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Contents

Foreword

This Technical Specification has been produced by the 3GPP.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

The present document covers the assessment of base stations, repeaters and associated ancillary equipment in respect of Electromagnetic Compatibility (EMC).

The present document specifies the applicable test conditions, performance assessment and performance criteria for base stations, repeaters and associated ancillary equipment in one of the following categories:

- base stations for the FDD mode of UTRA meeting the requirements of TS 25.104 [1], with conformance demonstrated by compliance to TS 25.141 [3].
- base stations for both options of the TDD mode of UTRA meeting the requirements of TS 25.105 [2], with conformance demonstrated by compliance to TS 25.142 [4]. The two options are the 3,84 Mcps and 1,28 Mcps options respectively. The requirements are listed in different subsections only if the parameters deviate.
- repeaters for the FDD mode of UTRA meeting the requirements of TS 25.106 [10], with conformance demonstrated by compliance to TS 25.143 [11].

Technical requirements related to the antenna port of base stations or repeaters are not included in the present document. These are found in the relevant product standards [1], [2], [3], [4], [10], [11].

The environment classification used in the present document refers to the environment classification used in IEC 61000-6-1 [5] and IEC 61000-6-3 [6].

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 25.104: "UTRA (BS) FDD; Radio transmission and reception".

[2] 3GPP TS 25.105: "UTRA (BS) TDD; Radio transmission and reception".

[3] 3GPP TS 25.141: "UTRA (BS) FDD; Base station conformance testing (FDD)".

[4] 3GPP TS 25.142: "UTRA (BS) TDD; Base station conformance testing (TDD)".

[5] IEC 61000-6-1: 2005; "Electromagnetic compatibility (EMC) - Part 6: Generic standards - Section 1: Immunity for residential, commercial and light-industrial environments".

[6] IEC 61000-6-3: 1996; "Electromagnetic compatibility (EMC) - Part 6: Generic standards - Section 3: Emission standard for residential, commercial and light industrial environments".

[7] IEC 60050(161): "International Electrotechnical Vocabulary - Chapter 161: Electromagnetic compatibility".

[8] 3GPP TS 25.101: "UTRA (UE) FDD; UE Radio transmission and reception (FDD)".

[9] 3GPP TS 25.102: "UTRA (UE) TDD: UE Radio transmission and reception (TDD)".

[10] 3GPP TS 25.106: "UTRA Repeater; Radio Transmission and Reception".

[11] 3GPP TS 25.143: "UTRA Repeater conformance testing".

[12] ITU-R Rec. SM.329: "Unwanted emissions in the spurious domain".

[13] CISPR 22: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".

[14] CISPR 16-1-1: "Specification for radio disturbance and immunity measuring apparatus and methods - Measuring apparatus".

[15] IEC 61000-3-2 (2004): "Electromagnetic compatibility (EMC) - Part 3: Limits - Section 2: Limits for harmonic current emissions (equipment input current ≤ 16 A)".

[16] IEC 61000-3-3 (2002): "Electromagnetic compatibility (EMC) - Part 3: Limits - Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A".

[17] IEC 61000-4-2: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 2: Electrostatic discharge immunity test".

[18] IEC 61000-4-3: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency electromagnetic field immunity test".

[19] IEC 61000-4-4: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 4: Electrical fast transient/burst immunity test".

[20] IEC 61000-4-5: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 5: Surge immunity test".

[21] IEC 61000-4-6: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 6: Immunity to contacted disturbances, induced by radio frequency fields".

[22] IEC 61000-4-11: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 11: Voltage dips, short interruptions and voltage variations. Immunity tests".

[23] ITU-R Recommendation SM.1539 (2001): "Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329".

[24] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[25] IEC 61000-3-12 (2005): "Electromagnetic compatibility (EMC) - Part 3-12: Limits- Limits for harmonic current produced by equipment connected to public low-voltage system with input current >16 A and ≤ 75 A.

[26] IEC 61000-3-11 (2000): "Electromagnetic compatibility (EMC) - Part 3-11: Limits –Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 75 A and subject to conditional connections"3Definitions, symbols and abbreviations

[27] 3GPP TS 37.113: 'E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)'.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

Ancillary equipment: Equipment (apparatus), used in connection with a receiver, transmitter or transceiver is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction with a receiver, transmitter or transceiver to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location); and

- the equipment cannot be used on a stand-alone basis to provide user functions independently of a receiver, transmitter or transceiver; and

- the receiver, transmitter or transceiver to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

Base Station equipment: Radio and/or ancillary equipment intended for operation at a fixed location and powered directly or indirectly (e.g. via an AC/DC converter or power supply) by AC mains network, or an extended local DC mains network.

BLER: BLER is block error ratio. The BLER calculation shall be based on evaluating the CRC on each transport block.

Continuous phenomena (continuous disturbance): Electromagnetic disturbance, the effects of which on a particular device or equipment cannot be resolved into a succession of distinct effects (IEC 60050-161 [7]).

Multi-band Base Station: Base Station characterized by the ability of its transmitter and/or receiver to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-overlapping operating band than the other carrier(s).

Pass band: The repeater can have one or several pass bands. The pass band is the frequency range that the repeater operates in with operational configuration. This frequency range can correspond to one or several consecutive nominal channels. If they are not consecutive each subset of channels shall be considered as an individual pass band.

Port: A particular interface, of the specified equipment (apparatus), with the electromagnetic environment. For example, any connection point on an equipment intended for connection of cables to or from that equipment is considered as a port (see figure 1).

Radio communications equipment : Telecommunications equipment which includes one or more transmitters and/or receivers and/or parts thereof for use in a fixed, mobile or portable application. It can be operated with ancillary equipment but if so, is not dependent on it for basic functionality.

Radio equipment: Equipment which contains Radio digital unit and Radio unit.

Radio digital unit: Equipment which contains base band and functionality for controlling Radio unit.

Radio unit: Equipment which contains transmitter and/or receiver.

Receiver exclusion band: The receiver exclusion band is the band of frequencies over which no tests of radiated immunity of a receiver are made. The exclusion band for receivers is expressed relative to the base station receive band.

Repeater: A device that receives, amplifies and transmits the radiated or conducted RF carrier both in the down-link direction (from the base station to the mobile area) and in the up-link direction (from the mobile to the base station). In operating bands specified with only down-link or up-link, only the up-link or down-link as specified for the operating band is repeated.

Signal and control : Port which carries information or control signals, excluding antenna ports.

Telecommunication port: Ports which are intended to be connected to telecommunication networks (e.g. public switched telecommunication networks, integrated services digital networks), local area networks (e.g. Ethernet, Token Ring) and similar networks.

