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*Technical Specification*

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
E-UTRA, UTRA and GSM/EDGE;  
Multi-Standard Radio (MSR) Base Station (BS)  
radio transmission and reception  
(3GPP TS 37.104 version 10.1.0 Release 10)**

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# Foreword

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# 1 Scope

The present document establishes the minimum RF characteristics of E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS). Requirements for multi-RAT and single-RAT operation of MSR BS are covered in the present document. The requirements in the present document for E-UTRA and UTRA single-RAT operation of MSR BS are also applicable to E-UTRA and UTRA multi-carrier capable single-RAT BS. Requirements for GSM BS that are only single-RAT capable are not covered.

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# 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.
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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 25.104, Technical Specification, '3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (FDD) (Release 9)'
- [3] 3GPP TS 25.105, Technical Specification, '3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) radio transmission and reception (TDD) (Release 9)'
- [4] 3GPP TS 36.104, Technical Specification, '3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (Release 9)'
- [5] 3GPP TS 45.005, Technical Specification, '3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Radio transmission and reception (Release 9)'
- [6] ITU-R Recommendation SM.329-10, 'Unwanted emissions in the spurious domain'.
- [7] 3GPP TR 25.942, 'Technical Report 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; Radio Frequency (RF) system scenarios (Release 8)'
- [8] 'Title 47 of the Code of Federal Regulations (CFR)', Federal Communications Commission.
- [9] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [10] 3GPP TS 37.141, Technical Specification, '3rd Generation Partnership Project; Technical Specification Group Radio Access Network; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing (Release 9)'
- [11] IEC 60721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations".
- [12] IEC 60721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations".



- [13] ETSI EN 300 019-1-3, *European Standard (Telecommunications series)*, 'Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weather protected locations'
- [14] ETSI EN 300 019-1-4, *European Standard (Telecommunications series)*, 'Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weather protected locations'.

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Band category:** A group of operating bands for which the same MSR scenarios apply

**Base Station RF bandwidth:** The bandwidth in which a Base Station transmits and receives multiple carriers and/or RATs simultaneously

**Base Station RF bandwidth edge:** The frequency of one of the edges of the Base Station RF bandwidth

**Carrier:** The modulated waveform conveying the E-UTRA, UTRA or GSM/EDGE physical channels

**Channel bandwidth:** The bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

**Carrier power:** The power at the antenna connector in the channel bandwidth of the carrier averaged over at least one subframe for E-UTRA, at least one slot for UTRA and the useful part of the burst for GSM/EDGE.

**Configured carrier power:** Target maximum power for a specific carrier for the operating mode set in the BS

**Downlink operating band:** The part of the operating band designated for downlink.

**Lower RF bandwidth edge:** The frequency of the lower edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements

**Maximum Base Station RF bandwidth:** The maximum RF bandwidth supported by a BS within an operating band.

**Maximum carrier output power:** Carrier power available at the antenna connector for a specified reference condition.

**Maximum RAT output power:** The sum of the power of all carriers of the same RAT available at the antenna connector for a specified reference condition.

**Maximum throughput:** The maximum achievable throughput for a reference measurement channel.

**Maximum total output power:** The sum of the power of all carriers available at the antenna connector for a specified reference condition.

**Measurement bandwidth:** The bandwidth in which an emission level is specified.

**MSR Base station:** Base Station characterized by the ability of its receiver and transmitter to process two or more carriers in common active RF components simultaneously in a declared RF bandwidth, where at least one carrier is of a different RAT than the other carrier(s).

**Multi-carrier transmission configuration:** A set of one or more contiguous carriers that a BS is able to transmit simultaneously according to the manufacturer's specification.

**Occupied bandwidth:** The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage  $\beta/2$  of the total mean power of a given emission.

**Operating band:** A frequency range in which E-UTRA, UTRA or GSM/EDGE operates (paired or unpaired), that is defined with a specific set of technical requirements.

NOTE: The operating band(s) for a BS is declared by the manufacturer.

**Throughput:** The number of payload bits successfully received per second for a reference measurement channel in a specified reference condition.

**Transmission bandwidth:** Bandwidth of an instantaneous E-UTRA transmission from a UE or BS, measured in Resource Block units.

**Uplink operating band:** The part of the operating band designated for uplink.

**Upper RF bandwidth edge:** The frequency of the upper edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements

## 3.2 Symbols

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

|                         |   |
|-------------------------|---|
| $\beta$                 | Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel   |
| $BW_{\text{Channel}}$   | Channel bandwidth (for E-UTRA)  |
| $BW_{\text{RF}}$        | Base Station RF bandwidth, where $BW_{\text{RF}} = F_{\text{BW RF,high}} - F_{\text{BW RF,low}}$  |
| $BW_{\text{RF,max}}$    | Maximum Base Station RF bandwidth   |
| $f$                     | Frequency   |
| $\Delta f$              | Separation between the Base Station RF bandwidth edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency             |
| $\Delta f_{\text{max}}$ | The largest value of $\Delta f$ used for defining the requirement   |
| $F_{\text{C}}$          | Carrier centre frequency  |
| $F_{\text{filter}}$     | Filter centre frequency   |
| $f_{\text{offset}}$     | Separation between the Base Station RF bandwidth edge frequency and the centre of the measuring filter  |
| $f_{\text{offset,max}}$ | The maximum value of $f_{\text{offset}}$ used for defining the requirement  |
| $F_{\text{BW RF,high}}$ | Upper RF bandwidth edge, where $F_{\text{BW RF,high}} = F_{\text{C,high}} + F_{\text{offset,RAT}}$  |
| $F_{\text{BW RF,low}}$  | Lower RF bandwidth edge, where $F_{\text{BW RF,low}} = F_{\text{C,low}} - F_{\text{offset,RAT}}$  |
| $F_{\text{C,high}}$     | Center frequency of the highest transmitted/received carrier.   |
| $F_{\text{C,low}}$      | Center frequency of the lowest transmitted/received carrier.  |
| $F_{\text{offset,RAT}}$ | Frequency offset from $F_{\text{C,high}}$ to the <i>upper RF bandwidth edge</i> or $F_{\text{C,low}}$ to the <i>lower RF bandwidth edge</i> for a specific RAT. |
| $F_{\text{DL,low}}$     | The lowest frequency of the downlink operating band   |
| $F_{\text{DL,high}}$    | The highest frequency of the downlink operating band  |
| $F_{\text{UL,low}}$     | The lowest frequency of the uplink operating band   |
| $F_{\text{UL,high}}$    | The highest frequency of the uplink operating band  |
| $P_{\text{EM,N}}$       | Declared emission level for channel N   |
| $P_{\text{max}}$        | Maximum total output power  |
| $P_{\text{max,RAT}}$    | Maximum RAT output power  |
| $P_{\text{max,c}}$      | Maximum carrier output power  |
| $P_{\text{REFSENS}}$    | Reference Sensitivity power level   |

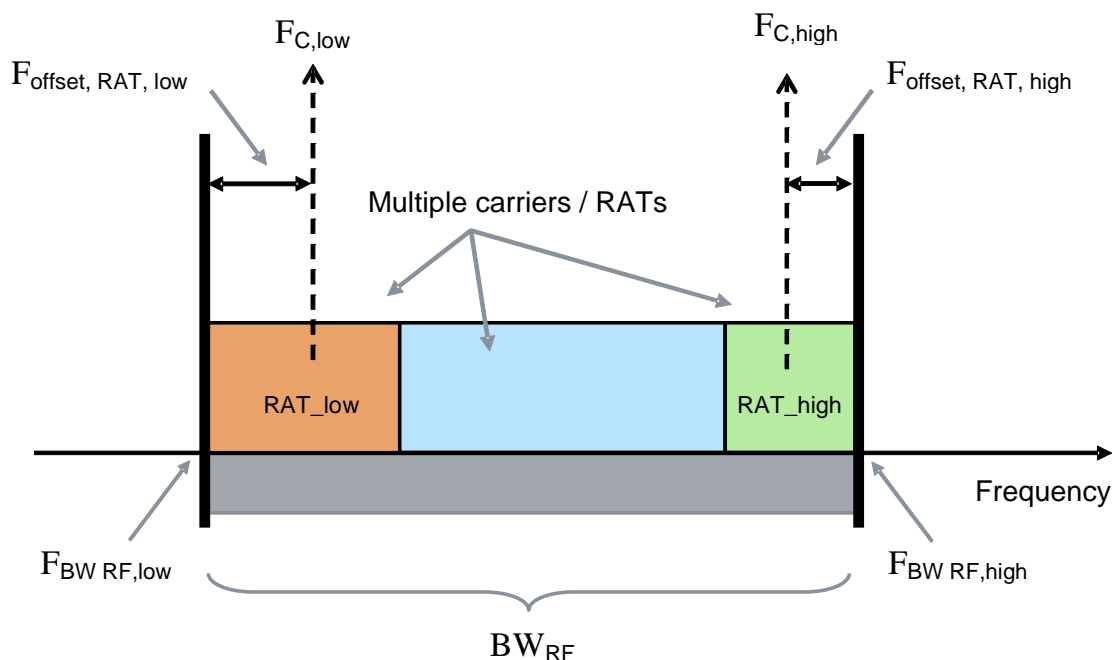


Figure 3.2-1: Illustration of RF bandwidth related symbols and definitions for Multi-standard Radio.

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

|             |  |
|-------------|--|
| ACLR        | Adjacent Channel Leakage Ratio                 |
| ACS         | Adjacent Channel Selectivity                   |
| ARFCN       | Absolute Radio Frequency Channel Number        |
| AWGN        | Additive White Gaussian Noise                  |
| BC          | Band Category                                  |
| BER         | Bit Error Ratio                                |
| BS          | Base Station                                   |
| BTS         | Base Transceiver Station                       |
| CA          | Carrier Aggregation                            |
| CP          | Cyclic prefix                                  |
| CW          | Continuous Wave                                |
| DB-DC-HSDPA | Dual Band Dual Cell HSDPA                      |
| DC-HSDPA    | Dual Cell HSDPA                                |
| DC-HSUPA    | Dual Cell HSUPA                                |
| DTT         | Digital Terrestrial Television                 |
| EARFCN      | E-UTRA Absolute Radio Frequency Channel Number |
| EDGE        | Enhanced Data rates for GSM Evolution          |
| EIRP        | Effective Isotropic Radiated Power             |
| EVM         | Error Vector Magnitude                         |
| FCC         | Federal Communications Commission              |
| FDD         | Frequency Division Duplex                      |
| FRC         | Fixed Reference Channel                        |
| GP          | Guard Period (for E-UTRA TDD operation)        |
| GSM         | Global System for Mobile Communications        |
| HSDPA       | High Speed Downlink Packet Access              |
| HSUPA       | High Speed Uplink Packet Access                |
| ICS         | In-Channel Selectivity                         |
| ITU-R       | Radiocommunication Sector of the ITU           |

|        |  |
|--------|--|
| LNA    | Low Noise Amplifier                          |
| MIMO   | Multiple Input Multiple Output               |
| MS     | Mobile Station                               |
| MSR    | Multi-Standard Radio                         |
| PA     | Power Amplifier                              |
| PHS    | Personal Handyphone System                   |
| QPSK   | Quadrature Phase-Shift Keying                |
| RAT    | Radio Access Technology                      |
| RB     | Resource Block (for E-UTRA)                  |
| RF     | Radio Frequency                              |
| RMS    | Root Mean Square (value)                     |
| RS     | Reference Symbol                             |
| RX     | Receiver                                     |
| SNR    | Signal-to-Noise Ratio                        |
| TDD    | Time Division Duplex                         |
| TX     | Transmitter                                  |
| UARFCN | UTRA Absolute Radio Frequency Channel Number |
| UE     | User Equipment                               |
| UEM    | operating band Unwanted Emissions Mask       |

---

## 4 General

### 4.1 Relation between the MSR specification and the single-RAT specifications

The requirements for MSR are in most parts specified in the present document, while many requirements are also specified through normative references to the respective single-RAT specifications in [2], [3], [4] and [5]. The resulting set of requirements for an MSR BS can be divided into three types, depending on their relation to the single-RAT specifications:

1. **Generic MSR requirement:** A common generic requirement is specified in the present document that applies for all RATs and for BS configured for both multi-RAT and single-RAT operation. In some cases, there are additional requirement(s) that apply only in some Band Category. There are no references to the single-RAT specifications.
2. **Generic MSR requirement, with additional single-RAT requirements:** A common generic requirement is specified in the present document which applies as in point 1. In addition some single RAT requirement(s) apply, included by normative reference(s) to the single-RAT specification(s).
3. **Single-RAT only requirements:** In this case, no common generic requirement is defined. The existing single-RAT requirement applies for each RAT, included by normative reference(s) to the single-RAT specification(s).

The applicability of each requirement is described in clause 5.

## 4.2 Relationship between minimum requirements and test requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 37.141 [10] defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements. For some requirements, including regulatory requirements, the test tolerance is set to zero.

For MSR single-RAT requirements, the principle used to define the test requirement remains from the existing specifications.

For both MSR single-RAT and multi-RAT requirements, the measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle. The Shared Risk principle is defined in ITU-R M.1545 [9].

## 4.3 Base station classes

The requirements presented in the present specification apply to MSR Base Stations intended for general purpose applications. MSR BS requirements for general purpose applications are based on Wide Area scenarios.

For GSM/EDGE operation of an MSR BS, a BS intended for general purpose applications corresponds to a normal BTS, including Multicarrier BTS classes. MSR requirements for multi-RAT operation only apply for the highest GSM/EDGE static power step.

Other base station classes are for further study. The requirements for these may be different than those for general purpose applications, or not applicable at all.

## 4.4 Regional requirements

Some requirements in the present document may only apply in certain regions either as optional requirements, or set by local and regional regulation as mandatory requirements. It is normally not stated in the 3GPP specifications under what exact circumstances that the requirements apply, since this is defined by local or regional regulation.

Table 4.4-1 lists all requirements in the present specification that may be applied differently in different regions. There are additional regional requirements that may apply for single-RAT operation of an MSR BS. These are referenced from the present specification, but listed in the specification for the RATs concerned [2][3][4][5].

Table 4.4-1: List of regional requirements

| Clause number | Requirement  | Comments  |
|---------------|--|---|
| 4.5           | Operating bands and Band Categories  | Some bands may be applied regionally.   |
| 6.2.2         | Base station output power  | These requirements apply in Japan for an E-UTRA BS operating in band 34.  |
| 6.6.1.1       | Mandatory requirements (spurious emissions)  | Category A limits are mandatory for regions where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [2] apply. Category B limits are mandatory for regions where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [2] apply. |
| 6.6.1.3       | Additional spurious emissions requirements   | These requirements may be applied for the protection of system operating in frequency ranges other than the MSR BS operating band.  |
| 6.6.1.3       | Additional spurious emissions requirements   | In addition to the requirements in subclauses 6.6.1.1, 6.6.1.2 and 6.6.1.3, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.        |
| 6.6.1.4       | Co-location (spurious emissions)   | These requirements may be applied for the protection of other BS receivers when a BS operating in another frequency band is co-located with an MSR BS.  |
| 6.6.2.4.1     | Additional requirement (Operating band unwanted emissions)                                 | In addition to the requirements in subclauses 6.6.2.1 and 6.6.2.2, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], when deployed in regions where those limits are applied and under the conditions declared by the manufacturer.                  |
| 6.6.2.4.2     | Unsynchronized operation for BC3 (Operating band unwanted emissions)                       | The requirements for unsynchronized TDD co-existence may apply regionally.  |
| 6.6.2.4.3     | Protection of DTT (Operating band unwanted emissions)                                      | The requirements for protection of DTT may apply regionally.  |
| 6.6.2.4.4     | Co-existence with services in adjacent frequency bands (Operating band unwanted emissions) | This regional requirement may be applied for the protection of systems operating in frequency bands adjacent to band 1 as defined in clause 4.5, in geographic areas in which both an adjacent band service and UTRA and/or E-UTRA are deployed.  |
| 6.6.3         | Occupied bandwidth   | The requirement may be applied regionally. There may also be regional requirements to declare the Occupied bandwidth according to the definition.   |
| 7.5.2         | Co-location requirement (blocking)   | These requirements may be applied for the protection of the BS receiver when a BS operating in another frequency band is co-located with an MSR BS.   |

## 4.5 Operating bands and Band Categories

MSR requirements are applicable for band definitions and band numbering as defined in the specifications TS 45.005 [2], TS25.104 [3], TS 25.105 [4] and TS 36.104 [5]. For the purpose of defining the MSR BS requirements, the operating bands are divided into three band categories as follows:

- Band Category 1 (BC1): Bands for E-UTRA FDD and UTRA FDD operation
- Band Category 2 (BC2): Bands for E-UTRA FDD, UTRA FDD and GSM/EDGE operation
- Band Category 3 (BC3): Bands for E-UTRA TDD and UTRA TDD operation

NOTE: For UTRA TDD, requirements in the present document cover the 1.28 Mcps UTRA TDD option.

