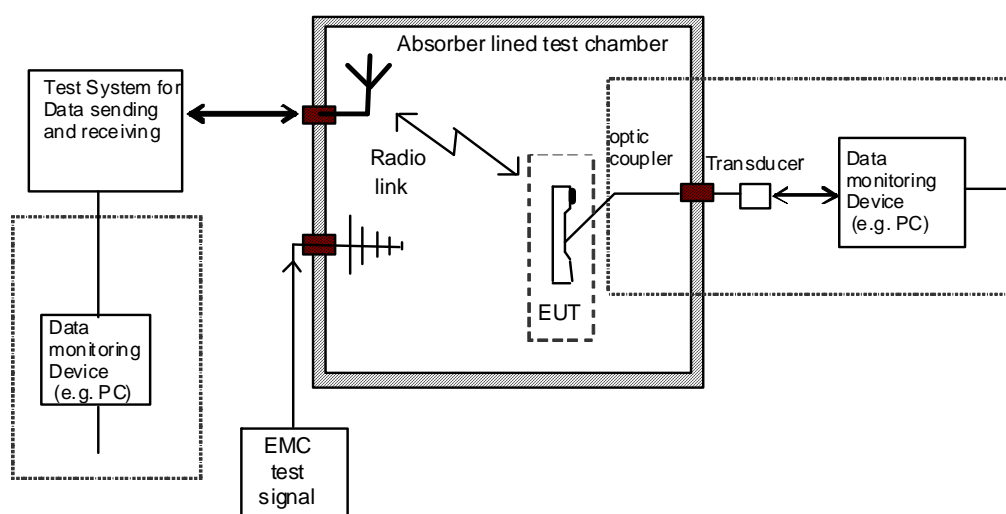


Figure C.1: Error Ratio or throughput assessment, test set-up for EUT without data application ancillary

C.4 EUT with data application ancillary

The Data monitoring Device is here considered as a part of the Test System. The Data application ancillary should be part of the data transfer (UL and DL) loop and is included in the EUT configuration.

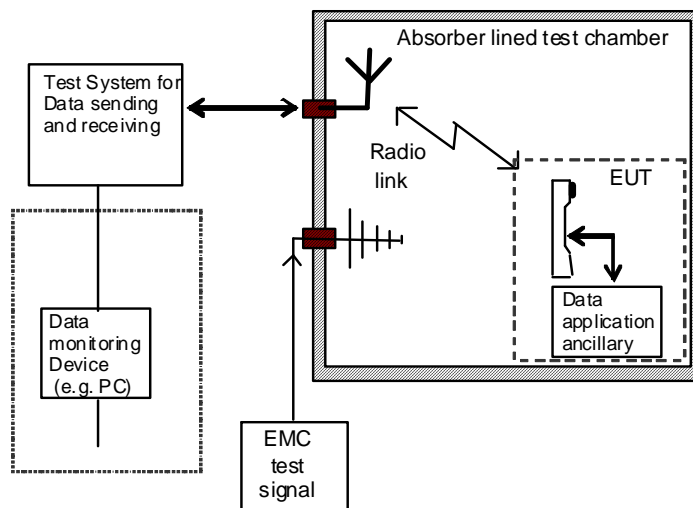


Figure C.2: Error Ratio or throughput assessment, test set-up for EUT with data application ancillary

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

The enlargement of the European Union (EU) resulted in a requirement from the EU for a larger number of languages for the translation of the titles of Harmonized Standards and mandated ENs that are to be listed in the Official Journal to support the implementation of this legislation.

For this reason the title translation concerning the present document can be consulted via the [e-approval](#) application.

Annex E (informative): Bibliography

- ETSI TS 134 121: "Universal Mobile Telecommunications System (UMTS); Terminal Conformance Specification; Radio Transmission and Reception (FDD) (3GPP TS 34.121)".
- ETSI TS 134 122: "Universal Mobile Telecommunications System (UMTS) Terminal Conformance Specification; Radio Transmission and Reception (TDD) (3GPP TS 34.122)".
- ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications (3GPP TR 21.905 version 7.2.0 Release 7)".
- ETSI TS 136 521-1: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification Radio transmission and reception". (3GPP TS 36.521-1 version 8.0.1 Release 8)
- ETSI TS 136 521-2: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification Radio transmission and reception". (3GPP TS 36.521-2 version 8.0.1 Release 8)
- ETSI TS 136 523-1: " Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification" Part 1: Protocol conformance specification (3GPP TS 36.523-1 version 8.0.1 Release 8).
- ETSI TS 136 523-2: " Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); User Equipment (UE) conformance specification" Part 2: ICS (3GPP TS 36.523-2 version 8.0.1 Release 8)

History

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V1.1.1	September 2001	Publication
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