Transient phenomena: Pertaining to or designating a phenomena or a quantity which varies between two consecutive steady states during a time interval short compared with the time-scale of interest (IEC 60050-161 [7]).

Transmitter exclusion band: The transmitter exclusion band is the band of frequencies over which no tests of radiated immunity of a transmitter are made. The exclusion band for transmitters is expressed relative to the carrier frequencies used (the carrier frequencies of the base stations activated transmitter(s).)

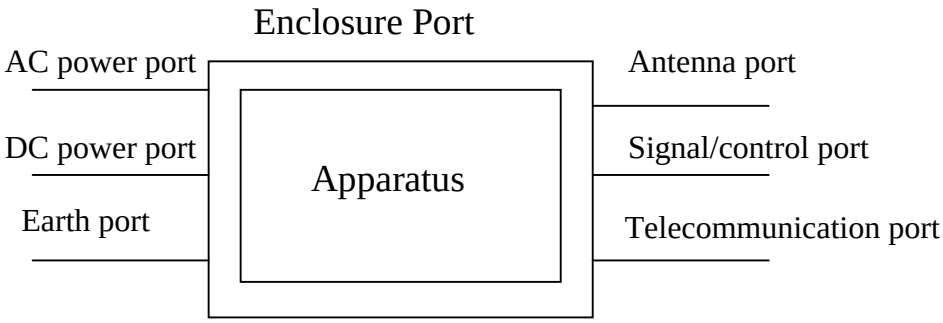

Figure 1: Examples of ports

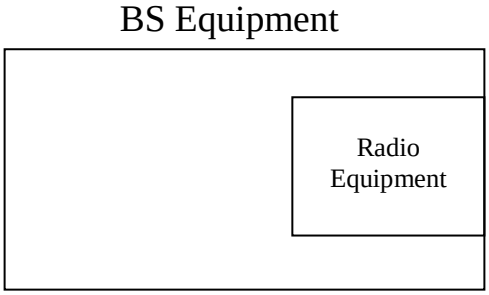

Figure 1A: BS with single enclosure solution

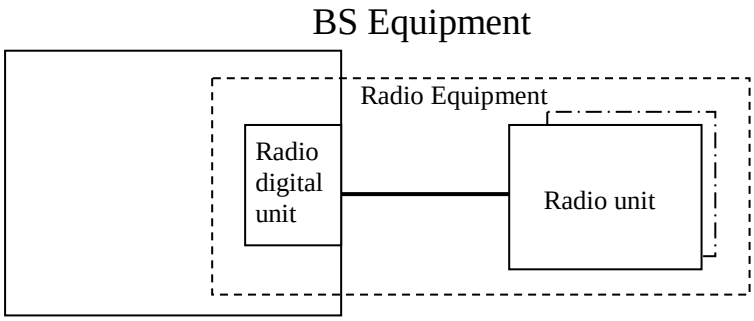

Figure 1B: BS with multiple enclosure solution

3.2 Symbols

(void)

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [24] and the following apply:

AC	Alternating Current
AMN	Artificial Mains Network
CDN	Coupling/Decoupling Network
DC	Direct Current
EMC	Electromagnetic Compatibility

ESD	Electrostatic discharge
EUT	Equipment Under Test
RF	Radio frequency
rms	root mean square
UTRA	Universal Terrestrial Radio Access

4 Test conditions

4.1 General

The equipment shall be tested in normal test environment defined in base station conformance testing specification TS 25.141 [3] or TS 25.142 [4] or in the UTRA Repeater conformance testing specification TS25.143 [11]. The test conditions shall be recorded in the test report.

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

For BS capable of multi-band operation, the requirements in the present document apply for each supported operating band unless otherwise stated. Operating bands shall be activated according to the test configuration in subclause 4.6. Tests shall be performed relating to each type of port and all bands shall be assessed during the tests.

4.2 Arrangements for establishing a communication link

The wanted RF input 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 required performance criteria (hereafter called "the test system") 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;
- 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 25.141 (for FDD) [3] or TS 25.142 (for TDD) [4], to provide a stable communication link.

For immunity tests subclause 4.3 shall apply and the conditions shall be as follows:

4.2.1 Multiple enclosure BS solution

For a BS with multiple enclosures, the BS part with Radio digital unit and the Radio unit may be tested separately. Communication link shall be set up in the same way as if they are in single BS enclosure. The Radio Digital unit and the Radio unit shall communicate over an interface enabling establishment of a communication link.

4.3 Narrow band responses on receivers

4.3.1 FDD and 3,84 Mcps TDD option

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 (clause 6), 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 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 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.

For BS capable of multi-band operation, all supported operating bands shall be considered for narrowband responses.

4.3.2 1,28 Mcps TDD option

For 1.28Mcps chip rate TDD option, 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 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 3.2MHz;

- if the deviation disappears in either or both of the above 3.2 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 4MHz;

- 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.

For BS capable of multi-band operation, all supported operating bands shall be considered for narrowband responses.

4.4 Test condition for Repeater

The wanted RF input signal nominal frequency shall be selected by setting the Absolute Radio Frequency Channel Number (ARFCN) to an appropriate number within the pass band of the Repeater.

The Repeater path shall be tested with a suitable test system capable of measuring RF performance criteria (hereafter called "the test system"). The test system shall be located outside of the test environment.

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

- the EUT shall be commanded to operate at maximum rated gain;

- Adequate measures shall be taken to avoid the effect of the unwanted signal on the measuring equipment;

For immunity tests conditions subclause 4.3 shall apply.

4.4.1 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.

4.5 Exclusion bands

4.5.1 Transmitter exclusion band

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

For UTRA FDD:

Lower carrier frequency used - 12,5 MHz. to upper carrier frequency used + 12,5 MHz.

For UTRA 3,84 Mcps TDD option:

Lower carrier frequency used - 12,5 MHz. to upper carrier frequency used + 12,5 MHz.

For UTRA 1,28 Mcps TDD option:

Lower carrier frequency used - 4 MHz to upper carrier frequency used + 4 MHz.

For UTRA 7,68 Mcps TDD option:

Lower carrier frequency used - 25 MHz. to upper carrier frequency used + 25 MHz.