The paired and unpaired bands for the three Band Categories are shown in Table 4.5-1 and 4.5-2, together with the corresponding E-UTRA, UTRA and GSM/EDGE band designations. In the present specification, the operating band of an MSR Base Stations is designated using the E-UTRA band number according to the tables.

Table 4.5-1: Paired bands in E-UTRA, UTRA and GSM/EDGE.

| MSR and E-UTRA Band number | UTRA Band number | GSM/EDGE Band designation | Uplink (UL) BS receive<br>UE transmit | Downlink (DL) BS transmit<br>UE receive | Band category    |
|----------------------------|------------------|---------------------------|---------------------------------------|---|------------------|
| 1                          | I                | -                         | 1920 MHz – 1980 MHz                   | 2110 MHz – 2170 MHz                     | 1                |
| 2                          | II               | PCS 1900                  | 1850 MHz – 1910 MHz                   | 1930 MHz – 1990 MHz                     | 2                |
| 3                          | III              | DCS 1800                  | 1710 MHz – 1785 MHz                   | 1805 MHz – 1880 MHz                     | 2                |
| 4                          | IV               | -                         | 1710 MHz – 1755 MHz                   | 2110 MHz – 2155 MHz                     | 1                |
| 5                          | V                | GSM 850                   | 824 MHz – 849 MHz                     | 869 MHz – 894 MHz                       | 2                |
| 6 <sup>(1)</sup>           | VI               | -                         | 830 MHz – 840 MHz                     | 875 MHz – 885 MHz                       | 1 <sup>(1)</sup> |
| 7                          | VII              | -                         | 2500 MHz – 2570 MHz                   | 2620 MHz – 2690 MHz                     | 1                |
| 8                          | VIII             | E-GSM                     | 880 MHz – 915 MHz                     | 925 MHz – 960 MHz                       | 2                |
| 9                          | IX               | -                         | 1749.9 MHz – 1784.9 MHz               | 1844.9 MHz – 1879.9 MHz                 | 1                |
| 10                         | X                | -                         | 1710 MHz – 1770 MHz                   | 2110 MHz – 2170 MHz                     | 1                |
| 11                         | XI               | -                         | 1427.9 MHz – 1447.9 MHz               | 1475.9 MHz – 1495.9 MHz                 | 1                |
| 12                         | XII              | -                         | 699 MHz – 716 MHz                     | 729 MHz – 746 MHz                       | 1                |
| 13                         | XIII             | -                         | 777 MHz – 787 MHz                     | 746 MHz – 756 MHz                       | 1                |
| 14                         | XIV              | -                         | 788 MHz – 798 MHz                     | 758 MHz – 768 MHz                       | 1                |
| 15                         | XV               | -                         | Reserved                              | Reserved                                |                  |
| 16                         | XVI              | -                         | Reserved                              | Reserved                                |                  |
| 17                         | -                | -                         | 704 MHz – 716 MHz                     | 734 MHz – 746 MHz                       | 1 <sup>(2)</sup> |
| 18                         | -                | -                         | 815 MHz – 830 MHz                     | 860 MHz – 875 MHz                       | 1 <sup>(2)</sup> |
| 19                         | XIX              | -                         | 830 MHz – 845 MHz                     | 875 MHz – 890 MHz                       | 1                |
| 20                         | XX               | -                         | 832 MHz – 862 MHz                     | 791 MHz – 821 MHz                       | 1                |
| 21                         | XXI              | -                         | 1447.9 MHz – 1462.9 MHz               | 1495.9 MHz – 1510.9 MHz                 | 1                |

NOTE 1: The band is for UTRA only.  
NOTE 2: The band is for E-UTRA only.

UTRA FDD can operate with DB-DC-HSDPA for the band configurations listed in subclause 5.2 c) of TS 25.104 [2].

Table 4.5-2: Unpaired bands in E-UTRA and UTRA.

| MSR and E-UTRA Band number | UTRA Band number | Uplink (UL) BS receive<br>UE transmit | Downlink (DL) BS transmit<br>UE receive | Band category |
|----------------------------|------------------|---------------------------------------|---|---------------|
| 33                         | a)               | 1900 MHz – 1920 MHz                   | 1900 MHz – 1920 MHz                     | 3             |
| 34                         | a)               | 2010 MHz – 2025 MHz                   | 2010 MHz – 2025 MHz                     | 3             |
| 35                         | b)               | 1850 MHz – 1910 MHz                   | 1850 MHz – 1910 MHz                     | 3             |
| 36                         | b)               | 1930 MHz – 1990 MHz                   | 1930 MHz – 1990 MHz                     | 3             |
| 37                         | c)               | 1910 MHz – 1930 MHz                   | 1910 MHz – 1930 MHz                     | 3             |
| 38                         | d)               | 2570 MHz – 2620 MHz                   | 2570 MHz – 2620 MHz                     | 3             |
| 39                         | f)               | 1880 MHz – 1920 MHz                   | 1880 MHz – 1920 MHz                     | 3             |
| 40                         | e)               | 2300 MHz – 2400 MHz                   | 2300 MHz – 2400 MHz                     | 3             |
| 41                         | -                | 2496 MHz – 2690 MHz                   | 2496 MHz – 2690 MHz                     | 3             |
| 42                         | h)               | 3400 MHz – 3600 MHz                   | 3400 MHz – 3600 MHz                     | 3             |
| 43                         | i)               | 3600 MHz – 3800 MHz                   | 3600 MHz – 3800 MHz                     | 3             |

#### 4.5.1 Band category 1 aspects (BC1)

BC1 requirements for receiver and transmitter shall apply with a frequency offset from the lowest and highest carriers to the RF bandwidth edges ( $F_{\text{offset, RAT}}$ ) as defined in Table 4.5.1-1.

**Table 4.5.1-1:  $F_{\text{offset, RAT}}$  for Band Category 1**

| RAT                      | $F_{\text{offset, RAT}}$                  |
|--------------------------|---|
| 1.4, 3 MHz E-UTRA        | $BW_{\text{Channel}}/2 + 200 \text{ kHz}$ |
| 5, 10, 15, 20 MHz E-UTRA | $BW_{\text{Channel}}/2$                   |
| UTRA                     | 2.5 MHz                                   |

## 4.5.2 Band category 2 aspects (BC2)

BC2 requirements for receiver and transmitter shall apply with a frequency offset from the lowest and highest carriers to the RF bandwidth edges ( $F_{\text{offset, RAT}}$ ) as defined in Table 4.5.2-1.

**Table 4.5.2-1:  $F_{\text{offset, RAT}}$  for Band Category 2**

| RAT      | $F_{\text{offset, RAT}}$ |
|----------|--------------------------|
| E-UTRA   | $BW_{\text{Channel}}/2$  |
| UTRA FDD | 2.5 MHz                  |
| GSM/EDGE | 200 kHz                  |

## 4.5.3 Band category 3 aspects (BC3)

BC3 requirements for receiver and transmitter shall apply with a frequency offset from the lowest and highest carriers to the RF bandwidth edges ( $F_{\text{offset, RAT}}$ ) as defined in Table 4.5.3-1.

**Table 4.5.3-1:  $F_{\text{offset, RAT}}$  for Band Category 3**

| RAT                      | $F_{\text{offset, RAT}}$                  |
|--------------------------|---|
| 1.4, 3 MHz E-UTRA        | $BW_{\text{Channel}}/2 + 200 \text{ kHz}$ |
| 5, 10, 15, 20 MHz E-UTRA | $BW_{\text{Channel}}/2$                   |
| 1.28 Mcps UTRA TDD       | 1 MHz                                     |

## 4.6 Channel arrangement

### 4.6.1 Channel spacing

The GSM/EDGE carrier spacing is 200 kHz [5].

The nominal UTRA FDD channel spacing is 5 MHz. The nominal channel spacing is 1.6MHz for the 1.28 Mcps UTRA TDD Option. These can be adjusted to optimise performance in a particular deployment scenario [2,3].

In E-UTRA the spacing between carriers will depend on the deployment scenario, the size of the frequency block available and the channel bandwidths. The nominal channel spacing between two adjacent E-UTRA carriers is defined as following:

$$\text{Nominal Channel spacing} = (BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)})/2$$

where  $BW_{\text{Channel}(1)}$  and  $BW_{\text{Channel}(2)}$  are the channel bandwidths of the two respective E-UTRA carriers. The channel spacing can be adjusted to optimize performance in a particular deployment scenario [4].

#### 4.6.1A CA Channel spacing

For contiguously aggregated carriers the channel spacing between adjacent component carriers shall be multiple of 300 kHz.

The nominal channel spacing between two adjacent aggregated E-UTRA carriers is defined as follows:



$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3$$

where  $BW_{\text{Channel}(1)}$  and  $BW_{\text{Channel}(2)}$  are the channel bandwidths of the two respective E-UTRA component carriers according to Table 5.6-1 with values in MHz. The channel spacing for intra-band contiguous carrier aggregation can be adjusted to any multiple of 300 kHz less than the nominal channel spacing to optimize performance in a particular deployment scenario.

## 4.6.2 Channel raster

The GSM/EDGE channel raster is 200 kHz for all bands [5].

The UTRA FDD and TDD channel raster is 200 kHz for all bands, which means that the centre frequency must be an integer multiple of 200 kHz. In addition a number of additional centre frequencies are specified according to [2,3], which means that the centre frequencies for these channels are shifted 100 kHz relative to the general raster.

The E-UTRA channel raster is 100 kHz for all bands, which means that the carrier centre frequency must be an integer multiple of 100 kHz [4].

## 4.6.3 Carrier frequencies and numbering

The carrier frequencies and corresponding numbering is defined for each RAT in the respective specifications TS 36.104 [4] TS25.104 [2], TS 25.105 [3] and TS 45.005 [5]. In the context of MSR, the frequency numbering scheme for each RAT will remain.

- The E-UTRA carrier frequency numbering (EARFCN) is defined in subclause 5.7 of TS 36.104 [4].
- The UTRA FDD carrier frequency numbering (UARFCN) is defined in subclause 5.4 of TS 25.104 [2].
- The UTRA TDD carrier frequency numbering (UARFCN) is defined in subclause 5.4 of TS 25.105 [3].
- The GSM/EDGE carrier frequency numbering (ARFCN) is defined subclause 2 of TS 45.005 [5].

NOTE: The numbering schemes for UTRA FDD and TDD are not coordinated, while both are called UARFCN.

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# 5 Applicability of requirements

## 5.1 Band category 1

For all MSR BS operating in Band Category 1, the RF requirements listed in Table 5.1-1 apply. Requirements apply according to the RAT configuration of the Base Station, as listed in the heading of the table. Some requirements listed in the table may not be mandatory or they may apply only regionally. This is further specified in the clause of each requirement and in Table 4.4-1.

Table 5.1-1: Applicability of requirements for MSR BS operation in Band Category 1

| RF requirement   | BS configured for multi-RAT operation | BS configured for single-RAT E-UTRA FDD operation | BS configured for single-RAT UTRA FDD operation |
|--|---------------------------------------|---|---|
| Base station output power  | 6.2.1<br>6.2.3<br>6.2.4               | 6.2.1<br><br>6.2.3                                | 6.2.1<br>6.2.4                                  |
| Output power dynamics  | 6.3.1<br>6.3.2                        | 6.3.1   | 6.3.2   |
| Transmitted signal quality   |                                       |   |   |
| Modulation quality   | 6.5.1.1<br>6.5.1.2                    | 6.5.1.1   | 6.5.1.2   |
| Frequency error  | 6.5.2.1<br>6.5.2.2                    | 6.5.2.1   | 6.5.2.2   |
| Time alignment between transmitter branches  | 6.5.3.1<br>6.5.3.2                    | 6.5.3.1   | 6.5.3.2   |
| Unwanted emissions   |                                       |   |   |
| Transmitter spurious emissions   | 6.6.1 (except for 6.6.1.1.3)          | 6.6.1 (except for 6.6.1.1.3)                      | 6.6.1 (except for 6.6.1.1.3)                    |
| Operating band unwanted emissions  | 6.6.2.1<br>6.6.2.4                    | 6.6.2.1<br>6.6.2.4                                | 6.6.2.1<br>6.6.2.4                              |
| Occupied bandwidth   | 6.6.3                                 | 6.6.3   | 6.6.3   |
| ACLR   | 6.6.4.1<br>6.6.4.2                    | 6.6.4.1   | 6.6.4.2   |
| Transmitter intermodulation  | 6.7.1                                 | 6.7.1   | 6.7.1   |
| Reference sensitivity level  | 7.2.1<br>7.2.2                        | 7.2.1   | 7.2.2   |
| Dynamic range  | 7.3.1<br>7.3.2                        | 7.3.1   | 7.3.2   |
| In-band selectivity and blocking   |                                       |   |   |
| Blocking   | 7.4.1                                 | 7.4.1   | 7.4.1   |
| Narrowband blocking  | 7.4.2                                 | 7.4.2   | 7.4.2   |
| Out-of-band blocking   | 7.5                                   | 7.5   | 7.5   |
| Receiver spurious emissions  | 7.6.1                                 | 7.6.1   | 7.6.1   |
| Receiver intermodulation   |                                       |   |   |
| Intermodulation  | 7.7.1                                 | 7.7.1   | 7.7.1   |
| Narrowband intermodulation   | 7.7.2                                 | 7.7.2   | 7.7.2   |
| In-channel selectivity   | 7.8                                   | 7.8   | -   |
| Performance requirements   | 8.1<br>8.2                            | 8.1   | 8.2   |
| NOTE 1: For some requirements in BS configured for multi-RAT operation, there is no general MSR multi-RAT requirement. Instead, the requirement is defined by the respective single-RAT requirement for each RAT supported by the BS as referenced in the table. |                                       |   |   |

## 5.2 Band category 2

For all MSR BS operating in Band Category 2, the RF requirements listed in Table 5.2-1 apply. Requirements apply according to the RAT configuration of the Base Station, as listed in the heading of the table. Some requirements listed in the table may not be mandatory or they may apply only regionally. This is further specified in the clause of each requirement and in Table 4.4-1.

Table 5.2-1: Applicability of requirements for MSR BS operation in Band Category 2

| RF requirement   | BS configured for multi-RAT operation not including GSM/EDGE | BS configured for multi-RAT operation including GSM/EDGE | BS configured for single-RAT E-UTRA FDD operation | BS configured for single-RAT UTRA FDD operation | BS configured for single-RAT GSM/EDGE operation |
|--|--|--|---|---|---|
| Base station output power  | 6.2.1<br>6.2.3<br>6.2.4                                      | 6.2.1<br>6.2.3<br>6.2.4                                  | 6.2.1<br>6.2.3                                    | 6.2.1<br>6.2.4                                  | 6.2.1   |
| Output power dynamics  | 6.3.1<br>6.3.2   | 6.3.1<br>6.3.2<br>6.3.4                                  | 6.3.1   | 6.3.2   | 6.3.4   |
| Transmit ON/OFF power  | -  | -  | -   | -   | -   |
| Transmitted signal quality   |  |  |   |   |   |
| Modulation quality   | 6.5.1.1<br>6.5.1.2   | 6.5.1.1<br>6.5.1.2<br>6.5.1.4                            | 6.5.1.1   | 6.5.1.2   | 6.5.1.4   |
| Frequency error  | 6.5.2.1<br>6.5.2.2   | 6.5.2.1<br>6.5.2.2<br>6.5.2.4                            | 6.5.2.1   | 6.5.2.2   | 6.5.2.4   |
| Time alignment between transmitter branches  | 6.5.3.1<br>6.5.3.2   | 6.5.3.1<br>6.5.3.2                                       | 6.5.3.1   | 6.5.3.2   | -   |
| Unwanted emissions   |  |  |   |   |   |
| Transmitter spurious emissions   | 6.6.1 (except for 6.6.1.1.3)                                 | 6.6.1  | 6.6.1 (except for 6.6.1.1.3)                      | 6.6.1 (except for 6.6.1.1.3)                    | 6.6.1   |
| Operating band unwanted emissions  | 6.6.2.2<br>6.6.2.4   | 6.6.2.2<br>6.6.2.4                                       | 6.6.2.2<br>6.6.2.4                                | 6.6.2.2<br>6.6.2.4                              | 6.6.2.3<br>6.6.2.4                              |
| Occupied bandwidth   | 6.6.3  | 6.6.3  | 6.6.3   | 6.6.3   | -   |
| ACLR   | 6.6.4.1<br>6.6.4.2   | 6.6.4.1<br>6.6.4.2                                       | 6.6.4.1   | 6.6.4.2   | -   |
| Transmitter intermodulation  | 6.7.1<br>6.7.2   | 6.7.1<br>6.7.2   | 6.7.1<br>6.7.2                                    | 6.7.1<br>6.7.2                                  | 6.7.2   |
| Reference sensitivity level  | 7.2.1<br>7.2.2   | 7.2.1<br>7.2.2<br>7.2.4                                  | 7.2.1   | 7.2.2   | 7.2.4   |
| Dynamic range  | 7.3.1<br>7.3.2   | 7.3.1<br>7.3.2<br>7.3.4                                  | 7.3.1   | 7.3.2   | 7.3.4   |
| In-band selectivity and blocking   |  |  |   |   |   |
| Blocking   | 7.4.1  | 7.4.1  | 7.4.1   | 7.4.1   | 7.4.1   |
| Narrowband blocking  | 7.4.2  | 7.4.2<br>7.4.3   | 7.4.2   | 7.4.2   | 7.4.2<br>7.4.3<br>7.4.4                         |
| Out-of-band blocking   | 7.5  | 7.5  | 7.5   | 7.5   | 7.5   |
| Receiver spurious emissions  | 7.6.1<br>7.6.2   | 7.6.1<br>7.6.2   | 7.6.1<br>7.6.2                                    | 7.6.1<br>7.6.2                                  | 7.6.1<br>7.6.2                                  |
| Receiver intermodulation   |  |  |   |   |   |
| Intermodulation  | 7.7.1  | 7.7.1  | 7.7.1   | 7.7.1   | 7.7.1   |
| Narrowband intermodulation   | 7.7.2  | 7.7.2<br>7.7.3   | 7.7.2   | 7.7.2   | 7.7.2<br>7.7.3                                  |
| In-channel selectivity   | 7.8  | 7.8  | 7.8   | -   | -   |
| Performance requirements   | 8.1<br>8.2   | 8.1<br>8.2<br>8.4  | 8.1   | 8.2   | 8.4   |
| NOTE 1: For some requirements in BS configured for multi-RAT operation, there is no general MSR multi-RAT requirement. Instead, the requirement is defined by the respective single-RAT requirement for each RAT supported by the BS as referenced in the table. |  |  |   |   |   |

### 5.3 Band category 3

For all MSR BS operating in Band Category 3, the RF requirements listed in Table 5.3-1 apply. Requirements apply according to the RAT configuration of the Base Station, as listed in the heading of the table. Some requirements listed

in the table may not be mandatory or they may apply only regionally. This is further specified in the clause of each requirement and in Table 4.4-1.

**Table 5.3-1: Applicability of requirements for MSR BS operation in Band Category 3**

| RF requirement                              | BS configured for multi-RAT operation  | BS configured for single-RAT E-UTRA TDD operation | BS configured for single-RAT UTRA TDD operation |
|---|--|---|---|
| Base station output power                   | 6.2.1<br>6.2.2<br>6.2.3<br>6.2.5   | 6.2.1<br>6.2.2<br>6.2.3                           | 6.2.1<br>6.2.5                                  |
| Output power dynamics                       | 6.3.1<br>6.3.3   | 6.3.1   | 6.3.3   |
| Transmit ON/OFF power                       | 6.4  | 6.4   | 6.4   |
| Transmitted signal quality                  |  |   |   |
| Modulation quality                          | 6.5.1.1<br>6.5.1.3   | 6.5.1.1   | 6.5.1.3   |
| Frequency error                             | 6.5.2.1<br>6.5.2.3   | 6.5.2.1   | 6.5.2.3   |
| Time alignment between transmitter branches | 6.5.3.1<br>6.5.3.3   | 6.5.3.1   | 6.5.3.3   |
| Unwanted emissions                          |  |   |   |
| Transmitter spurious emissions              | 6.6.1 (except for 6.6.1.1.3 and 6.6.1.2)   | 6.6.1 (except for 6.6.1.1.3 and 6.6.1.2)          | 6.6.1 (except for 6.6.1.1.3 and 6.6.1.2)        |
| Operating band unwanted emissions           | 6.6.2.1<br>6.6.2.4   | 6.6.2.1<br>6.6.2.4                                | 6.6.2.1<br>6.6.2.4                              |
| Occupied bandwidth                          | 6.6.3  | 6.6.3   | 6.6.3   |
| ACLR  | 6.6.4.1<br>6.6.4.3   | 6.6.4.1   | 6.6.4.3   |
| Transmitter intermodulation                 | 6.7.1<br>6.7.3   | 6.7.1<br>6.7.3                                    | 6.7.1<br>6.7.3                                  |
| Reference sensitivity level                 | 7.2.1<br>7.2.3   | 7.2.1   | 7.2.3   |
| Dynamic range                               | 7.3.1<br>7.3.3   | 7.3.1   | 7.3.3   |
| In-band selectivity and blocking            |  |   |   |
| Blocking                                    | 7.4.1<br>7.4.5   | 7.4.1<br>7.4.5                                    | 7.4.1<br>7.4.5                                  |
| Narrowband blocking                         | 7.4.2  | 7.4.2   | 7.4.2   |
| Out-of-band blocking                        | 7.5  | 7.5   | 7.5   |
| Receiver spurious emissions                 | 7.6.1  | 7.6.1   | 7.6.1   |
| Receiver intermodulation                    |  |   |   |
| Intermodulation                             | 7.7.1  | 7.7.1   | 7.7.1   |
| Narrowband intermodulation                  | 7.7.2  | 7.7.2   | 7.7.2   |
| In-channel selectivity                      | 7.8  | 7.8   | -   |
| Performance requirements                    | 8.1<br>8.3   | 8.1   | 8.3   |
| Note 1:                                     | For some requirements in BS configured for multi-RAT operation, there is no general MSR multi-RAT requirement. Instead, the requirement is defined by the respective single-RAT requirement for each RAT supported by the BS as referenced in the table. |   |   |

## 5.4 Inclusion of requirements by reference

Many requirements in the present specification are not explicitly stated in the clauses listed in Tables 5.3-1, 5.3-2 and 5.3-3, but are instead included by reference to the respective single-RAT specifications. Each reference is normative and identifies the clause where the requirement is specified.

In some cases, the referenced clause may contain requirements that for different reasons do not apply for an MSR base station. It is in those cases stated that 'applicable parts' of the referenced clause apply. What parts are applicable is determined by the scope of the MSR specification. For example:

- In a referenced clause including requirements for multiple operating bands, only requirements for bands listed in the present document apply.
- In a referenced clause that includes requirements for different types of base stations, only requirements for Wide Area BS apply in case of UTRA. For GSM/EDGE, only requirements for Multicarrier BTS and/or Normal BTS apply.

## 6 Transmitter characteristics

### 6.1 General

Unless otherwise stated, the requirements in clause 6 are expressed for a single transmitter antenna connector. In case of multi-carrier transmission with multiple transmitter antenna connectors, transmit diversity, DB-DC-HSDPA or MIMO transmission, the requirements apply for each transmitter antenna connector.

A BS supporting DC-HSDPA and DB-DC-HSDPA transmits two UTRA FDD cells simultaneously. A BS supporting DC-HSDPA transmits two UTRA FDD cells simultaneously on adjacent carrier frequencies.

A BS supporting contiguous CA in a specified band transmits multiple component carriers aggregated contiguously. A BS supporting inter-band CA transmits multiple component carriers in the specified bands.

Unless otherwise stated, the transmitter characteristics are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (test port B).

Unless otherwise stated the requirements in subclause 6 applies at all times, i.e. during the Transmitter ON period, the Transmitter OFF period and the Transmitter transient period.

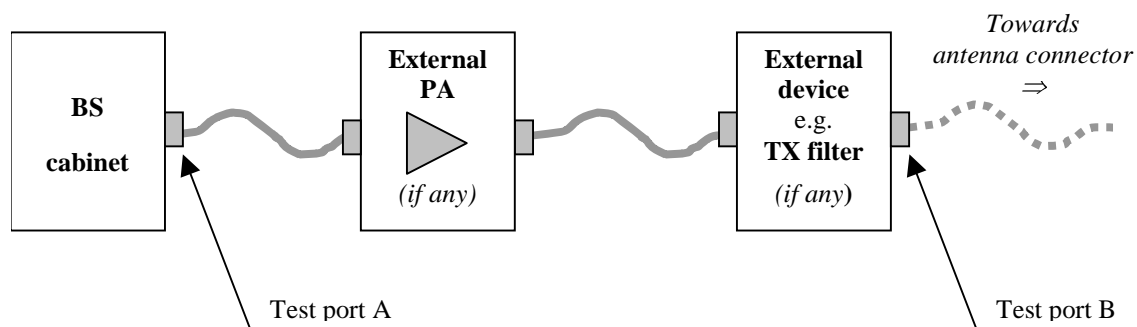


Figure 6.1-1: Transmitter test ports

Values for  $F_{\text{offset, RAT}}$  to meet transmitter requirements are specific for each RAT in each Band Category as specified in subclause 4.5.1 for Band Category 1, subclause 4.5.2 for Band Category 2 and subclause 4.5.3 for Band Category 3.

### 6.2 Base station output power

Output power of the base station is the mean power delivered to a load with resistance equal to the nominal load impedance of the transmitter.

The configured carrier power is the target maximum power for a specific carrier for the operating mode set in the BS within the limits given by the manufacturer's declaration.

The maximum total output power,  $P_{\text{max}}$ , of the base station is the mean power level measured at the antenna connector during the transmitter ON period in a specified reference condition.

The maximum RAT output power,  $P_{\max, \text{RAT}}$ , of the base station is the mean power level measured at the antenna connector during the transmitter ON period for a specific RAT in a specified reference condition.

The maximum carrier output power,  $P_{\max, c}$  of the base station is the mean power level measured at the antenna connector during the transmitter ON period for a specific carrier in a specified reference condition.

### 6.2.1 Minimum requirement

In normal conditions, the maximum carrier output power shall remain within +2 dB and -2 dB of the configured carrier power declared by the manufacturer.

In extreme conditions, maximum carrier output power shall remain within +2.5 dB and -2.5 dB of the configured carrier power declared by the manufacturer.

The definition of the output power parameters declared by the manufacturer can be found in TS 37.141 [10].

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.

### 6.2.2 Additional requirement (regional)

For Band 34 operation in Japan, the rated E-UTRA output power declared by the manufacturer shall be less than or equal to the values specified in Table 6.2.2-1.

**Table 6.2.2-1: Regional requirements for Band 34 for rated output power declared by the manufacturer.**

| Channel bandwidth<br>$BW_{\text{Channel}}$ [MHz] | 1.4 | 3   | 5  | 10 | 15 | 20  |
|--|-----|-----|----|----|----|-----|
| Maximum output power<br>[W]                      | N/A | N/A | 20 | 40 | 60 | N/A |

### 6.2.3 E-UTRA minimum requirement for DL RS power

For E-UTRA, the minimum requirement for DL RS power is specified in TS 36.104 [4], subclause 6.5.4.

### 6.2.4 UTRA FDD minimum requirement for primary CPICH power

For UTRA FDD, the minimum requirements for primary CPICH power is specified in TS 25.104 [2], subclause 6.4.4,

### 6.2.5 UTRA TDD minimum requirement for primary CCPCH power

For UTRA TDD, the minimum requirements for Primary CCPCH power and Differential accuracy of primary CCPCH power specified in TS 25.105 [3], subclause 6.4.5 and 6.4.6 respectively.

## 6.3 Output power dynamics

Output power dynamics is defined by the BS transmitter's ability to operate at varying output power levels.

### 6.3.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for output power dynamics is specified in TS 36.104 [4], subclause 6.3.

### 6.3.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for output power dynamics is specified in TS 25.104 [2], subclause 6.4.

### 6.3.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for output power dynamics is specified in TS 25.105 [3], subclause 6.4.

### 6.3.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirement for output power dynamics is specified in TS 45.005[5], subclause 4.1.2-c. The minimum requirement for output level dynamic operation is specified in TS 45.005[5], subclause 4.5.1.

## 6.4 Transmit ON/OFF power

The requirements in subclause 6.4 are only applied for BC3 BS.

### 6.4.1 Transmitter OFF power

Transmitter OFF power is defined as the mean power measured over 70  $\mu$ s filtered with a square filter of bandwidth equal to the RF bandwidth of the BS centred on the central frequency of the RF bandwidth during the transmitter OFF period.