4.5.2 Receiver exclusion band

The receiver exclusion band for base stations extends from the lower frequency of the Base Station receive band minus 20 MHz to the upper frequency of the Base Station receive band plus 20 MHz. The exclusion bands are as set out below:

UTRA FDD:

a) 1900 MHz to 2000 MHz (Band I)

b) 1830 MHz to 1930 MHz (Band II)

c) 1690 MHz to 1805 MHz (Band III)

d) 1690 MHz to 1775 MHz (Band IV)

e) 804 MHz to 869 MHz (Band V)

f) 810 MHz to 860 MHz (Band VI)

g) 2480 MHz to 2590 MHz (Band VII)

h) 860 MHz to 935 MHz (Band VIII)

i) 1729.9 MHz to 1804.9 MHz (Band IX)

j) 1690 MHz to 1790 MHz (Band X)

k) 1407.9 MHz to 1467.9 MHz (Band XI)

l) 679-736 MHz (Band XII)

m) 757-807 MHz (Band XIII)

n) 768-818 MHz (Band XIV)

o) 810-865 MHz (Band XIX)

p) 712-782 MHz (Band XX)

q) 1427.9-1482.9 MHz (Band XXI)

r) 3390-3510 MHz (Band XXII)

s) 1830 MHz to 1935 MHz (Band XXV)

t) 794 MHz to 869 MHz (Band XXVI)

u) N/A (Band XXXII)

UTRA 3,84 Mcps TDD option, UTRA 1,28 Mcps TDD option and UTRA 7.68 Mcps TDD option:

a) 1880 MHz to 1940 MHz
1990 MHz to 2045 MHz

b) 1830 MHz to 2010 MHz

c) 1890 MHz to 1950 MHz

d) 2550 MHz to 2640MHz

e) 2280MHz to 2420MHz

f) 1860 MHz to 1940 MHz

For BS capable of multi-band operation, the total receiver exclusion band shall be the combination of the exclusion bands for each operating band supported by the BS.

4.6 BS test configurations

The present clause defines the BS test configurations that shall be used for demonstrating conformance. A single UTRA carrier shall be used for testing of single-carrier capable BS. For other BS types, the test configurations in Table 4.6.1 shall be used. The test configurations (UTCx) are defined in TS 25.141 [3], subclause 4.12.

Table 4.6.1: Test configurations for UTRA BS

BS test case	BS capable of multi-carrier operation in contiguous spectrum in single band only	BS capable of multi-carrier operation in both contiguous and non-contiguous spectrum in single band	BS capable of multi-band operation
Emission tests	UTC1	UTC2	UTC1/2 (Note 1), UTC4
Immunity tests	UTC1	UTC2	UTC1/2 (Note 1), UTC4
NOTE 1: UTC1 or UTC2 shall be applied in each supported operating band according to the respective capability in each band, as defined in the 2nd and 3rd column of the table.			

5 Performance assessment

5.1 General

Following information shall be recorded in or annexed to the test report:

- the primary functions of the radio equipment to be tested during and after the EMC testing;
- the intended functions of the radio equipment which shall be in accordance with the documentation accompanying the equipment;
- the method to be used to verify that a communications link is established and maintained

- the user-control functions and stored data that are required for normal operation and the method to be used to assess whether these have been lost after EMC stress;
- the ancillary equipment to be combined with the radio equipment for testing (where applicable);
- the information about ancillary equipment intended to be used with the radio equipment;
- information about the common and/or band-specific active RF components and other HW blocks for a communication link in BS capable of multi-band operation;
- an exhaustive list of ports, classified as either power or signal/control. Power ports shall further be classified as AC or DC power.

Performance assessment of a BS with multiple enclosures may be done separately for the BS part with the Radio digital unit and the Radio unit respectively, according to the manufacturer's choice.

A communication link used by more than one operating band shall be assessed on all operating bands. Communication link(s) and/or radio performance parameters for the operating bands can during the test be assessed simultaneously or separately for each band, depending on the test environment capability.

5.2 Assessment of BLER in Downlink

The output of the transmitter shall be connected to an equipment which meet the requirements for the BLER assessment of TS25.101 [8] in case of FDD and TS25.102 [9] in case of TDD for the bearer used in the immunity tests. 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.

5.3 Assessment of BLER in Uplink

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

5.4 Ancillary equipment

At the manufacturer's discretion the test may be performed on the ancillary equipment separately or a representative configuration of the combination of radio and ancillary equipment. In each case EUT is tested against all applicable immunity and emission clauses of the present document and in each case, compliance enables the ancillary equipment to be used with different radio equipment.

5.5 Repeaters

The parameter used for assessment of performance of a repeater is the gain within the pass band.

6 Performance Criteria

6.1 Performance criteria for continuous phenomena for BS

The test should, where possible, be performed using a bearer with the characteristics of data rate and BLER defined in Table 1. If the test is not performed using one of these bearers (for, example, of none of them are supported by the BS), the characteristics of the bearer used shall be recorded in the test report.

The BS Uplink and Downlink paths shall each meet the performance criteria defined in Table 1 during the test. If the Uplink and Downlink paths are evaluated as a one loop then the criteria is two times the value shown in Table 1.After each test case BS shall operate as intended with no loss of user control function, stored data and the communication link shall be maintained.

Table 1: BS Performance Criteria for continuous phenomena for BS

Bearer Information Data Rate	Performance Criteria
12.2 kbps	BLER < 10^{-2} No loss of service
64 kbps	BLER < 10^{-2} No loss of service
144 kbps	BLER < 10^{-2} No loss of service
384 kbps	BLER < 10^{-2} No loss of service

NOTE: The performance criteria, BLER < 10^{-2} / No loss of service, applies also if a bearer with another characteristics is used in the test.

6.2 Performance criteria for transient phenomena for BS

The test should be, where possible, be performed using a bearer with the characteristics of data rate and BLER defined in Table 2. If the test is not performed using one of these bearers (for, example, of none of them are supported by the BS), the characteristics of the bearer used shall be recorded.

The BS Uplink and Downlink paths shall each meet the performance criteria defined in table 2 during the test. If the Uplink and Downlink paths are evaluated as a one loop then the criteria is two times the value shown in Table 2. After each test case BS shall operate as intended with no loss of user control function, stored data and the communication link shall be maintained.

Table 2: BS Performance Criteria for transient phenomena for BS

Bearer Information Data Rate	Performance Criteria
12.2 kbps	BLER > 10^{-2} temporarily, however the communication link shall be maintained
64 kbps	BLER > 10^{-2} temporarily, however the communication link shall be maintained
144 kbps	BLER > 10^{-2} temporarily, however the communication link shall be maintained
384 kbps	BLER > 10^{-2} temporarily, however the communication link shall be maintained

NOTE: The performance criteria, BLER > 10^{-2} temporarily / however the communication link shall be maintained, applies also if a bearer with another characteristics is used in the test.

6.3 (void)

6.4 Performance criteria for continuous phenomena for Ancillary equipment

The apparatus 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 of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacture, 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.