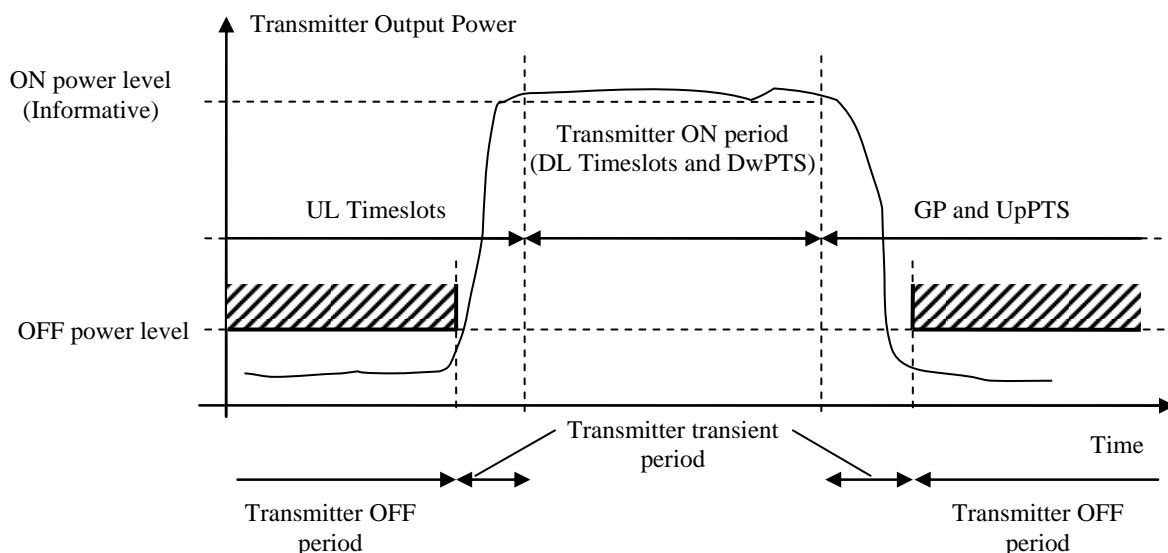
For BS supporting contiguous CA, the transmitter OFF power is defined as the mean power measured over 70  $\mu$ s filtered with a square filter of bandwidth equal to the Aggregated Channel Bandwidth  $BW_{\text{Channel\_CA}}$  centred on  $(F_{\text{edge\_high}}+F_{\text{edge\_low}})/2$  during the transmitter OFF period.

#### 6.4.1.1 Minimum Requirement

The transmitter OFF power spectral density shall be less than -85 dBm/MHz.

### 6.4.2 Transmitter transient period

The transmitter transient period is the time period during which the transmitter is changing from the OFF period to the ON period or vice versa. The transmitter transient period is illustrated in Figure 6.4.2-1.



**Figure 6.4.2-1: Illustration of the relations of transmitter ON period, transmitter OFF period and transmitter transient period.**

#### 6.4.2.1 Minimum requirements

The transmitter transient period shall be shorter than the values listed in Table 6.4.2.1-1.

**Table 6.4.2.1-1: Minimum requirements for the transmitter transient period**

| Transition | Transient period length [ $\mu$ s] |
|------------|------------------------------------|
| OFF to ON  | 6.25                               |
| ON to OFF  | 17                                 |

## 6.5 Transmitted signal quality

### 6.5.1 Modulation quality

Modulation quality is defined by the difference between the measured carrier signal and a reference signal. Modulation quality can e.g. be expressed as Error Vector Magnitude (EVM), Peak Code domain Error (PCDE) or Relative Code domain Error (RCDE).

#### 6.5.1.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for modulation quality, EVM, is specified in TS 36.104 [4], subclause 6.5.2.

#### 6.5.1.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirements for modulation quality, EVM, PCDE and RCDE, are specified in TS 25.104 [2], subclause 6.8.2, 6.8.3 and 6.8.5 respectively. The UTRA transmit pulse shape filter is defined in subclause 6.8.1.

#### 6.5.1.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirements for modulation quality, EVM, PCDE and RCDE, are specified in TS 25.105 [3], subclause 6.8.2, 6.8.3 and 6.8.4 respectively.

#### 6.5.1.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirements for modulation accuracy are specified in TS 45.005, subclause 4.6 .

### 6.5.2 Frequency error

Frequency error is a measure of the difference between the actual BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

#### 6.5.2.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for frequency error is specified in TS 36.104 [4], subclause 6.5.1.

#### 6.5.2.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for frequency error is specified in TS 25.104 [2], subclause 6.3.1.

#### 6.5.2.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for frequency error is specified in TS 25.105 [3], subclause 6.3.1.

#### 6.5.2.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirement for frequency error is specified in TS 45.005 [5], subclause 4.4 .



### 6.5.3 Time alignment between transmitter branches

In Tx Diversity, spatial multiplexing and MIMO, signals are transmitted from two or more antennas. These signals shall be aligned. The time alignment error for transmission is specified as the delay between the signals from two antennas at the antenna ports.

For dual cell transmissions (DC-HSDPA and DB-DC-HSDPA) in UTRA FDD, the time alignment error is defined as the delay between the signals from the two cells at the antenna ports.

This requirement is only applicable for Node B supporting TX diversity, spatial multiplexing, MIMO, DC-HSDPA or DB-DC-HSDPA and their combinations.

#### 6.5.3.1 E-UTRA minimum Requirement

For E-UTRA, the minimum requirement for time alignment is specified in TS 36.104 [4], subclause 6.5.3.

#### 6.5.3.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for time alignment is specified in TS 25.104 [2], subclause 6.8.4.

#### 6.5.3.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for time alignment is specified in TS 25.105 [3], subclause 6.8.5.

## 6.6 Unwanted emissions

Unwanted emissions consist of out-of-band emissions and spurious emissions [6]. Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The out-of-band emissions requirement for the BS transmitter is specified in terms of an Operating band unwanted emissions requirement that defines limits for emissions in the downlink operating band plus the frequency ranges 10 MHz above and 10 MHz below the band. Emissions outside of this frequency range are limited by a spurious emissions requirement.

There is in addition a requirement for occupied bandwidth and an ACLR requirement applicable for some RATs.

### 6.6.1 Transmitter spurious emissions

The transmitter spurious emission limits apply from 9 kHz to 12.75 GHz, excluding the frequency range from 10 MHz below the lowest frequency of the downlink operating band up to 10 MHz above the highest frequency of the downlink operating band. Exceptions are the requirement in Table 6.6.1.3.1-2 that apply also closer than 10 MHz from the downlink operating band. For some operating bands the upper frequency limit is higher than 12.75 GHz.

The requirements shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification. Unless otherwise stated, all requirements are measured as mean power (RMS).

### 6.6.1.1 Mandatory Requirements

The requirements of either subclause 6.6.1.1.1 (Category A limits) or subclause 6.6.1.1.2 (Category B limits) shall apply. In addition for a BS operating in Band Category 2, the requirements of 6.6.1.1.3 shall apply in case of Category B limits when GSM/EDGE is configured.

#### 6.6.1.1.1 Minimum requirement (Category A)

The power of any spurious emission shall not exceed the limits in Table 6.6.1.1.1-1

**Table 6.6.1.1.1-1: BS Spurious emission limits, Category A**

| Frequency range  | Maximum level | Measurement Bandwidth | Note           |
|--|---------------|-----------------------|----------------|
| 9kHz - 150kHz  | -13 dBm       | 1 kHz                 | Note 1         |
| 150kHz - 30MHz   |               | 10 kHz                | Note 1         |
| 30MHz - 1GHz   |               | 100 kHz               | Note 1         |
| 1GHz - 12.75 GHz   |               | 1 MHz                 | Note 2         |
| 12.75 GHz – 19 GHz   |               | 1 MHz                 | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [2] , s4.1  |               |                       |                |
| NOTE 2: Bandwidth as in ITU-R SM.329 [2] , s4.1. Upper frequency as in ITU-R SM.329 [2] , s2.5 table 1 |               |                       |                |
| NOTE 3: Applies only for Bands 42 and 43.  |               |                       |                |

#### 6.6.1.1.2 Minimum requirement (Category B)

The power of any spurious emission shall not exceed the limits in Table 6.6.1.1.2-1

**Table 6.6.1.1.2-1: BS Spurious emissions limits, Category B**

| Frequency range  | Maximum Level | Measurement Bandwidth | Note           |
|--|---------------|-----------------------|----------------|
| 9 kHz ↔ 150 kHz  | -36 dBm       | 1 kHz                 | Note 1         |
| 150 kHz ↔ 30 MHz   | -36 dBm       | 10 kHz                | Note 1         |
| 30 MHz ↔ 1 GHz   | -36 dBm       | 100 kHz               | Note 1         |
| 1 GHz ↔ 12.75 GHz  | -30 dBm       | 1 MHz                 | Note 2         |
| 12.75 GHz ↔ 19 GHz   | -30 dBm       | 1 MHz                 | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [2] , s4.1  |               |                       |                |
| NOTE 2: Bandwidth as in ITU-R SM.329 [2] , s4.1. Upper frequency as in ITU-R SM.329 [2] , s2.5 table 1 |               |                       |                |
| NOTE 3: Applies only for Bands 42 and 43.  |               |                       |                |

#### 6.6.1.1.3 Additional minimum requirement for BC2 (Category B)

For a BS operating in Band Category 2 when GSM/EDGE is configured, the power of any spurious emission shall not exceed the limits in Table 6.6.1.1.3-1.

**Table 6.6.1.1.3-1: Additional BS Spurious emissions limits for BC2, Category B**

| Frequency range   | Frequency offset from downlink operating band edge | Maximum Level | Measurement Bandwidth |
|-------------------|--|---------------|-----------------------|
| 30 MHz ↔ 1 GHz    | 10 – 20 MHz  | -36 dBm       | 300 kHz               |
|                   | 20 – 30 MHz  | -36 dBm       | 1 MHz                 |
|                   | ≥ 30 MHz   | -36 dBm       | 3 MHz                 |
| 1 GHz ↔ 12.75 GHz | ≥ 30 MHz   | -30 dBm       | 3 MHz                 |

### 6.6.1.2 Protection of the BS receiver of own or different BS

This requirement shall be applied for FDD operation in order to prevent the receivers of Base Stations being desensitised by emissions from the BS transmitter. It is measured at the transmit antenna port for any type of BS which has common or separate Tx/Rx antenna ports.

#### 6.6.1.2.1 Minimum Requirement

The power of any spurious emission shall not exceed the limits in Table 6.6.1.2.1-1.

**Table 6.6.1.2.1-1: BS Spurious emissions limits for protection of the BS receiver**

| Band category | Frequency range              | Maximum Level | Measurement Bandwidth | Note |
|---------------|------------------------------|---------------|-----------------------|------|
| BC1           | $F_{UL\_low} - F_{UL\_high}$ | -96 dBm       | 100 kHz               |      |
| BC2           | $F_{UL\_low} - F_{UL\_high}$ | -98 dBm       | 100 kHz               |      |

### 6.6.1.3 Additional spurious emissions requirements

These requirements may be applied for the protection of system operating in frequency ranges other than the BS downlink operating band. The limits may apply as an optional protection of such systems that are deployed in the same geographical area as the BS, or they may be set by local or regional regulation as a mandatory requirement for an operating band. It is in some cases not stated in the present document whether a requirement is mandatory or under what exact circumstances that a limit applies, since this is set by local or regional regulation. An overview of regional requirements in the present document is given in subclause 4.4.

Some requirements may apply for the protection of specific equipment (UE, MS and/or BS) or equipment operating in specific systems (GSM/EDGE, CDMA, UTRA, E-UTRA, etc.) as listed below.

#### 6.6.1.3.1 Minimum Requirement

The power of any spurious emission shall not exceed the limits of Table 6.6.1.3.1-1 for a BS where requirements for co-existence with the system listed in the first column apply.

**Table 6.6.1.3.1-1: BS Spurious emissions limits for co-existence with systems operating in other frequency bands**

| System type to co-exist with                   | Frequency range for co-existence requirement | Maximum Level | Measurement Bandwidth | Note   |
|--|--|---------------|-----------------------|--|
| GSM900   | 921 - 960 MHz                                | -57 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 8  |
|  | 876 - 915 MHz                                | -61 dBm       | 100 kHz               | For the frequency range 880-915 MHz, this requirement does not apply to BS operating in band 8, since it is already covered by the requirement in sub-clause 6.6.1.2.                        |
| DCS1800 (Note 3)                               | 1805 - 1880 MHz                              | -47 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 3.   |
|  | 1710 - 1785 MHz                              | -61 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 3, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| PCS1900  | 1930 - 1990 MHz                              | -47 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 2 or band 36.  |
|  | 1850 - 1910 MHz                              | -61 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 2, since it is already covered by the requirement in sub-clause 6.6.1.2. This requirement does not apply to BS operating in band 35. |
| GSM850 or CDMA850                              | 869 - 894 MHz                                | -57 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 5  |
|  | 824 - 849 MHz                                | -61 dBm       | 100 kHz               | This requirement does not apply to BS operating in band 5, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band I or E-UTRA Band 1               | 2110 - 2170 MHz                              | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 1,   |
|  | 1920 - 1980 MHz                              | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 1, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band II or E-UTRA Band 2              | 1930 - 1990 MHz                              | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 2.   |
|  | 1850 - 1910 MHz                              | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 2, since it is already covered by the requirement in sub-clause 6.6.1.2  |
| UTRA FDD Band III or E-UTRA Band 3 (Note 3)    | 1805 - 1880 MHz                              | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 3.   |
|  | 1710 - 1785 MHz                              | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 3, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band IV or E-UTRA Band 4              | 2110 - 2155 MHz                              | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 4 or 10  |
|  | 1710 - 1755 MHz                              | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 4 or 10, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band V or E-UTRA Band 5               | 869 - 894 MHz                                | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 5  |
|  | 824 - 849 MHz                                | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 5, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band VI, XIX or E-UTRA Band 6, 18, 19 | 860 - 895 MHz                                | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 6, 18, 19  |
|  | 815 - 830 MHz                                | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 18 since it is already covered by the requirement in sub-clause 6.6.1.2.   |
|  | 830 - 850 MHz                                | -49 dBm       | 1 MHz                 | This requirement does not apply to E-UTRA BS operating in band 6, 19, since it is already covered by the requirement in sub-clause 6.6.1.2.  |
| UTRA FDD Band VII or E-UTRA Band 7             | 2620 - 2690 MHz                              | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 7.   |
|  | 2500 - 2570 MHz                              | -49 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 7, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band VIII or                          | 925 - 960 MHz                                | -52 dBm       | 1 MHz                 | This requirement does not apply to BS operating in band 8.   |

|   |                     |         |       |   |
|---|---------------------|---------|-------|---|
| E-UTRA Band 8                                   | 880 - 915 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 8, since it is already covered by the requirement in sub-clause 6.6.1.2.  |
| UTRA FDD Band IX or E-UTRA Band 9               | 1844.9 - 1879.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 9.  |
|   | 1749.9 - 1784.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 9, since it is already covered by the requirement in sub-clause 6.6.1.2.  |
| UTRA FDD Band X or E-UTRA Band 10               | 2110 - 2170 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 4 or 10   |
|   | 1710 - 1770 MHz     | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 10, since it is already covered by the requirement in sub-clause 6.6.1.2. For BS operating in Band 4, it applies for 1755 MHz to 1770 MHz, while the rest is covered in sub-clause 6.6.1.2. |
| UTRA FDD Band XI or XXI or E-UTRA Band 11 or 21 | 1475.9 - 1510.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 11 or 21  |
|   | 1427.9 - 1447.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 11, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
|   | 1447.9 - 1462.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to E-UTRA BS operating in band 21, since it is already covered by the requirement in sub-clause 6.6.1.2.  |
| UTRA FDD Band XII or E-UTRA Band 12             | 729 - 746 MHz       | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 12.   |
|   | 699 - 716 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 12, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band XIII or E-UTRA Band 13            | 746 - 756 MHz       | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 13.   |
|   | 777 - 787 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 13, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| UTRA FDD Band XIV or E-UTRA Band 14             | 758 - 768 MHz       | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 14.   |
|   | 788 - 798 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 14, since it is already covered by the requirement in sub-clause 6.6.1.2.   |
| E-UTRA Band 17                                  | 734 - 746 MHz       | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 17.   |
|   | 704 - 716 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 17, since it is already covered by the requirement in subclause 6.6.1.2.  |
| UTRA FDD Band XX or E-UTRA Band 20              | 791 - 821 MHz       | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 20.   |
|   | 832 - 862 MHz       | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 20, since it is already covered by the requirement in subclause 6.6.1.2.  |
| E-UTRA Band 24                                  | 1525 - 1559 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 24.   |
|   | 1626.5 - 1660.5 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 24, since it is already covered by the requirement in subclause 6.6.1.2.  |
| UTRA TDD in Band a) or E-UTRA Band 33           | 1900 - 1920 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 33  |
| UTRA TDD in Band a) or E-UTRA Band 34           | 2010 - 2025 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 34  |
| UTRA TDD in Band b) or E-UTRA Band 35           | 1850 - 1910 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 35  |
| UTRA TDD in Band b) or E-UTRA Band 36           | 1930 - 1990 MHz     | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 2 and 36  |

|                                       |                 |           |       |   |
|---------------------------------------|-----------------|-----------|-------|---|
| UTRA TDD in Band c) or E-UTRA Band 37 | 1910 - 1930 MHz | -52 dBm   | 1 MHz | This is not applicable to BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, but is pending any future deployment. |
| UTRA TDD in Band d) or E-UTRA Band 38 | 2570 – 2620 MHz | -52 dBm   | 1 MHz | This requirement does not apply to BS operating in Band 38.   |
| E-UTRA Band 39                        | 1880 – 1920MHz  | -52 dBm   | 1 MHz | This is not applicable to BS operating in Band 39   |
| E-UTRA Band 40                        | 2300 – 2400MHz  | -52 dBm   | 1 MHz | This is not applicable to BS operating in Band 40   |
| E-UTRA Band 41                        | 2496 – 2690MHz  | -52 dBm   | 1 MHz | This is not applicable to BS operating in Band 41   |
| E-UTRA Band 42                        | 3400 – 3600 MHz | [-52 dBm] | 1 MHz | This is not applicable to BS operating in Band 42   |
| E-UTRA Band 43                        | 3600 – 3800 MHz | [-52 dBm] | 1 MHz | This is not applicable to BS operating in Band 43   |

NOTE 1: As defined in the scope for spurious emissions in this subclause, the co-existence requirements in Table 6.6.1.3.1-1 do not apply for the 10 MHz frequency range immediately outside the downlink operating band (see Tables 4.5-1 and 4.5-2). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2: The table above assumes that two operating bands, where the frequency ranges in Table 4.5-1 or Table 4.5-2 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.

NOTE 3: For the protection of DCS1800, UTRA Band III or E-UTRA Band 3 in China, the frequency ranges of the downlink and uplink protection requirements are 1805 – 1850 MHz and 1710 – 1755 MHz respectively.

The following requirement may be applied for the protection of PHS. This requirement is also applicable at specified frequencies falling between 10 MHz below the lowest BS transmitter frequency of the downlink operating band and 10 MHz above the highest BS transmitter frequency of the downlink operating band.

The power of any spurious emission shall not exceed:

**Table 6.6.1.3.1-2: BS Spurious emissions limits for BS for co-existence with PHS**

| Frequency range                                   | Maximum Level | Measurement Bandwidth | Note  |
|---|---------------|-----------------------|---|
| 1884.5 - 1919.6 MHz                               | -41 dBm       | 300 kHz               | Applicable for co-existence with PHS system operating in. 1884.5-1919.6MHz. |
| 1884.5 - 1915.7 MHz                               | -41 dBm       | 300 kHz               | Applicable for co-existence with PHS system operating in 1884.5-1915.7MHz   |
| NOTE: The requirement is not applicable in China. |               |                       |   |

In addition to the requirements in subclauses 6.6.1.1, 6.6.1.2 and above in the present subclause, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

#### 6.6.1.4 Co-location with other base stations

These requirements may be applied for the protection of other BS receivers when GSM900, DCS1800, PCS1900, GSM850, CDMA850, UTRA FDD, UTRA TDD and/or E-UTRA BS are co-located with a BS.

The requirements assume a 30 dB coupling loss between transmitter and receiver.

NOTE: For co-location with UTRA, the requirements are based on co-location with Wide Area UTRA FDD or TDD base stations.

#### 6.6.1.4.1 Minimum Requirement

The power of any spurious emission shall not exceed the limits of Table 6.6.1.4.1-1 for a BS where requirements for co-location with a BS type listed in the first column apply.

Table 6.6.1.4.1-1: BS Spurious emissions limits for BS co-located with another BS

| Type of co-located BS                      | Frequency range for co-location requirement | Maximum Level | Measurement Bandwidth | Note  |
|--|---|---------------|-----------------------|---|
| Macro GSM900                               | 876-915 MHz                                 | -98 dBm       | 100 kHz               |   |
| Macro DCS1800                              | 1710 - 1785 MHz                             | -98 dBm       | 100 kHz               |   |
| Macro PCS1900                              | 1850 - 1910 MHz                             | -98 dBm       | 100 kHz               |   |
| Macro GSM850 or CDMA850                    | 824 - 849 MHz                               | -98 dBm       | 100 kHz               |   |
| UTRA FDD Band I or E-UTRA Band 1           | 1920 - 1980 MHz                             | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band II or E-UTRA Band 2          | 1850 - 1910 MHz                             | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band III or E-UTRA Band 3         | 1710 - 1785 MHz                             | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band IV or E-UTRA Band 4          | 1710 - 1755 MHz                             | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band V or E-UTRA Band 5           | 824 - 849 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band VI, XIX or E-UTRA Band 6, 19 | 830 - 850 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band VII or E-UTRA Band 7         | 2500 - 2570 MHz                             | -96 dBm       | 100 KHz               |   |
| UTRA FDD Band VIII or E-UTRA Band 8        | 880 - 915 MHz                               | -96 dBm       | 100 KHz               |   |
| UTRA FDD Band IX or E-UTRA Band 9          | 1749.9 - 1784.9 MHz                         | -96 dBm       | 100 KHz               |   |
| UTRA FDD Band X or E-UTRA Band 10          | 1710 - 1770 MHz                             | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XI or E-UTRA Band 11         | 1427.9 - 1447.9 MHz                         | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XII or E-UTRA Band 12        | 699 - 716 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XIII or E-UTRA Band 13       | 777 - 787 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XIV or E-UTRA Band 14        | 788 - 798 MHz                               | -96 dBm       | 100 kHz               |   |
| E-UTRA Band 17                             | 704 - 716 MHz                               | -96 dBm       | 100 kHz               |   |
| E-UTRA Band 18                             | 815 - 830 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XX or E-UTRA Band 20         | 832 - 862 MHz                               | -96 dBm       | 100 kHz               |   |
| UTRA FDD Band XXI or E-UTRA Band 21        | 1447.9 – 1462.9 MHz                         | -96 dBm       | 100 kHz               |   |
| E-UTRA Band 24                             | 1626.5 – 1660.5 MHz                         | -96 dBm       | 100 kHz               |   |
| UTRA TDD in Band a) or E-UTRA Band 33      | 1900 - 1920 MHz                             | -96 dBm       | 100 kHz               | This is not applicable to BS operating in Band 33       |
| UTRA TDD in Band a) or E-UTRA Band 34      | 2010 - 2025 MHz                             | -96 dBm       | 100 kHz               | This is not applicable to BS operating in Band 34       |
| UTRA TDD in Band b) or E-UTRA Band 35      | 1850 – 1910 MHz                             | -96 dBm       | 100 kHz               | This is not applicable to BS operating in Band 35       |
| UTRA TDD in Band b) or E-UTRA Band 36      | 1930 - 1990 MHz                             | -96 dBm       | 100 kHz               | This is not applicable to BS operating in Band 2 and 36 |



|                                       |                 |         |         |   |
|---------------------------------------|-----------------|---------|---------|---|
| UTRA TDD in Band c) or E-UTRA Band 37 | 1910 - 1930 MHz | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, but is pending any future deployment. |
| UTRA TDD in Band d) or E-UTRA Band 38 | 2570 – 2620 MHz | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 38.  |
| E-UTRA Band 39                        | 1880 – 1920MHz  | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 33 and 39  |
| E-UTRA Band 40                        | 2300 – 2400MHz  | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 40   |
| E-UTRA Band 41                        | 2496 – 2690MHz  | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 41   |
| E-UTRA Band 42                        | 3400 – 3600 MHz | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 42   |
| E-UTRA Band 43                        | 3600 – 3800 MHz | -96 dBm | 100 kHz | This is not applicable to BS operating in Band 43   |

NOTE 1: As defined in the scope for spurious emissions in this subclause, the co-location requirements in Table 6.6.1.4.1-1 do not apply for the 10 MHz frequency range immediately outside the BS transmit frequency range of a downlink operating band (see Tables 4.5-1 and 4.5-2). The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30 dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [7].

NOTE 2: The table above assumes that two operating bands, where the corresponding BS transmit and receive frequency ranges in Table 4.5-1 or Table 4.5-2 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-location requirements may apply that are not covered by the 3GPP specifications.

NOTE 3: Co-located TDD base stations that are synchronized and using the same or adjacent operating band can transmit without special co-locations requirements. For unsynchronized base stations, special co-location requirements may apply that are not covered by the 3GPP specifications.

## 6.6.2 Operating band unwanted emissions

Unless otherwise stated, the Operating band unwanted emission limits are defined from 10 MHz below the lowest frequency of the downlink operating band to the lower RF bandwidth edge located at  $F_{BW\text{ RF,low}}$  and from the upper RF bandwidth edge located at  $F_{BW\text{ RF,high}}$  up to 10 MHz above the highest frequency of the downlink operating band.

The requirements shall apply whatever the type of transmitter considered (single RAT or multi-RAT, single carrier or multi-carrier) and for all transmission modes foreseen by the manufacturer's specification, except for GSM/EDGE single RAT operation. The requirements in TS 45.005 [5] as defined in subclause 6.6.2.3 apply to an MSR Base Station for GSM/EDGE single RAT operation in Band Category 2.

### 6.6.2.1 General minimum requirement for Band Categories 1 and 3

For a BS operating in Band Category 1 or Band Category 3, emissions shall not exceed the maximum levels specified in Table 6.6.2.1-1 below, where:

- $\Delta f$  is the separation between the RF bandwidth edge frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency.
- $f_{\text{offset}}$  is the separation between the RF bandwidth edge frequency and the centre of the measuring filter.
- $f_{\text{offset}_{\text{max}}}$  is the offset to the frequency 10 MHz outside the downlink operating band.
- $\Delta f_{\text{max}}$  is equal to  $f_{\text{offset}_{\text{max}}}$  minus half of the bandwidth of the measuring filter.

**Table 6.6.2.1-1: Operating band unwanted emission mask (UEM) for BC1 and BC3**

| Frequency offset of measurement filter -3dB point, $\Delta f$                  | Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$                      | Minimum requirement   | Measurement bandwidth (Note 2) |
|--|---|---|--------------------------------|
| $0 \text{ MHz} \leq \Delta f < 0.2 \text{ MHz}$                                | $0.015 \text{ MHz} \leq f_{\text{offset}} < 0.215 \text{ MHz}$                                    | -14 dBm   | 30 kHz                         |
| $0.2 \text{ MHz} \leq \Delta f < 1 \text{ MHz}$                                | $0.215 \text{ MHz} \leq f_{\text{offset}} < 1.015 \text{ MHz}$                                    | $-14 \text{ dBm} - 15 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 0.215 \right) \text{ dB}$ | 30 kHz                         |
| (Note 1)   | $1.015 \text{ MHz} \leq f_{\text{offset}} < 1.5 \text{ MHz}$                                      | -26 dBm   | 30 kHz                         |
| $1 \text{ MHz} \leq \Delta f \leq \min(\Delta f_{\text{max}}, 10 \text{ MHz})$ | $1.5 \text{ MHz} \leq f_{\text{offset}} < \min(f_{\text{offset}_{\text{max}}}, 10.5 \text{ MHz})$ | -13 dBm   | 1 MHz                          |
| $10 \text{ MHz} \leq \Delta f \leq \Delta f_{\text{max}}$                      | $10.5 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$                        | -15 dBm (Note 3)  | 1 MHz                          |

NOTE 1: This frequency range ensures that the range of values of  $f_{\text{offset}}$  is continuous.

NOTE 2: As a general rule for the requirements in the present subclause, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3: The requirement is not applicable when  $\Delta f_{\text{max}} < 10 \text{ MHz}$ .

### 6.6.2.2 General minimum requirement for Band Category 2

For a BS operating in Band Category 2, emissions shall not exceed the maximum levels specified in Table 6.6.2.2-1 and 6.6.2.2-2 below, where:

- $\Delta f$  is the separation between the RF bandwidth edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency.
- $f_{\text{offset}}$  is the separation between the RF bandwidth edge frequency and the centre of the measuring filter.
- $f_{\text{offset}_{\text{max}}}$  is the offset to the frequency 10 MHz outside the downlink operating band.
- $\Delta f_{\text{max}}$  is equal to  $f_{\text{offset}_{\text{max}}}$  minus half of the bandwidth of the measuring filter.

Table 6.6.2.2-1: Operating band unwanted emission mask (UEM) for BC2

| Frequency offset of measurement filter -3dB point, $\Delta f$   | Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$                      | Minimum requirement   | Measurement bandwidth (Note 5) |
|---|---|---|--------------------------------|
| $0 \text{ MHz} \leq \Delta f < 0.2 \text{ MHz}$<br>(Note 1)   | $0.015 \text{ MHz} \leq f_{\text{offset}} < 0.215 \text{ MHz}$                                    | -14 dBm   | 30 kHz                         |
| $0.2 \text{ MHz} \leq \Delta f < 1 \text{ MHz}$   | $0.215 \text{ MHz} \leq f_{\text{offset}} < 1.015 \text{ MHz}$                                    | $-14 \text{ dBm} - 15 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 0.215 \right) \text{ dB}$ | 30 kHz                         |
| (Note 4)  | $1.015 \text{ MHz} \leq f_{\text{offset}} < 1.5 \text{ MHz}$                                      | -26 dBm   | 30 kHz                         |
| $1 \text{ MHz} \leq \Delta f \leq \min(\Delta f_{\text{max}}, 10 \text{ MHz})$  | $1.5 \text{ MHz} \leq f_{\text{offset}} < \min(f_{\text{offset}_{\text{max}}}, 10.5 \text{ MHz})$ | -13 dBm   | 1 MHz                          |
| $10 \text{ MHz} \leq \Delta f \leq \Delta f_{\text{max}}$   | $10.5 \text{ MHz} \leq f_{\text{offset}} < f_{\text{offset}_{\text{max}}}$                        | -15 dBm (Note 6)  | 1 MHz                          |
| NOTE 1: For operation with a GSM/EDGE or an E-UTRA 1.4 or 3 MHz carrier adjacent to the RF bandwidth edge, the limits in Table 6.6.2.2-2 apply for $0 \text{ MHz} \leq \Delta f < 0.15 \text{ MHz}$ . |   |   |                                |

Table 6.6.2.2-2: Operating band unwanted emission limits for operation in BC2 with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers adjacent to the RF bandwidth edge

| Frequency offset of measurement filter -3dB point, $\Delta f$  | Frequency offset of measurement filter centre frequency, $f_{\text{offset}}$ | Minimum requirement  | Measurement bandwidth (Note 5) |
|--|--|--|--------------------------------|
| $0 \text{ MHz} \leq \Delta f < 0.05 \text{ MHz}$   | $0.015 \text{ MHz} \leq f_{\text{offset}} < 0.065 \text{ MHz}$               | $5 \text{ dBm} - 60 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 0.015 \right) \text{ dB}$  | 30 kHz                         |
| $0.05 \text{ MHz} \leq \Delta f < 0.15 \text{ MHz}$  | $0.065 \text{ MHz} \leq f_{\text{offset}} < 0.165 \text{ MHz}$               | $2 \text{ dBm} - 160 \cdot \left( \frac{f_{\text{offset}}}{\text{MHz}} - 0.065 \right) \text{ dB}$ | 30 kHz                         |
| NOTE 2: The limits in this table only apply for operation with a GSM/EDGE or an E-UTRA 1.4 or 3 MHz carrier adjacent to the RF bandwidth edge. |  |  |                                |

NOTE 3: All limits in Table 6.6.2.2-1 are identical to the corresponding limits for Band Category 1 and 3.