6.5 Performance criteria for transient phenomena for Ancillary equipment

The apparatus 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 of performance. During the test, degradation of performance is however allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacture, 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.

6.6 (void)

6.7 Performance criteria for continuous phenomena for repeaters

The gain of the EUT shall be measured throughout the period of exposure of the phenomenon. The gain measured during the test shall not change 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.

6.8 Performance criteria for transient phenomena for repeaters

The 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.

6.9 (void)

7 Applicability overview

7.1 Emission

Table 3: Emission applicability

Phenomenon	Application	Equipment test requirement			Reference subclause in the present document	Reference Standard
		BS equipment	Ancillary equipment	Repeater		
Radiated emission (NOTE 2)	Enclosure	applicable		applicable	8.3.1	ITU-R SM.329 [12]
Radiated emission	Enclosure		applicable		8.3.2	CISPR 22 [13]
Conducted emission	DC power input/output port	applicable	applicable	applicable	8.4	CISPR 22 [13], CISPR 16-1-1 [14]
Conducted emission	AC mains input/output port	applicable	applicable	applicable	8.5	CISPR 22 [13]
Harmonic current emissions	AC mains input port	applicable	applicable	applicable	8.6	IEC 61000-3-2 [15] or IEC 61000-3-12 [25]
Voltage fluctuations and flicker	AC mains input port	applicable	applicable	applicable	8.7	IEC 61000-3-3 [16]] or IEC 61000-3-11 [26]
Conducted emission	Telecommunica-tion port	applicable	applicable	applicable	8.8	CISPR 22 [13]

NOTE 1: Spurious emissions from antenna connector shall be measured according to TS 25.141 [3] and TS 25.142 [4] and TS 25.143 [11].

NOTE 2: The radiated emissions requirement for the BS equipment covers radiated emissions in the spurious domain. Note that in ETSI standards and in 3GPP GERAN specifications it is considered a part of radio aspects.

7.2 Immunity

Table 4: Immunity applicability

Phenomenon	Application	Equipment test requirement			Reference subclause in the present document	Reference standard
		BS equipment	Ancillary equipment	Repeater		
RF electromagnetic field (80 - 2700 MHz)	Enclosure	applicable	applicable	applicable	9.3	IEC 61000-4-3 [18]
Electrostatic discharge	Enclosure	applicable	applicable	applicable	9.4	IEC 61000-4-2 [17]
Fast transients common mode	Signal, telecommunications and control ports, DC and AC power input ports	applicable	applicable	applicable	9.5	IEC 61000-4-4 [19]
RF common mode 0,15 - 80 MHz	Signal, telecommunications and control ports, DC and AC power input ports	applicable	applicable	applicable	9.6	IEC 61000-4-6 [21]
Voltage dips and interruptions	AC mains power input ports	applicable	applicable	applicable	9.7	IEC 61000-4-11
Surges, common and differential mode	AC power input ports and telecommunications port	applicable	applicable	applicable	9.8	IEC 61000-4-5 [20]

7.3 Applicability of requirements in TS 37.113

For a BS that is UTRA (single-RAT) capable only, the requirements in the present document are applicable and additional conformance to TS 37.113 [27] is optional. For a BS additionally conforming to TS 37.113 [27], conformance to some of the emission test requirements in the present document can be demonstrated through the corresponding requirements in TS 37.113 [27] as listed in Table 4A and conformance to some of the immunity test requirements in the present document can be demonstrated through the corresponding requirements in TS 37.113 [27] as listed in Table 4B.

Table 4A: Alternative emission test requirements for a BS additionally conforming to TS 37.113 [27]

Phenomenon	Application	Clause in the present document	Alternative clause in TS 37.113 [27]
Radiated emission	Enclosure	8.3.1	8.2.1
Conducted emission	DC power input/output port	8.4	8.3
Conducted emission	AC mains input/output port	8.5	8.4
Harmonic current emissions	AC mains input port	8.6	8.5
Voltage fluctuations and flicker	AC mains input port	8.7	8.6
Conducted emission	Telecommunication port	8.8	8.7

Table 4B: Alternative immunity test requirements for a BS additionally conforming to TS 37.113 [27]

Phenomenon	Application	Clause in the present document	Alternative clause in TS 37.113 [27]
RF electromagnetic field (80 - 2700 MHz)	Enclosure	9.3	9.2
Electrostatic discharge	Enclosure	9.4	9.3
Fast transients common mode	Signal, telecommunications and control ports, DC and AC power input ports	9.5	9.4
RF common mode (0,15 - 80 MHz)	Signal, telecommunications and control ports, DC and AC power input ports	9.6	9.5
Voltage dips and interruptions	AC mains power input ports	9.7	9.6
Surges, common and differential mode	AC power input ports and telecommunications port	9.8	9.7

8 Emission

8.1 Methods of measurement and limits for EMC emissions

8.2 Test configurations

This subclause defines the configurations for emission tests as follows:

- the equipment shall be tested under normal test conditions as specified in the functional standards;
- the test configuration shall be as close to normal intended use as possible;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;
- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;
- the test conditions, test configuration and mode of operation shall be recorded in the test report;
- ports which in normal operation are connected shall be connected to an ancillary equipment or to a representative piece of cable correctly terminated to simulate the input/output characteristics of the ancillary equipment, Radio Frequency (RF) input/output ports shall be correctly terminated;
- ports which are not connected to cables during normal operation, e.g. service connectors, programming connectors, temporary connectors etc. shall not be connected to any cables for the purpose of EMC testing. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables;
- the test arrangements for transmitter and receiver sections of the transceiver are described separately for the sake of clarity. However, where possible the test of the transmitter section and receiver section of the EUT may be carried out simultaneously to reduce test time.

8.3 Radiated emission from Base station, Repeater and ancillary equipment

8.3.1 Radiated emission, Base stations and Repeater

This test is applicable to Base station and Repeater. This test shall be performed on a representative configuration of the Base station or Repeater.

8.3.1.1 Definition

This test assesses the ability of BS and Repeater to limit unwanted emission from the enclosure port.

8.3.1.2 Test method

8.3.1.2.1 FDD and 3,84 Mcps TDD option

a) A test site fulfilling the requirements of ITU-R SM. 329 [12] shall be used. The BS or Repeater shall be placed on a non-conducting support and shall be operated from a power source via a RF filter to avoid radiation from the power leads.

Mean power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser). At each frequency at which a component is detected, the BS or Repeater shall be rotated and the height of the test antenna adjusted to obtain maximum response, and the effective radiated power (e.r.p.) of that component determined by a substitution measurement. The measurement shall be repeated with the test antenna in the orthogonal polarization plane.