NOTE 4: This frequency range ensures that the range of values of  $f_{\text{offset}}$  is continuous.

NOTE 5: As a general rule for the requirements in the present subclause, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 6: The requirement is not applicable when  $\Delta f_{\text{max}} < 10 \text{ MHz}$ .

### 6.6.2.3 GSM/EDGE single-RAT requirements

The following requirements in TS 45.005 [5] shall apply to an MSR Base Station for GSM/EDGE single RAT operation in Band Category 2:

- Spectrum due to the modulation and wide band noise, applicable parts of subclause 4.2.1.1, 4.2.1.2, 4.2.1.3-a2, 4.2.1.3-b2, 4.2.1.3-c2 and 4.2.1.4.2.
- Spectrum due to switching transients, applicable parts of subclause 4.2.2.1-b.
- Emission requirement for frequency offsets of between 2 and 10 MHz outside relevant transmit band, applicable parts of subclause 4.3.1 and 4.3.2.1.
- Intra BTS Intermodulation, applicable parts of subclause 4.7.2, 4.7.2.1-b, 4.7.2.3-b and 4.7.2.3-c.

## 6.6.2.4 Additional requirements

### 6.6.2.4.1 Limits in FCC Title 47

In addition to the requirements in subclauses 6.6.2.1 and 6.6.2.2, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

### 6.6.2.4.2 Unsynchronized operation for BC3

In certain regions, the following requirements may apply to a TDD BS operating in BC3 in the same geographic area and in the same operating band as another TDD system without synchronisation. For this case the emissions shall not exceed -52 dBm/MHz in the downlink operating band except in:

- The frequency range from 10 MHz below the lower RF bandwidth edge to the frequency 10 MHz above the upper RF bandwidth edge.

NOTE 1: Local or regional regulations may specify another excluded frequency range, which may include frequencies where synchronised TDD systems operate.

NOTE 2: TDD base stations that are synchronized and operating in BC3 can transmit without these additional co-existence requirements.

### 6.6.2.4.3 Protection of DTT

In certain regions the following requirement may apply for protection of DTT. For a BS operating in Band 20, the level of emissions in the band 470-790 MHz, measured in an 8 MHz filter bandwidth on centre frequencies  $F_{\text{filter}}$  according to Table 6.6.2.4.3-1, shall not exceed the maximum emission level  $P_{\text{EM,N}}$  declared by the manufacturer. This requirement applies in the frequency range 470-790 MHz even though part of the range falls in the spurious domain.

**Table 6.6.2.4.3-1: Declared emissions levels for protection of DTT**

| Filter centre frequency,<br>$F_{\text{filter}}$                     | Measurement<br>bandwidth | Declared emission level<br>[dBm] |
|---|--------------------------|----------------------------------|
| $F_{\text{filter}} = 8 \cdot N + 306$ (MHz);<br>$21 \leq N \leq 60$ | 8 MHz                    | $P_{\text{EM,N}}$                |

Note: The regional requirement is defined in terms of EIRP (effective isotropic radiated power), which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement. Compliance with the regional requirement can be determined using the method outlined in Annex G of TS 36.104 [4].

### 6.6.2.4.4 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection of systems operating in frequency bands adjacent to Band 1 as defined in clause 4.5, in geographic areas in which both an adjacent band service and UTRA and/or E-UTRA are deployed.

The power of any spurious emission shall not exceed:

**Table 6.6.2.4.4-1: Emissions limits for protection of adjacent band services**

| Operating Band | Frequency range | Maximum Level                                | Measurement Bandwidth |
|----------------|-----------------|--|-----------------------|
| 1              | 2100-2105 MHz   | $-30 + 3.4 \cdot (f - 2100)$ MHz) dBm        | 1 MHz                 |
|                | 2175-2180 MHz   | $-30 + 3.4 \cdot (2180 \text{ MHz} - f)$ dBm | 1 MHz                 |

### 6.6.3 Occupied bandwidth

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage  $\beta/2$  of the total mean transmitted power. See also ITU-R Recommendation SM.328 [11].

The value of  $\beta/2$  shall be taken as 0.5%.

The requirement applies during the transmitter ON period for a single transmitted carrier.

The minimum requirement below may be applied regionally. There may also be regional requirements to declare the occupied bandwidth according to the definition in the present clause.

#### 6.6.3.1 Minimum requirement

The occupied bandwidth shall be less than values listed in Table 6.6.3.1-1.

**Table 6.6.3.1-1: Occupied bandwidth**

| RAT                | Occupied bandwidth limit |
|--------------------|--------------------------|
| E-UTRA             | $BW_{\text{Channel}}$    |
| UTRA FDD           | 5 MHz                    |
| 1.28 Mcps UTRA TDD | 1.6 MHz                  |

### 6.6.4 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The requirement applies to frequency ranges outside the Base Station RF bandwidth.

#### 6.6.4.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for ACLR is specified in TS 36.104 [4], subclause 6.6.2.

#### 6.6.4.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for ACLR is specified in TS 25.104 [2], subclause 6.6.2.2.

#### 6.6.4.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for ACLR is specified in TS 25.105 [3], subclause 6.6.2.2.1.2.

## 6.7 Transmitter intermodulation

The transmit intermodulation requirement is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the own transmit signal and an interfering signal reaching the transmitter via the antenna. The requirement applies during the transmitter ON period and the transmitter transient period. The transmitter intermodulation level is the power of the intermodulation products when an interfering signal is injected into the antenna connector.

### 6.7.1 General minimum requirement

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclause 6.6 in the presence of a wanted signal and an interfering signal according to Table 6.7.1-1 for BS operation in BC1, BC2 and BC3. The measurement may be limited to frequencies on which third and fifth order intermodulation products appear, considering the width of these products.

**Table 6.7.1-1: Interfering signals for the Transmitter intermodulation requirement**

| Parameter  | Value  |
|--|--|
| Interfering signal type  | E-UTRA signal of channel bandwidth 5 MHz   |
| Interfering signal level   | Mean power level 30 dB below the mean power of the wanted signal   |
| Interfering signal centre frequency offset from edge of the RF bandwidth | 2.5 MHz for modulated interferer<br>7.5 MHz for modulated interferer<br>12.5 MHz for modulated interferer  |
| NOTE:  | Interfering signal positions that are partially or completely outside of the downlink operating band of the base station are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink operating bands in the same geographical area. In case that none of the interfering signal positions fall completely within the frequency range of the downlink operating band, TS 37.141 [10] provides further guidance regarding appropriate test requirements. |
| NOTE2:   | NOTE 1 is not applied in Band 1, 9, 11, 18, 19, 21, 34 in certain regions.   |

## 6.7.2 Additional minimum requirement (BC2)

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclause 6.6 in the presence of a wanted signal and an interfering signal according to Table 6.7.2-1 for BS operation in BC2. The measurement may be limited to frequencies on which third and fifth order intermodulation products appear, considering the width of these products.

**Table 6.7.2-1: Interfering signal for the Transmitter intermodulation requirement (BC2)**

| Parameter  | Value   |
|--|---|
| Interfering signal type  | CW  |
| Interfering signal level   | Mean power level 30 dB below the mean power of the wanted signal  |
| Interfering signal centre frequency offset from edge of the RF bandwidth | > 800 kHz for CW interferer   |
| NOTE:  | Interfering signal positions that are partially or completely outside of the downlink operating band of the base station are excluded from the requirement. |

## 6.7.3 Additional minimum requirement (BC3)

The transmitter intermodulation level shall not exceed the unwanted emission limits in subclause 6.6 in the presence of a wanted signal and an interfering signal according to Table 6.7.3-1 for BS operation in BC3. The measurement may be limited to frequencies on which third and fifth order intermodulation products appear, considering the width of these products.

**Table 6.7.3-1: Interfering signals for the Transmitter intermodulation requirement (BC3)**

| Parameter  | Value   |
|--|---|
| Interfering signal type  | 1.28Mcps UTRA TDD signal of channel bandwidth 1.6MHz  |
| Interfering signal level   | Mean power level 30 dB below the mean power of the wanted signal  |
| Interfering signal centre frequency offset from edge of the RF bandwidth | 0.8 MHz for modulated 1.28Mcps TDD interferer<br>1.6 MHz for modulated 1.28Mcps TDD interferer<br>2.4 MHz for modulated 1.28Mcps TDD interferer             |
| NOTE:  | Interfering signal positions that are partially or completely outside of the downlink operating band of the base station are excluded from the requirement. |

## 7 Receiver characteristics

### 7.1 General

The requirements in clause 7 are expressed for a single receiver antenna connector. For receivers with antenna diversity or in case of multi-carrier reception with multiple receiver antenna connectors, the requirements apply for each receiver antenna connector.

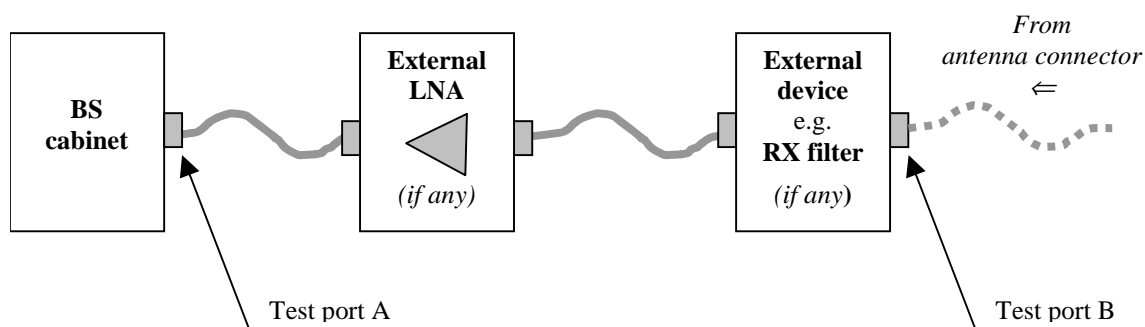
For blocking and intermodulation characteristics, the negative offsets of the interfering signal apply relative to the assigned channel frequency of the lowest carrier frequency received and positive offsets of the interfering signal apply relative to the assigned channel frequency of the highest carrier frequency received .

A BS supporting DC-HSUPA receives two UTRA FDD cells simultaneously on adjacent carrier frequencies.

Unless otherwise stated, the receiver characteristics are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a RX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (test port B).

A BS supporting contiguous CA in a specified band receives multiple component carriers aggregated contiguously.

Unless otherwise stated the requirements in clause 7 apply during the base station receive period.

**Figure 7.1-1: Receiver test ports**

E-UTRA throughput requirements defined for the receiver characteristics in this clause do not assume HARQ retransmissions.

Values for  $F_{\text{offset, RAT}}$  to meet receiver requirements are specific for each RAT in each Band Category as specified in subclause 4.5.1 for Band Category 1, subclause 4.5.2 for Band Category 2 and subclause 4.5.3 for Band Category 3.

## 7.2 Reference sensitivity level

The reference sensitivity power level  $P_{\text{REFSENS}}$  is the minimum mean power received at the antenna connector at which a reference performance requirement shall be met for a specified reference measurement channel.

### 7.2.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for reference sensitivity is specified in TS 36.104 [4], subclause 7.2.

### 7.2.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for reference sensitivity is specified in TS 25.104 [2], subclause 7.2.

### 7.2.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for reference sensitivity is specified in TS 25.105 [3], subclause 7.2.

### 7.2.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirement for reference sensitivity is specified in TS 45.005 [5], applicable parts of subclause 6.2.

The conditions specified in TS 45.005 [5], Annex P.1 apply for GSM/EDGE reference sensitivity.

## 7.3 Dynamic range

The dynamic range is a measure of the capability of the receiver to receive a wanted signal in the presence of an interfering signal inside the received channel bandwidth or the capability of receiving high level of wanted signal.

### 7.3.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for dynamic range is specified in TS 36.104 [4], subclause 7.3.

### 7.3.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirement for dynamic range is specified in TS 25.104 [2], subclause 7.3.

### 7.3.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirement for dynamic range is specified in TS 25.105 [3], subclause 7.3.

### 7.3.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirement for dynamic range is expressed as Nominal Error Rate and is specified in TS 45.005 [5], applicable parts of subclause 6.1.1.1, 6.1.1.3, 6.1.2.2 and 6.1.3.2.

## 7.4 In-band selectivity and blocking

The in-band selectivity and blocking characteristics are measures of the receiver ability to receive a wanted signal at its assigned channel in the presence of an unwanted interferer inside the operating band and are defined by a (wideband) and a narrowband blocking requirement.

### 7.4.1 General blocking minimum requirement

For the general blocking requirement, the interfering signal shall be a UTRA FDD signal as specified in Annex A.



For the wanted and interfering signal coupled to the base station antenna input, using the parameters in Table 7.4.1-1, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.1.

**Table 7.4.1-1: General blocking requirement**

| Operating Band Number  | Centre Frequency of Interfering Signal [MHz]  | Interfering Signal mean power [dBm] | Wanted Signal mean power [dBm] | Interfering signal centre frequency minimum frequency offset from the RF bandwidth edge [MHz] |
|--|---|-------------------------------------|--------------------------------|---|
| 1-7, 9-11, 13, 14, 18, 19, 21, 33-43   | $(F_{UL\_low} - 20)$ to $(F_{UL\_high} + 20)$ | -40                                 | $P_{REFSENS} + X$ dB*          | $\pm 7.5$   |
| 8  | $(F_{UL\_low} - 20)$ to $(F_{UL\_high} + 10)$ |                                     |                                |   |
| 12   | $(F_{UL\_low} - 20)$ to $(F_{UL\_high} + 13)$ |                                     |                                |   |
| 17   | $(F_{UL\_low} - 20)$ to $(F_{UL\_high} + 18)$ |                                     |                                |   |
| 20   | $(F_{UL\_low} - 11)$ to $(F_{UL\_high} + 20)$ |                                     |                                |   |
| NOTE*: $P_{REFSENS}$ depends on the RAT and on the channel bandwidth, see subclause 7.2.                             |   |                                     |                                |   |
| NOTE**: 'X' is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. |   |                                     |                                |   |

## 7.4.2 General narrowband blocking minimum requirement

For the general narrowband blocking requirement, the interfering signal shall be an E-UTRA 1RB signal as specified in Annex A.

For the wanted and interfering signal coupled to the base station antenna input, using the parameters in Table 7.4.2-1, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.1.