NOTE: Effective radiated power (e.r.p.) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2,15 dB between e.i.r.p. and e.r.p.

e.r.p. (dBm) = e.i.r.p. (dBm) – 2,15 Ref: ITU-R SM.329 ANNEX 1 [12].

b) The BS shall transmit with maximum power declared by the manufacturer with all transmitters active. Set the base station to transmit a signal as stated for measurement of spurious emission for FDD in the TS25.141 [3] and for 3.84 Mcps TDD option in the TS25.142 [4].

In case of a Repeater the gain and the output power shall be set to the maximum value as declared by the manufacturer.

c) The received power shall be measured over the frequency range 30 MHz to 12.75 GHz, excluding 12.5MHz below the first carrier frequency to 12.5 MHz above the last carrier frequency used. The measurement bandwidth shall be 100 kHz between 30 MHz and 1 GHz and 1 MHz above 1 GHz as given in ITU-R SM.329 [12]. The video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the measuring receiver, it shall be the maximum available and at least 1 MHz. Unless otherwise stated, all measurements are done as mean power (RMS).

8.3.1.2.2 1,28 Mcps TDD option

a) A test site fulfilling the requirements of ITU-R SM. 329 [12] shall be used. The BS shall be placed on a non-conducting support and shall be operated from a power source via a RF filter to avoid radiation from the power leads.

Mean power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser). At each frequency at which a component is detected, the BS shall be rotated and the height of the test antenna adjusted to obtain maximum response, and the effective radiated power (e.r.p.) of that component determined by a substitution measurement. The measurement shall be repeated with the test antenna in the orthogonal polarisation plane.

NOTE: Effective radiated power (e.r.p.) refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2,15 dB between e.i.r.p. and e.r.p.

e.r.p. (dBm) = e.i.r.p. (dBm) – 2,15 Ref: ITU-R SM.329 ANNEX 1 [12].

b) The BS shall transmit with maximum power declared by the manufacturer with all transmitters active. Set the base station to transmit a signal as stated for measurement of spurious emission for 1.28 Mcps TDD in the TS25.142 [4].

c) The received power shall be measured over the frequency range 30 MHz to 12.75 GHz, excluding 4MHz below the first carrier frequency to 4 MHz above the last carrier frequency used. The measurement bandwidth shall be 100 kHz between 30 MHz and 1 GHz and 1 MHz above 1 GHz as given in ITU-R SM.329 [12]. The video bandwidth shall be approximately three times the resolution bandwidth. If this video bandwidth is not available on the measuring receiver, it shall be the maximum available and at least 1 MHz. Unless otherwise stated, all measurements are done as mean power (RMS).

8.3.1.3 Limits

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out of band emissions and spurious emissions are based on ITU-R Recommendations SM.329 [12] and SM.1539 [23].

8.3.1.3.1 FDD and 3,84 Mcps TDD option

The BS or the Repeater shall meet the limits below:

Table 5: Limits for radiated emissions from BS and repeater

Frequency range	Minimum requirement (e.r.p.)/Reference Bandwidth
30 MHz≤ f <1000 MHz	-36 dBm/100 kHz
1 GHz≤ f <12,75 GHz	-30 dBm/ 1MHz
Fc1 - 12,5 MHz < f < Fc2+12,5 MHz (Note 1)	Not defined
NOTE 1: For BS capable of multi-band operation, the frequency ranges relating to the carriers of all supported bands apply.	

Key:

Fc1: Center frequency of first carrier frequency used by the BS and repeater.

Fc2: Center frequency of last carrier frequency used by the BS and repeater.

8.3.1.3.2 1,28 Mcps TDD option

The BS shall meet the limits below:

Table 5A: Limits for radiated emissions from BS

Frequency range	Minimum requirement (e.r.p.)/Reference Bandwidth
30 MHz≤ f <1000 MHz	-36 dBm/100 kHz
1 GHz≤ f <12,75 GHz	-30 dBm/ 1MHz
Fc1 - 4 MHz < f < Fc2+4 MHz	Not defined

Key:

Fc1: Center frequency of first carrier frequency used by the BS.

Fc2: Center frequency of last carrier frequency used by the BS.

8.3.1.4 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the radiated emission measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 5B for BS and repeater.

Table 5B specifies the Maximum measurement uncertainty of the Test System. The Test System shall enable the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95% is the measurement uncertainty tolerance interval for a specific measurement that contains 95% of the performance of a population of test equipment.

Table 5B: Maximum measurement uncertainty (BS, and Repeater)

Parameter	Uncertainty for EUT dimension ≤ 1 m	Uncertainty for EUT dimension >1 m
Effective radiated RF power between 30 MHz to 180 MHz	±6 dB	±6 dB
Effective radiated RF power between 180 MHz to 4 GHz	±4 dB	±6 dB
Effective radiated RF power between 4 GHz to 12,75 GHz	±6 dB	±9* dB
*Note: This value may be reduced to ±6 dB when further information on the potential radiation characteristic of the EUT is available.		

NOTE: If the Test System for a test is known to have a measurement uncertainty greater than that specified in table 5B, this equipment can still be used, provided that an adjustment is made follows:

Any additional uncertainty in the Test System over and above that specified in table 5B is used to tighten the Test Requirements - making the test harder to pass. This procedure will ensure that a Test System not compliant with table 5B does not increase the probability of passing an EUT that would otherwise have failed a test if a Test System compliant with table 5B had been used.

8.3.2 Radiated emission, Ancillary equipment

This test is applicable to ancillary equipment. This test shall be performed on a representative configuration of the ancillary equipment.

8.3.2.1 Definition

This test assesses the ability of ancillary equipment to limit unwanted emission from the enclosure port.

8.3.2.2 Test method

The test method shall be in accordance with CISPR 22 [13]

8.3.2.3 Limits

The ancillary equipment shall meet the limits according to CISPR 22 [13] shown in table 6 and table 6A.

Table 6: Limits for radiated emissions from ancillary equipment, measured on a stand-alone basis (10 m measuring distance)

Frequency range	Quasi-peak
30 MHz-230 MHz	30 dBµV/m
230 MHz-1000 MHz	37 dBµV/m

Table 6A: Limits for radiated emissions from ancillary equipment, measured on a stand-alone basis (3 m measuring distance)

Frequency range GHz	Average limit dBµV/m	Peak limit dBµV/m
1 to 3	50	70
3 to 6	54	74
Note: The lower limit applies at the transition frequency.		

8.4 Conducted emission DC power input/output port

This test is applicable to equipment which may have DC cables longer than 3 m.