Table 7.4.2-1: Narrowband blocking requirement

| RAT of the carrier  | Wanted signal mean power [dBm] | Interfering signal mean power [dBm] | Interfering RB*** centre frequency offset from the RF bandwidth edge [kHz] |
|---|--------------------------------|-------------------------------------|--|
| E-UTRA, UTRA and GSM/EDGE   | PREFSENS + x dB*               | -49                                 | $\pm(240 + m \cdot 180)$ ,<br>m=0, 1, 2, 3, 4, 9, 14, 19, 24               |
| NOTE*: P <sub>PREFSENS</sub> depends on the RAT and on the channel bandwidth, see subclause 7.2.<br>NOTE**: 'x' is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal.<br>NOTE***: Interfering signal (E-UTRA 3MHz) consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the RF bandwidth edge. |                                |                                     |  |

### 7.4.3 Additional Narrowband blocking minimum requirement for GSM/EDGE

The GSM/EDGE in-band blocking requirement as stated in TS 45.005 [5], applicable parts of subclauses 5.1.3 and 5.1.4, shall apply for any GSM/EDGE carrier.

The conditions specified in TS 45.005 [5], Annex P.2.1 apply for GSM/EDGE in-band narrowband blocking.

### 7.4.4 GSM/EDGE requirements for AM suppression

The GSM/EDGE AM suppression requirement as stated in TS 45.005 [5], applicable parts of subclauses 5.2.2, shall apply for any GSM/EDGE carrier.

The conditions specified in TS 45.005 [5], Annex P.2.3 apply for GSM/EDGE AM suppression.

### 7.4.5 Additional BC3 blocking minimum requirement

The interfering signal is a 1.28 Mcps UTRA TDD modulated signal as specified in Annex A.

For the wanted and interfering signal coupled to the base station antenna input, using the parameters in Table 7.4.5-1, the following requirements shall be met:

- For any E-UTRA TDD carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.

Table 7.4.5-1: Additional blocking requirement for Band Category 3

| Operating Band   | Centre Frequency of Interfering Signal [MHz]              | Interfering Signal mean power [dBm] | Wanted Signal mean power [dBm] | Interfering signal centre frequency minimum frequency offset from the RF bandwidth edge [MHz] |
|--|---|-------------------------------------|--------------------------------|---|
| 33 - 43  | (F <sub>UL low</sub> - 20) to (F <sub>UL high</sub> + 20) | -40,                                | P <sub>PREFSENS</sub> + 6 dB*  | $\pm 2.4$   |
| NOTE*: P <sub>PREFSENS</sub> depends on the RAT and on the channel bandwidth, see section 7.2. |   |                                     |                                |   |

## 7.5 Out-of-band blocking

The Out-of-band blocking characteristic is a measure of the receiver ability to receive a wanted signal at its assigned channel in the presence of an unwanted interferer outside the uplink operating band.

## 7.5.1 General minimum requirement

For a wanted and an interfering signal coupled to BS antenna input using the parameters in Table 7.5.1-1, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.1.

**Table 7.5.1-1: Blocking performance requirement**

| Operating Band Number   | Centre Frequency of Interfering Signal [MHz]                | Interfering Signal mean power [dBm] | Wanted Signal mean power [dBm] | Type of Interfering Signal |
|---|---|-------------------------------------|--------------------------------|----------------------------|
| 1-7, 9-11, 13, 14, 18, 19, 21, 33-43  | 1 to $(F_{UL\_low} - 20)$<br>$(F_{UL\_high} + 20)$ to 12750 | -15                                 | $P_{REFSENS} + x \text{ dB}^*$ | CW carrier                 |
| 8   | 1 to $(F_{UL\_low} - 20)$<br>$(F_{UL\_high} + 10)$ to 12750 | -15                                 | $P_{REFSENS} + x \text{ dB}^*$ | CW carrier                 |
| 12  | 1 to $(F_{UL\_low} - 20)$<br>$(F_{UL\_high} + 13)$ to 12750 | -15                                 | $P_{REFSENS} + x \text{ dB}^*$ | CW carrier                 |
| 17  | 1 to $(F_{UL\_low} - 20)$<br>$(F_{UL\_high} + 18)$ to 12750 | -15                                 | $P_{REFSENS} + x \text{ dB}^*$ | CW carrier                 |
| 20  | 1 to $(F_{UL\_low} - 11)$<br>$(F_{UL\_high} + 20)$ to 12750 | -15                                 | $P_{REFSENS} + x \text{ dB}^*$ | CW carrier                 |
| NOTE*: $P_{REFSENS}$ depends on the RAT and the channel bandwidth, see subclause 7.2.<br>'x' is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. |   |                                     |                                |                            |

## 7.5.2 Co-location minimum requirement

This additional blocking requirement may be applied for the protection of BS receivers when E-UTRA BS, UTRA, CDMA or GSM/EDGE operating in a different frequency band are co-located with a BS.

The requirements in this subclause assume a 30 dB coupling loss between the interfering transmitter and the BS receiver.

NOTE: For co-location with UTRA, the requirements are based on co-location with Wide Area UTRA FDD or TDD base stations.

For a wanted and an interfering signal coupled to BS antenna input using the parameters in Table 7.5.2-1, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.1.

Table 7.5.2-1: Blocking requirement for when co-located with BS in other frequency bands.

| Type of co-located BS                        | Centre Frequency of Interfering Signal (MHz) | Interfering Signal mean power (dBm) | Wanted Signal mean power (dBm)        | Type of Interfering Signal |
|--|--|-------------------------------------|---------------------------------------|----------------------------|
| Macro GSM850 or CDMA850                      | 869 – 894                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| Macro GSM900                                 | 921 – 960                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| Macro DCS1800                                | 1805 – 1880<br>(Note 4)                      | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| Macro PCS1900                                | 1930 – 1990                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band I or E-UTRA Band 1             | 2110 – 2170                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band II or E-UTRA Band 2            | 1930 – 1990                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band III or E-UTRA Band 3           | 1805 – 1880<br>(Note 4)                      | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band IV or E-UTRA Band 4            | 2110 – 2155                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band V or E-UTRA Band 5             | 869 – 894                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band VI or E-UTRA Band 6            | 875 – 885                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band VII or E-UTRA Band 7           | 2620 – 2690                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band VIII or E-UTRA Band 8          | 925 – 960                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band IX or E-UTRA Band 9            | 1844.9 – 1879.9                              | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band X or E-UTRA Band 10            | 2110 – 2170                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XI or E-UTRA Band 11           | 1475.9 - 1495.9                              | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XII or E-UTRA Band 12          | 729 - 746                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XIII or E-UTRA Band 13         | 746 - 756                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XIV or E-UTRA Band 14          | 758 - 768                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA Band 17                               | 734 - 746                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA Band 18                               | 860 - 875                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XIX or E-UTRA Band 19          | 875 - 890                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XX or E-UTRA Band 20           | 791 - 821                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA FDD Band XXI or E-UTRA Band 21          | 1495.9 – 1510.9                              | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA Band 24                               | 1525 – 1559                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA TDD in Band a)                          | 1900-1920<br>2010-2025                       | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA TDD in Band 33                        | 1900-1920                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA TDD in Band 34                        | 2010-2025                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA TDD in Band b)                          | 1850-1910<br>1930-1990                       | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA TDD in Band 35                        | 1850-1910                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA TDD in Band 36                        | 1930-1990                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA TDD in Band c) or E-UTRA TDD in Band 37 | 1910-1930                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| UTRA TDD in Band d) or E-UTRA in Band 38     | 2570-2620                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA in Band 39                            | 1880-1920                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA in Band 40                            | 2300-2400                                    | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA in Band 41                            | 2496 - 2690                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA in Band 42                            | 3400 – 3600                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |
| E-UTRA in Band 43                            | 3600 – 3800                                  | +16                                 | $P_{\text{REFSENS}} + x \text{ dB}^*$ | CW carrier                 |

|             |  |
|-------------|--|
| NOTE 1 (*): | $P_{\text{REFSENS}}$ depends on the RAT and the channel bandwidth, see subclause 7.2. 'x' is equal to 3 in case of GSM/EDGE wanted signal and equal to 6 in case of UTRA or E-UTRA wanted signals.   |
| NOTE 2:     | Except for a BS operating in Band 13, these requirements do not apply when the interfering signal falls within the uplink operating band or in the 10 MHz immediately outside the uplink operating band.<br>For a BS operating in band 13 the requirements do not apply when the interfering signal falls within the frequency range 768-797 MHz.  |
| NOTE 3:     | Some combinations of bands may not be possible to co-site based on the requirements above. The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA TDD or E-UTRA TDD with E-UTRA FDD on adjacent frequencies for 30dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [7]. |
| NOTE 4:     | In China, the blocking requirement for co-location with DCS1800 and Band III BS is only applicable in the frequency range 1805-1850MHz.  |

## 7.6 Receiver spurious emissions

The receiver spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the BS receiver antenna connector. The requirements apply to all BS with separate RX and TX antenna ports. In this case for FDD BS the test shall be performed when both TX and RX are on, with the TX port terminated.

For TDD BS with common RX and TX antenna port the requirement applies during the Transmitter OFF period. For FDD BS with common RX and TX antenna port the transmitter spurious emission limits as specified in subclause 6.6.1 are valid.

### 7.6.1 General minimum requirement

The power of any spurious emission shall not exceed the levels in Table 7.6.1-1:

**Table 7.6.1-1: General spurious emissions requirement**

| Frequency range  | Maximum level | Measurement Bandwidth | Note                              |
|--|---------------|-----------------------|-----------------------------------|
| 30MHz - 1 GHz  | -57 dBm       | 100 kHz               |                                   |
| 1 GHz - 12.75 GHz  | -47 dBm       | 1 MHz                 |                                   |
| 12.75 GHz - 19 GHz   | -47 dBm       | 1 MHz                 | Applies only for Bands 42 and 43. |
| NOTE: The frequency range from $F_{\text{BW RF,DL,low}} - 10 \text{ MHz}$ to $F_{\text{BW RF,DL,high}} + 10 \text{ MHz}$ may be excluded from the requirement. |               |                       |                                   |

In addition to the requirements in Table 7.6.1-1, the power of any spurious emission shall not exceed the Additional spurious emissions requirements in subclause 6.6.1.3 and in case of FDD BS (for BC1 and BC2) emission shall not exceed the levels specified for Protection of the BS receivers of own or different BS in subclause 6.6.1.2. In addition, the requirements for co-location with other base stations specified in subclause 6.6.1.4 may also be applied.

### 7.6.2 Additional minimum requirement for BC2 (Category B)

For a BS operating in Band Category 2 and where Category B spurious emissions apply, the power of any spurious emissions shall not exceed the limits in Table 7.6.2-1.

**Table 7.6.2-1: Additional BS spurious emissions limits for BC2, Category B**

| Frequency range   | Frequency offset from downlink operating band edge | Maximum level | Measurement Bandwidth |
|-------------------|--|---------------|-----------------------|
| 30 MHz – 1 GHz    | 10 – 20 MHz  | -57 dBm       | 300 kHz               |
|                   | 20 – 30 MHz  | -57 dBm       | 1 MHz                 |
|                   | $\geq 30 \text{ MHz}$                              | -57 dBm       | 3 MHz                 |
| 1 GHz – 12.75 GHz | $\geq 30 \text{ MHz}$                              | -47 dBm       | 3 MHz                 |

## 7.7 Receiver intermodulation

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two interfering signals which have a specific frequency relationship to the wanted signal.

### 7.7.1 General intermodulation minimum requirement

Interfering signals shall be a CW signal and an E-UTRA or UTRA signal as specified in Annex A.

For the wanted signal at the assigned channel frequency and two interfering signals coupled to the base station antenna input, using the parameters in Table 7.7.1-1 and 7.7.1-2, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.2.

**Table 7.7.1-1: General intermodulation requirement**

| Mean power of interfering signals [dBm]   | Wanted Signal mean power [dBm]        | Type of interfering signal |
|---|---------------------------------------|----------------------------|
| -48   | $P_{\text{REFSENS}} + x \text{ dB}^*$ | See Table 7.7.1-2          |
| NOTE*: $P_{\text{REFSENS}}$ depends on the RAT and on the channel bandwidth, see subclause 7.2.<br>'x' is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. |                                       |                            |

**Table 7.7.1-2: Interfering signals for intermodulation requirement**

| RAT of the carrier adjacent to the high (low) edge of the RF bandwidth | Interfering signal centre frequency offset from the RF bandwidth edge [MHz] | Type of interfering signal |
|--|---|----------------------------|
| E-UTRA 1.4 MHz   | $\pm 2.0$ (BC1 and BC3) / $\pm 2.1$ (BC2)                                   | CW                         |
|  | $\pm 4.9$   | 1.4MHz E-UTRA signal       |
| E-UTRA 3 MHz   | $\pm 4.4$ (BC1 and BC3) / $\pm 4.5$ (BC2)                                   | CW                         |
|  | $\pm 10.5$  | 3MHz E-UTRA signal         |
| UTRA FDD and E-UTRA 5 MHz  | $\pm 7.5$   | CW                         |
|  | $\pm 17.5$  | 5MHz E-UTRA signal         |
| E-UTRA 10 MHz  | $\pm 7.375$   | CW                         |
|  | $\pm 17.5$  | 5MHz E-UTRA signal         |
| E-UTRA 15 MHz  | $\pm 7.25$  | CW                         |
|  | $\pm 17.5$  | 5MHz E-UTRA signal         |
| E-UTRA 20 MHz  | $\pm 7.125$   | CW                         |
|  | $\pm 17.5$  | 5MHz E-UTRA signal         |
| GSM/EDGE   | $\pm 7.575$   | CW                         |
|  | $\pm 17.5$  | 5MHz E-UTRA signal         |
| 1.28 Mcps UTRA TDD   | $\pm 2.3$ (BC3)   | CW                         |
|  | $\pm 5.6$ (BC3)   | 1.28Mcps UTRA TDD signal   |

## 7.7.2 General narrowband intermodulation minimum requirement

Interfering signals shall be a CW signal and an E-UTRA 1RB signal as specified in Annex A.

For the wanted signal at the assigned channel frequency and two interfering signals coupled to the base station antenna input, using the parameters in Table 7.7.2-1 and 7.7.2-2, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be  $\geq 95\%$  of the maximum throughput of the reference measurement channel defined in TS 36.104 [4], subclause 7.2.
- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], subclause 7.2.
- For any UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [3], subclause 7.2.
- For any GSM/EDGE carrier, the conditions are specified in TS 45.005 [5], Annex P.2.2.