If the DC power cable of the radio equipment is intended to be less than 3 m in length, and intended only for direct connection to a dedicated AC to DC power supply, then the measurement shall be performed only on the AC power input of that power supply as specified in subclause 8.5.

This test shall be performed on a representative configuration of the radio equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

8.4.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to limit internal noise from the DC power input/output ports.

8.4.2 Test method

The test method shall be in accordance with CISPR 22 [13] and the Artificial Mains Network (AMN) shall be connected to a DC power source.

In the case of DC output ports, the ports shall be connected via a AMN to a load drawing the rated current of the source.

A measuring receiver shall be connected to each AMN measurement port in turn and the conducted emission recorded.

The equipment shall be installed with a ground plane as defined in CISPR 22 [13]. The reference earth point of the AMNs shall be connected to the reference ground plane with a conductor as short as possible.

The measurement receiver shall be in accordance with the requirements of section one of CISPR 16-1 [14].

8.4.3 Limits

The equipment shall meet the limits below (including the average limit and the quasi-peak limit) when using, respectively, an average detector receiver and a quasi-peak detector receiver and measured in accordance with the method described in subclause 8.4.2 above. If the average limit is met when using a quasi-peak detector, the equipment shall be deemed to meet both limits and measurement with the average detector receiver is not necessary.

The equipment shall meet the limits given in table 7.

Table 7: Limits for conducted emissions

Frequency range	Quasi-peak	Average
>0,15-0,5MHz	79dBµV	66dBµV
>0,5-30 MHz	73dBµV	60dBµV

8.5 Conducted emissions, AC mains power input/output port

This test is applicable to equipment powered by the AC mains.

This test is not applicable to AC output ports which are connected directly (or via a circuit breaker) to the AC power port of the EUT.

This test shall be performed on a representative configuration of the radio equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

8.5.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to limit internal noise from the AC mains power input/output ports.

8.5.2 Test method

The test method shall be in accordance with CISPSR 22 [13].

Mains connected ancillary equipment which is not part of the EUT shall be connected to the mains via a separate AMN. According to CISPR 16-1 [14], the Protective Earth (PE) conductor shall also be terminated by a 50 Ω/50 µH common mode RF impedance.

8.5.3 Limits

The equipment shall meet the limits below (including the average limit and the quasi-peak limit) when using, respectively, an average detector receiver and a quasi-peak detector receiver and measured in accordance with the method described in subclause 8.5.2 above. If the average limit is met when using a quasi-peak detector, the equipment shall be deemed to meet both limits and measurement with the average detector receiver is not necessary.

Table 8: Limits for conducted emissions

Frequency range	Quasi-peak	Average
> 0,15-0,5 MHz	66 - 56 dBµV	56 - 46 dBµV
> 0.5- 5 MHz	56 dBµV	46 dBµV
> 5-30 MHz	60 dBµV	50 dBµV
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz.		

Alternatively, for equipment intended to be used in telecommunication centres the limits given in table 9 shall be used.

Table 9: Limits for conducted emissions

Frequency range	Quasi-peak	Average
>0,15-0,5MHz	79dBµV	66dBµV
>0,5-30 MHz	73dBµV	60dBµV

8.6 Harmonic Current emissions (AC mains input port)

The requirements of IEC 61000-3-2 [15] for harmonic current emission apply for equipment covered by the scope of the present document. For equipment with an input current of greater than 16 A per phase, IEC 61000-3-12 [25] applies.

8.7 Voltage fluctuations and flicker (AC mains input port)

The requirements of IEC 61000-3-3 [16] for voltage fluctuations and flicker apply for equipment covered by the scope of the present document. For equipment with an input current of greater than 16 A per phase, IEC 61000-3-12 [26] applies.

8.8 Telecommunication ports

This test is applicable for radio equipment and/or ancillary equipment for fixed use which have telecommunication ports.

This test shall be performed on a representative configuration of radio equipment, the associated ancillary equipment, or a representative configuration of the combination of radio and ancillary equipment.

8.8.1 Definition

This test assesses the EUT unwanted emission present at the telecommunication ports.

8.8.2 Test method

The test method shall be in accordance with CISPR 22 [13]

The measurement frequency range extends from 150 kHz to 30 MHz. When the EUT is a transmitter operating at frequencies below 30 MHz, then the exclusion band for transmitters applies (see subclause 4.5) for measurements in the transmit mode of operation.

8.8.3 Limits

The telecommunication ports shall meet the limits according to CISPR 22 [13] shown in table 10.

Table 10: Limits for conducted emissions from telecommunication ports

Frequency range	Voltage limits dB (µV)		Current limits dB (µA)	
MHz	Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,5	84 to 74	74 to 64	40 to 30	30 to 20
0,5 to 30	74	64	30	20
NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz. NOTE 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$ 150/I = 44 dB).				

Alternatively, for equipment intended to be used in telecommunication centres only, the limits given in table 11 may be used.

Table 11: Limits for conducted emissions from telecommunication ports of equipment intended for use in telecommunication centres only

Frequency range	Voltage limits dB (µV)		Current limits dB (µA)	
MHz	Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,5	97 to 87	84 to 74	53 to 43	40 to 30
0,5 to 30	87	74	43	30
NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz. NOTE 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN), which presents a common mode (asymmetric mode) impedance of 150 Ω to the telecommunication port under test (conversion factor is 20 $\log_{10}$ 150/I = 44 dB).				

9 Immunity

9.1 Test methods and levels for immunity tests

9.2 Test configurations

This subclause defines the configurations for immunity tests as follows:

- the equipment shall be tested under normal test conditions as specified in the functional standards;
- the test configuration shall be as close to normal intended use as possible;
- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;
- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;
- the test conditions, test configuration and mode of operation shall be recorded in the test report;
- ports which in normal operation are connected shall be connected to an ancillary equipment or to a representative piece of cable correctly terminated to simulate the input/output characteristics of the ancillary equipment, Radio Frequency (RF) input/output ports shall be correctly terminated;

- ports which are not connected to cables during normal operation, e.g. service connectors, programming connectors, temporary connectors etc. shall not be connected to any cables for the purpose of EMC testing. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables;

- 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 Iub-interface (e.g. with an RNC simulator) and evaluating the BLER (see figure 2);

- Immunity tests shall be performed on both the Uplink and Downlink paths. The tests shall also include both the air-interface and Iub-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 Iub-interface. In case of looping is used care have to be taken that the BLER information doesn't change due to looping. The BLER evaluation shall be based on the number of transmitted blocks i.e including possible deleted blocks.

- For BS capable of multi-band operation, communication links shall be established in such a way that all operating band(s) are activated during the test according to the applicable test configurations in subclause 4.6. Performance assessment may be done separately for each operating band.

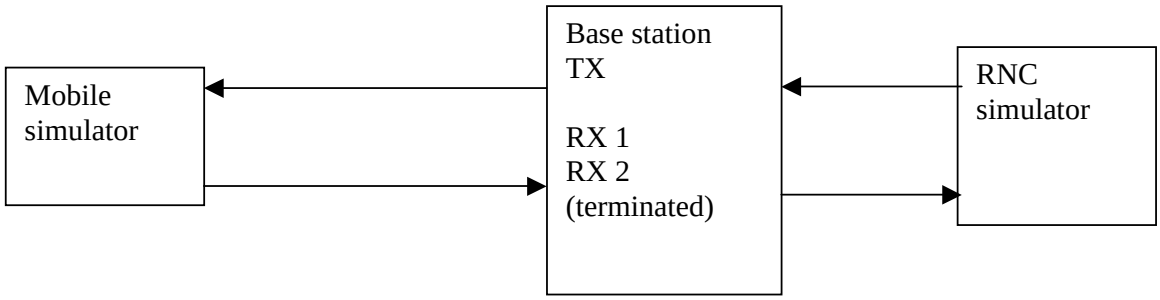

Figure 2: Communication link set up for BS immunity measurement

9.3 RF electromagnetic field (80 MHz - 1000 MHz, 1400 MHz to 2700 MHz)

The test shall be performed on a representative configuration of the equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

9.3.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to operate as intended in the presence of a radio frequency electromagnetic field disturbance at the enclosure.

9.3.2 Test method and level

The test method shall be in accordance with IEC 61000-4-3 [18]:

- for transmitters, receivers and transceivers the following requirements shall apply:

- the test level shall be 3 V/m amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 kHz;

- the stepped frequency increments shall be 1 % of the momentary frequency;

- the test shall be performed over the frequency range 80 MHz - 1 000 MHz and 1400 MHz - 2700 MHz;

- responses in stand-alone receivers or receivers which are part of transceivers occurring at discrete frequencies which are narrow band responses, shall be disregarded, see subclause 4.3;

- the frequencies selected during the test shall be recorded in the test report.

9.3.3 Performance criteria

Base station:

The performance criteria of subclause 6.1 shall apply.

Ancillary equipment:

The performance criteria of subclause 6.4 shall apply.

Repeater:

The performance criteria of subclause 6.7 shall apply.

9.4 Electrostatic discharge

The test shall be performed on a representative configuration of the radio equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

9.4.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to operate as intended in the event of an electrostatic discharge.

9.4.2 Test method and level

The test method shall be in accordance with IEC 61000-4-2 [17]:

- for contact discharge, the equipment shall pass at ±2 kV and ±4 kV;
- for air discharge shall pass at ±2 kV, ±4 kV and ±8 kV;
- electrostatic discharge shall be applied to all exposed surfaces of the EUT except where the user documentation specially indicates a requirement for appropriate protective measures.

NOTE: Ensure that the EUT is fully discharged between each ESD exposure.

9.4.3 Performance criteria

Base station:

The performance criteria of subclause 6.2 shall apply.

Ancillary equipment:

The performance criteria of subclause 6.5 shall apply.

Repeater:

The performance criteria of subclause 6.8 shall apply.

9.5 Fast transients common mode

The test shall be performed on AC mains power input ports.

This test shall be performed on signal ports, telecommunication ports, control ports and DC power input/output ports if the cables may be longer than 3 m.

Where this test is not carried out on a port or any other ports because the manufacturer declares that it is not intended to be used with cables longer than 3 m, a list of ports which were not tested for this reason shall be included in the test report.

This test shall be performed on a representative configuration of the equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

9.5.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to operate as intended in the event of fast transients present on one of the input/output ports.

9.5.2 Test method and level

The test method shall be in accordance with IEC 61000-4-4 [19]:

- the test level for signal ports, telecommunication ports and control ports shall be 0,5 kV open circuit voltage as given in IEC 61000-4-4 [19];
- the test level for DC power input/output ports shall be 0.5 kV open circuit voltage as given in IEC 61000-4-4 [19];
- the test level for AC mains power input ports shall be 1 kV open circuit voltage as given in IEC 61000-4-4 [19].

For AC and DC power input ports the transients shall be applied (in parallel) to all the conductors in the cable with reference to the cabinet reference earth (true common mode) and the source impedance shall be 50 Ω.

9.5.3 Performance criteria

Base station:

The performance criteria of subclause 6.2 shall apply.

Ancillary equipment:

The performance criteria of subclause 6.5 shall apply.

Repeater:

The performance criteria of subclause 6.8 shall apply.

9.6 RF common mode (0,15 MHz - 80 MHz)

The test shall be performed on AC mains power input/output ports.

This test shall be performed on signal ports, telecommunication ports, control and DC power input/output ports, which may have cables longer than 3 m.

Where this test is not carried out on a port or any other ports because the manufacturer declares that it is not intended to be used with cables longer than stated above, a list of ports which were not tested shall be included in the test report.

This test shall be performed on a representative configuration of the equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

NOTE: This test can also be performed using the intrusive method, where appropriate, see IEC 61000-4-6 [21].

9.6.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to operate as intended in the presence of a radio frequency electromagnetic disturbance.

9.6.2 Test method and level

The test method shall be in accordance with IEC 61000-4-6 [21]:

- the test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 kHz;
- the stepped frequency increments shall be 50 kHz in the frequency range 150 kHz to 5 MHz and 1%frequency increment of the momentary frequency in the frequency range 5 MHz to 80 MHz.
- the test level shall be severity level 2 as given in IEC 61000-4-6 [21] corresponding to 3 V rms, at a transfer impedance of 150 Ω;
- the test shall be performed over the frequency range 150 kHz - 80 MHz;
- the injection method to be used shall be selected according to the basic standard IEC 61000-4-6 [21];
- responses of stand-alone receivers or receivers which are part of transceivers occurring at discrete frequencies which are narrow band responses, shall be disregarded, see subclause 4.3;
- the frequencies of the immunity test signal selected and used during the test shall be recorded in the test report.

9.6.3 Performance criteria

Base station:

The performance criteria of subclause 6.1 shall apply.

Ancillary equipment:

The performance criteria of subclause 6.4 shall apply.

Repeater:

The performance criteria of subclause 6.7 shall apply.

9.7 Voltage dips and interruptions

The tests shall be performed on AC mains power input ports.

These tests shall be performed on a representative configuration of the equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

9.7.1 Definition

These tests assess the ability of radio equipment and ancillary equipment to operate as intended in the event of voltage dips and interruptions present on the AC mains power input ports.