**Table 7.7.2-1: General narrowband intermodulation requirement**

| Mean power of interfering signals [dBm]   | Wanted Signal mean power [dBm]        | Type of interfering signal |
|---|---------------------------------------|----------------------------|
| -52   | $P_{\text{REFSENS}} + x \text{ dB}^*$ | See Table 7.7.2-2          |
| NOTE*: $P_{\text{REFSENS}}$ depends on the RAT and on the channel bandwidth, see subclause 7.2.<br>'x' is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. |                                       |                            |

**Table 7.7.2-2: Interfering signals for narrowband intermodulation requirement**

| RAT of the carrier adjacent to the high (low) edge of the RF bandwidth  | CW or 1RB interfering signal centre frequency offset from the RF bandwidth edge [kHz] | Type of interfering signal   |
|---|---|------------------------------|
| E-UTRA 1.4 MHz  | $\pm 260$ (BC1 and BC3) / $\pm 270$ (BC2)   | CW                           |
|   | $\pm 970$ (BC1 and BC3) / $\pm 790$ (BC2)   | 1.4 MHz E-UTRA signal, 1 RB* |
| E-UTRA 3 MHz  | $\pm 260$ (BC1 and BC3) / $\pm 270$ (BC2)   | CW                           |
|   | $\pm 960$ (BC1 and BC3) / $\pm 780$ (BC2)   | 3.0 MHz E-UTRA signal, 1 RB* |
| E-UTRA 5 MHz  | $\pm 360$   | CW                           |
|   | $\pm 1060$  | 5 MHz E-UTRA signal, 1 RB*   |
| E-UTRA 10 MHz<br>(**)   | $\pm 325$   | CW                           |
|   | $\pm 1240$  | 5 MHz E-UTRA signal, 1 RB*   |
| E-UTRA 15 MHz<br>(**)   | $\pm 380$   | CW                           |
|   | $\pm 1600$  | 5MHz E-UTRA signal, 1 RB*    |
| E-UTRA 20 MHz<br>(**)   | $\pm 345$   | CW                           |
|   | $\pm 1780$  | 5MHz E-UTRA signal, 1 RB*    |
| UTRA FDD  | $\pm 345$ (BC1 and BC2)   | CW                           |
|   | $\pm 1780$ (BC1 and BC2)  | 5MHz E-UTRA signal, 1 RB*    |
| GSM/EDGE  | $\pm 340$   | CW                           |
|   | $\pm 880$   | 5MHz E-UTRA signal, 1 RB*    |
| 1.28Mcps UTRA<br>TDD  | $\pm 190$ (BC3)   | CW                           |
|   | $\pm 970$ (BC3)   | 1.4 MHz E-UTRA signal, 1 RB* |
| NOTE*: Interfering signal consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the RF bandwidth edge. |   |                              |
| NOTE**: This requirement shall apply only for an E-UTRA FRC A1-3 mapped to the frequency range at the channel edge adjacent to the interfering signals.                                     |   |                              |

### 7.7.3 Additional narrowband intermodulation minimum requirement for GSM/EDGE

The GSM/EDGE MC-BTS receiver intermodulation requirement as stated in TS 45.005 [5], applicable parts of subclause 5.3.2 shall apply for any GSM/EDGE carrier.

The conditions specified in TS 45.005 [5], Annex P.2.2 apply for the GSM/EDGE intermodulation requirement.

## 7.8 In-channel selectivity

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. In this condition a throughput requirement shall be met for a specified reference measurement channel.

### 7.8.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirement for in-channel selectivity is specified in TS 36.104 [4], subclause 7.4.

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## 8 Performance requirements

Performance requirements specify the ability of the BS to correctly demodulate signals in various conditions and configurations. For UTRA and E-UTRA the requirements specify a minimum throughput or maximum BLER or BER that shall be achieved at a specific SNR. For GSM/EDGE the requirements specify a maximum FER, BLER or BER that shall be achieved at specific sensitivity levels (C) and specific carrier-to-interference ratios (C/I).

### 8.1 E-UTRA minimum requirement

For E-UTRA, the minimum requirements for performance are specified in TS 36.104 [4], clause 8.

### 8.2 UTRA FDD minimum requirement

For UTRA FDD, the minimum requirements for performance are specified in TS 25.104 [2], clause 8.

### 8.3 UTRA TDD minimum requirement

For UTRA TDD, the minimum requirements for performance are specified in TS 25.105 [3], clause 8.

### 8.4 GSM/EDGE minimum requirement

For GSM/EDGE, the minimum requirements for reference sensitivity level and reference interference level are specified in TS 45.005 [5], applicable parts of clauses 6.2, 6.3, 6.4, 6.5 and 6.6. The conditions specified in TS 45.005 [5], Annex P.1 are valid for GSM sensitivity and interference performance.



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## Annex A (normative): Characteristics of interfering signals

### A.1 UTRA FDD interfering signal

The UTRA FDD interfering signal shall be a DPCH containing the DPCCH and one DPDCH. The data content for each channelization code shall be uncorrelated with each other and to the wanted signal and spread and modulated according to clause 4 of TS 25.213. Further characteristics of DPDCH and DPCCH are specified in Table A.1-1.

**Table A.1-1: Characteristics of UTRA FDD interfering signal**

| Channel  | Bit Rate | Spreading Factor | Channelization Code | Relative Power |
|--|----------|------------------|---------------------|----------------|
| DPDCH  | 240 kbps | 16               | 4                   | 0 dB           |
| DPCCH  | 15 kbps  | 256              | 0                   | -5.46 dB       |
| NOTE: The DPDCH and DPCCH settings are chosen to simulate a signal with realistic Peak to Average Ratio. |          |                  |                     |                |

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### A.2 UTRA TDD interfering signal

The UTRA TDD interfering signal shall be 1.28 Mcps UTRA TDD signal with one code. The data content shall be uncorrelated to the wanted signal. They are specified in Table A.2-1.

**Table A.2-1: Characteristics of UTRA TDD interfering signal**

| UTRA TDD option  | Type of Interfering Signal               |
|--|--|
| 1.28 Mcps UTRA TDD   | 1,28 Mcps UTRA TDD signal with one code* |
| * NOTE: The channelisation code ID and Midamble shift shall be different with the wanted signal's. |  |

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### A.3 E-UTRA interfering signal

The E-UTRA interfering signal shall be a PUSCH containing data and reference symbols. Normal CP is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS 36.211. Mapping of PUSCH modulation to receiver requirement are specified in Table A.3-1.

**Table A.3-1: Modulation of the E-UTRA interfering signal**

| Receiver requirement     | Modulation |
|--------------------------|------------|
| Narrowband blocking      | QPSK       |
| Receiver intermodulation | QPSK       |

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## Annex B (normative): Environmental requirements for the BS equipment

The BS equipment shall fulfil all the requirements in the full range of environmental conditions for the relevant environmental class. The environmental conditions and class shall be from the relevant IEC specifications or the corresponding ETSI specifications listed below.

IEC specifications for environmental requirements:

IEC 60 721-3-3 "Stationary use at weather protected locations" [11]

IEC 60 721-3-4 "Stationary use at non weather protected locations" [12]

ETSI specifications for environmental requirements:

ETSI EN 300 019-1-3 "Stationary use at weather protected locations" [13]

ETSI EN 300 019-1-4 "Stationary use at non weather protected locations" [14]

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated. For guidance on the use of test conditions to be used in order to show compliance refer to TS 37.141 [10].

## Annex C (informative): Change history

| Change history |          |           |    |     |   |       |       |
|----------------|----------|-----------|----|-----|---|-------|-------|
| Date           | TSG #    | TSG Doc.  | CR | Rev | Subject/Comment   | Old   | New   |
| 2009-07        | R4#51bis | R4-092358 |    |     | Specification skeleton  |       | 0.0.1 |
| 2009-08        | R4#52    | R4-093257 |    |     | <p>Agreed Text Proposals in RAN4#52:</p> <p><b>R4-093005</b>, "TS 37.104: TP on Relationship between minimum requirements and test requirements (TS ch 4.2)"</p> <p><b>R4-093006</b>, "TS 37.104: TP on Base station classes (TS ch 4.3)"</p> <p><b>R4-093008</b>, "TS 37.104: TP on Operating bands and Band Categories (TS ch 4.5)"</p> <p><b>R4-093009</b>, "TS 37.104: TP on Channel arrangement (TS ch 4.6)"</p> <p><b>R4-093011</b>, "TS 37.104: TP on Transmitter characteristics - General (TS ch 6.1)"</p> <p><b>R4-093012</b>, "TS 37.104: TP on Output power dynamics (TS ch 6.3)"</p> <p><b>R4-093016</b>, "TS 37.104: TP on Transmitter Intermodulation (TS ch 6.7)"</p> <p><b>R4-093017</b>, "TS 37.104: TP on Receiver characteristics General (TS ch 7.1)"</p> <p><b>R4-093018</b>, "TS 37.104: TP on Reference sensitivity level (TS ch 7.2)"</p> <p><b>R4-093019</b>, "TS 37.104: TP on Dynamic range (TS ch 7.3)"</p> <p><b>R4-093022</b>, "TS 37.104: TP on Receiver spurious emissions (TS ch 7.6)"</p> <p><b>R4-093024</b>, "TS 37.104: TP on In-channel selectivity (TS ch 7.8)"</p> <p><b>R4-093375</b>, "TS 37.104: TP on MSR References and definitions (TS ch 2 and 3)"</p> <p><b>R4-093376</b>, "TS 37.104: TP on Regional requirements (TS ch 4.4)"</p> <p><b>R4-093378</b>, "TS 37.104: TP on Transmitted signal quality (TS ch 6.5)"</p> <p><b>R4-093379</b>, "TS 37.104: TP on Transmitter spurious emissions (TS ch 6.6 and 6.6.1)"</p> <p><b>R4-093380</b>, "TS 37.104: TP on Operating band unwanted emissions (TS ch 6.6.2)"</p> <p><b>R4-093381</b>, "TS 37.104: TP on In-band selectivity and blocking (TS ch 7.4)"</p> <p><b>R4-093382</b>, "TS 37.104: TP on Out-of-band blocking (TS ch 7.5)"</p> <p><b>R4-093383</b>, "TS 37.104: TP on Receiver intermodulation (TS ch 7.7)"</p> | 0.0.1 | 0.1.0 |
| 2009-09        | RAN #45  | RP-090764 |    |     | Presentation to TSG RAN for information   | 0.1.0 | 1.0.0 |
| 2009-10        | R4#52bis | R4-093979 |    |     | <p>Agreed Text Proposals in RAN4#52bis:</p> <p><b>R4-093788</b>, "TS 37.104: TP on Relation to other RAN and GERAN specifications (TS ch 4.2)"</p> <p><b>R4-093792</b>, "TS 37.104: TP on Spurious emissions requirements in BC2 (TS ch 6.6.2 and 7.6)"</p> <p><b>R4-093796</b>, "TS 37.104: TP on Characteristics of interfering signals"</p> <p><b>R4-094013</b>, "Clarification on Spurious emissions limits for BS co-existed with another BS (37.104)"</p> <p><b>R4-094050</b>, "TS 37.104: TP on Additional spurious emissions requirement (TS ch 6.6.1.3)"</p> <p><b>R4-094051</b>, "TS 37.104: TP on Introduction of BC2 transmitter requirements (TS ch 6)"</p> <p><b>R4-094052</b>, "TS 37.104: TP on Introduction of BC2 receiver requirements (TS ch 7)"</p> <p><b>R4-094053</b>, "TS 37.104: TP on Applicability of requirements (TS ch 5)"</p> <p><b>R4-094054</b>, "TS 37.104: TP on Performance requirements</p>  | 1.0.0 | 1.1.0 |

|         |         |           |     |  |  |        |        |
|---------|---------|-----------|-----|--|--|--------|--------|
|         |         |           |     | (TS ch 8)"<br><b>R4-094058</b> , "TP for 37.104 Maximum power requirements"  |  |        |        |
| 2009-11 | R4#53   | R4-094476 |     | Agreed Text Proposals in RAN4#52bis:<br><b>R4-094061</b> , "A Note of 37.104 MSR category 3 on additional spurious emission requirement when BC3 is deployed in the same geographical area as the PHS"<br><b>R4-094062</b> , "TP of 37.104 on Transmitter intermodulation requirement of MSR category 3"<br><b>R4-094063</b> , "TP of 37.104 on Out-of-band blocking requirement of MSR category 3"<br><b>R4-094075</b> , "Text proposal of transmitter off power for TS37.104"<br><b>R4-094076</b> , "Text proposal of receiver intermodulation of BC3 for TS37.104"  | 1.1.0  | 1.2.0  |        |
| 2009-11 | R4#53   | R4-094777 |     | Agreed Text Proposals in RAN4#53:<br><b>R4-094403</b> , "Corrections on frequency range of unwanted emissions requirements (37.104)"<br><b>R4-094479</b> , "TS 37.104: TP on Occupied bandwidth (TS ch 6.6.3)"<br><b>R4-094480</b> , "TS 37.104: TP on remaining BC3 transmitter requirements (TR ch 6)"<br><b>R4-094484</b> , "TS 37.104: TP on Inclusion of requirements by reference (TS ch 5.4)"<br><b>R4-094485</b> , "TS 37.104: TP on additional emission requirements for GSM (TS ch 6.6.2.3)"<br><b>R4-094486</b> , "TS 37.104: TP on General updates"<br><b>R4-094540</b> , "Output Power clarification"<br><b>R4-094662</b> , "TS 37.104: TP for scope update (TS ch 1)"<br><b>R4-094663</b> , "TS 37.104: TP on Environmental requirements for the BS equipment (TS Annex B)"<br><b>R4-094862</b> , "TS 37.104: TP for ACLR requirement (TS ch 6.6.4)"<br><b>R4-094863</b> , "TS 37.104: TP on Applicability of requirements for BC3"<br><b>R4-094881</b> , "Proposed updates of references to TS 45.005 in MSR specification TR 37.104 (GERAN1 AHG1-090157)"<br><b>R4-094882</b> , "TS 37.104: TP on Declared output power parameters"<br><b>R4-094883</b> , "TS 37.104: TP on remaining BC3 receiver requirements (TS ch 7)" | 1.2.0  | 1.3.0  |        |
| 2009-12 | RAN #46 | RP-091107 |     | Presentation to TSG RAN for approval.  | 1.3.0  | 2.0.0  |        |
| 2009-12 | RAN #46 | RP-091107 |     | Approved in TSG RAN#46   | 2.0.0  | 9.0.0  |        |
| 2010-03 | RAN #47 | RP-100265 | 1   | Correction of additional spurious emission requirement for BC2   | 9.0.0  | 9.1.0  |        |
| 2010-03 | RAN #47 | RP-100265 | 7   | ACLR requirement E-UTRA channel BW <5 MHz  | 9.0.0  | 9.1.0  |        |
| 2010-03 | RAN #47 | RP-100265 | 3   | MSR corrections in TS 37.104   | 9.0.0  | 9.1.0  |        |
| 2010-03 | RAN #47 | RP-100265 | 5   | 1  | Alignment of MSR specification with new items in single-RAT specifications       | 9.0.0  | 9.1.0  |
| 2010-03 | RAN #47 | RP-100265 | 6   |  | Correction of scope  | 9.0.0  | 9.1.0  |
| 2010-06 | RP-48   | RP-100625 | 014 |  | Corrections to clause 7.1  | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 013 | 1  | Corrections to MSR core requirements   | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 012 |  | Correction to Clause 6.1   | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 010 | 1  | Clarification to the receiver narrowband blocking requirement                    | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 009 | 1  | Clarification to the receiver narrowband intermodulation requirement             | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 008 | 2  | Co-existence with services in adjacent frequency bands                           | 9.1.0  | 9.2.0  |
| 2010-06 | RP-48   | RP-100625 | 015 |  | Spurious emissions limits and blocking requirements for coexistence with CDMA850 | 9.1.0  | 9.2.0  |
| 2010-09 | RP-49   | RP-100922 | 018 | 1  | TS 37.104 Subclause 7.7; Receiver intermodulation                                | 9.2.0  | 9.3.0  |
| 2010-09 | RP-49   | RP-100927 | 016 |  | CR LTE_TDD_2600_US spectrum band definition additions to TS 37.104               | 9.3.0  | 10.0.0 |
| 2010-12 | RP-50   | RP-101345 | 023 |  | Band XII/12 frequency range  | 10.0.0 | 10.1.0 |
| 2010-12 | RP-50   | RP-101356 | 019 | 4  | Band 42 and 43 parameters for UMTS/LTE 3500 (TDD) for TS 37.104                  | 10.0.0 | 10.1.0 |
| 2010-12 | RP-50   | RP-101359 | 024 |  | Introduction of Carrier Aggregation for LTE in TS 37.104                         | 10.0.0 | 10.1.0 |
| 2010-12 | RP-50   | RP-101361 | 020 |  | Protection of E-UTRA Band 24   | 10.0.0 | 10.1.0 |

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## History

| <b>Document history</b> |              |             |
|-------------------------|--------------|-------------|
| V10.1.0                 | January 2011 | Publication |
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