9.7.2 Test method and level

The following requirements shall apply.

The test method shall be in accordance with IEC 61000-4-11 [22].

The test levels shall be:

- a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms;
- a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms;
- a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5 000 ms.

9.7.3 Performance criteria

For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the performance criteria for transient phenomena shall be applied:

- Criteria 6.2 for base station
- Criteria 6.5 for ancillary equipment
- Criteria 6.8 for repeater

For a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms and/or a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5 000 ms, the following applies:

1. In the case where the equipment is fitted with or connected to a battery back-up, the following performance criteria shall be applied:
   - Criteria 6.2 for base station
   - Criteria 6.5 for ancillary equipment
   - Criteria 6.8 for repeater
2. In the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator:
   - No unintentional responses shall occur at the end of the test
   - In the event of loss of communications link or in the event of loss of user data, this fact shall be recorded in the test report

9.8 Surges, common and differential mode

The tests shall be performed on AC mains power input ports.

This test shall be additionally performed on telecommunication ports.

These tests shall be performed on a representative configuration of the equipment, the associated ancillary equipment, or representative configuration of the combination of radio and ancillary equipment.

9.8.1 Definition

These tests assess the ability of radio equipment and ancillary equipment to operate as intended in the event of surges being present at the AC mains power input ports and telecommunication ports.

9.8.2 Test method and level

The test method shall be in accordance with IEC 61000-4-5 [20].

The requirements and evaluation of test results given in clause 9.8.2.1 (telecommunication ports, outdoor cables), clause 9.8.2.2 (telecommunication ports, indoor cables) and clause 9.8.2.3 (AC power ports) shall apply, but no test shall be required where normal functioning cannot be achieved, because of the impact of the CDN on the EUT.

9.8.2.1 Test method for telecommunication ports directly connected to outdoor cables

The test level for telecommunications ports, intended to be directly connected to the telecommunications network via outdoor cables, shall be 1 kV line to ground as given in IEC 61000-4-5 [20], however, in telecommunications centres 0,5 kV line to ground shall be used. In this case the total output impedance of the surge generator shall be in accordance with the basic standard IEC 61000-4-5 [20].

The test generator shall provide the 1,2/50 μs pulse as defined in IEC 61000-4-5 [20]

9.8.2.2 Test method for telecommunication ports connected to indoor cables

The test level for telecommunication ports, intended to be connected to indoor cables (longer than 10 m) shall be 0,5 kV line to ground. In this case the total output impedance of the surge generator shall be in accordance with the basic standard IEC 61000-4-5 [20]

The test generator shall provide the 1,2/50 μs pulse as defined in IEC 61000-4-5 [20].

9.8.2.3 Test method for AC power ports

The test level for AC power input ports shall be 2 kV line to ground, and 1 kV line to line, with the output impedance of the surge generator as given in IEC 61000-4-5 [20].

In telecom centres 1 kV line to ground and 0,5 kV line to line shall be used.

The test generator shall provide the 1,2/50 μs pulse as defined in IEC 61000-4-5 [20].

9.8.3 Performance criteria

Base station:

The performance criteria of subclause 6.2 shall apply.

Ancillary equipment:

The performance criteria of subclause 6.5 shall apply.

Repeater:

The performance criteria of subclause 6.8 shall apply.

Annex A (informative): Change History

TSG	Doc	CR	R	Title	Cat	Curr	New	Work Item
RP-37				Rel-8 version created from v7.6.0			8.0.0	
RP-37	RP-070658	0036		Introduction of UMTS1500 requirements (Rel-8)	B	7.6.0	8.0.0	RInImp8-UMTS1500
RP-39	RP-080124	0038	1	Introduction of UMTS700 requirements	B	8.0.0	8.1.0	RInImp8-UMTS700
RP-40	RP-080384	0039		Introduction of UMTS2300 requirements	B	8.1.0	8.2.0	RInImp8-UMTS2300TDD
RP-41	RP-080631	0040		EMC for BS equipment divided into more than one cabinet	B	8.2.0	8.3.0	TEI8
RP-43	RP-080197	0041		Introduction of band 1880MHz for 25.113	F	8.3.0	8.4.0	RInImp9-UMTS1880TDD
RP-44	RP-090559	0042		Introduction of Extended UMTS800 requirements	B	8.4.0	9.0.0	RInImp9-UMTSLTE800
RP-46	RP-091286	043		Introduction of Extended UMTS1500 requirements for TS25.113 (Technically endorsed at RAN 4 52bis in R4-093626)	B	9.0.0	9.1.0	UMTSLTE1500
RP-46	RP-091279	045		BS emission applicability correction (Technically endorsed at RAN 4 52bis in R4-094024)	A	9.0.0	9.1.0	TEI8
RP-47	RP-100263	47		Introduction of Band XX in 25.113	B	9.1.0	9.2.0	RInImp9-UMTSLTE800EU
RP-49	RP-100923	048		Clarification of radiated emissions requirement	F	9.2.0	9.3.0	RInImp9-RFmulti
RP-50	RP-101334	052		Band XII channel arrangement correction on 25.113	A	9.3.0	9.4.0	TEI8
RP-50	RP-101338	050		Correction due to the introduction of the definition of pass band	A	9.3.0	9.4.0	TEI8
RP-51	RP-110344	0055	-	Applicability of EMC requirements	F	9.4.0	9.5.0	TEI9
RP-51	-	-		Automatic upgrade from rel-9 to rel-10	-	9.5.0	10.0.0	-
RP-52	RP-110804	056		Add Expanded 1900MHz band in 25.113	B	10.0.0	10.1.0	E1900-Core
RP-53	RP-111255	057		Add Band 22/XXII for LTE/UMTS 3500 (FDD) to TS 25.113	B	10.1.0	10.2.0	RInImp8-UMTSLTE3500
RP-55	RP-120305	058		Add upper 850MHz band in 25.113	B	10.2.0	11.0.0	e850_UB-Core
RP-64	RP-140926	061		Introduction of operating band XXXII in TS25.113	B	11.0.0	12.0.0	LTE_UTRA_SDL_BandL-Core
RP-65	RP-141562	062	1	Update of definitions to support supplemental DL in TS25.113	F	12.0.0	12.1.0	TEI12
RP-68	RP-150955	064		EMC testing of multi-band operation for UTRA BS	A	12.1.0	12.2.0	MB_MSR_RF-Perf
SP-70	-	-	-	Update to Rel-13 version (MCC)	-	12.2.0	13.0.0	
				Editorial correction in the cover page		13.0.0	13.0.1	

History

Document history		
V13.0.1	January 2016	Publication