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Contents

Foreword

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1 Scope

The present document specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS). These have been derived from, and are consistent with the E-UTRA, UTRA and GSM/EDGE MSR BS specification defined in [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

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

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 37.104: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception".

[3] 3GPP TS 25.104: "Base Station (BS) radio transmission and reception (FDD) ".

[4] 3GPP TS 25.105: "Base Station (BS) radio transmission and reception (TDD) ".

[5] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[6] 3GPP TS 45.005: "Radio transmission and reception".

[7] ITU-R Recommendation M.1545, "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".

[8] "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission.

[9] 3GPP TS 36.141: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing".

[10] 3GPP TS 25.141: "Base Station (BS) conformance testing (FDD) ".

[11] 3GPP TS 51.021: "Base Station System (BSS) equipment specification; Radio aspects".

[12] 3GPP TS 25.142: "Base Station (BS) conformance testing (TDD) ".

[13] Recommendation ITU-R SM.329-10, "Unwanted emissions in the spurious domain".

[14] 3GPP TR 25.942: "Radio Frequency (RF) system scenarios".

[15] ITU-R recommendation SM.328: "Spectra and bandwidth of emissions".

[16] IEC 60721: "Classification of environmental conditions".

[17] 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".

[18] 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".

[19] 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"

[20] 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".

[21] IEC 60068-2-1 (2007): "Environmental testing - Part 2: Tests. Tests A: Cold".

[22] IEC 60068-2-2 (2007): "Environmental testing - Part 2: Tests. Tests B: Dry heat".

[23] IEC 60068-2-6 (2007): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)".

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

Carrier aggregation: aggregation of two or more E-UTRA component carriers in order to support wider transmission bandwidths

Carrier aggregation band: a set of one or more operating bands across which multiple E-UTRA carriers are aggregated with a specific set of technical requirements.

NOTE: Carrier aggregation band(s) for an E-UTRA BS is declared by the manufacturer according to the designations in Tables 5.5-2 to 5.5-3 of TS 36.104 [5]

Channel bandwidth: The bandwidth supporting a single E-UTRA, UTRA or GSM/EDGE 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.

Contiguous carriers: a set of two or more carriers configured in a spectrum block where there are no RF requirements based on co-existence for un-coordinated operation within the spectrum block.

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.

Contiguous spectrum: Spectrum consisting of a contiguous block of spectrum with no sub-block gaps.

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

Inter-band carrier aggregation: carrier aggregation of E-UTRA component carriers in different operating bands**.**

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

Intra-band contiguous carrier aggregation: contiguous E-UTRA carriers aggregated in the same operating band.

Intra-band non-contiguous carrier aggregation: non-contiguous E-UTRA carriers aggregated in the same operating band.

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

Lower sub-block edge: The frequency at the lower edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

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

NOTE: The Maximum Base Station RF bandwidth for BS configured for contiguous and non-contiguous operation is declared separately.

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).

Non-contiguous spectrum: Spectrum consisting of two or more sub-blocks separated by sub-block gap(s).

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 β/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.

Sub-block: This is one contiguous allocated block of spectrum for use by the same Base Station. There may be multiple instances of sub-blocks within an RF bandwidth.

Sub-block bandwidth: The bandwidth of one sub-block.

Sub-block gap: A frequency gap between two consecutive sub-blocks within an RF bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation.

Synchronized operation: Operation of TDD in two different systems, where no simultaneous uplink and downlink occur.

RAT power: The sum of all carrier powers for all carriers of the same type.

Rated carrier output power: The mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

Rated RAT output power: The mean power level per RAT that the manufacturer has declared to be available at the antenna connector.

Rated total output power: The total mean power level that the manufacturer has declared to be available at the antenna connector.

RRC filtered mean power: The mean power of a UTRA carrier as measured through a root raised cosine filter with roll-off factor α and a bandwidth equal to the chip rate of the radio access mode.

NOTE: The RRC filtered mean power of a perfectly modulated UTRA signal is 0.246 dB lower than the mean power of the same signal.

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

Total output power: The sum of all carrier powers for all carriers transmitted by the BS.

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

Transmission bandwidth configuration: The highest E-UTRA transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in Resource Block units.

Transmitter ON period: The time period during which the BS transmitter is transmitting data and/or reference symbols.

Transmitter OFF period: The time period during which the BS transmitter is not allowed to transmit.

Transmitter transient period: The time period during which the transmitter is changing from the OFF period to the ON period or vice versa.

Unsynchronized operation: Operation of TDD in two different systems, where the conditions for synchronized operation are not met.

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.

Upper sub-block edge: The frequency at the upper edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

3.2 Symbols

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

α	Roll-off factor
β	Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel
$BW_{Channel}$	Channel bandwidth (for E-UTRA)
BW_{Config}	Transmission bandwidth configuration (for E-UTRA), expressed in MHz, where $BW_{Config} = N_{RB}$ x 180 kHz in the uplink and BW_{Config} = 15 kHz + N_{RB} x 180 kHz in the downlink.
BW_{RF}	Base Station RF bandwidth, where $BW_{RF} = F_{BW\ RF,high} - F_{BW\ RF,low}$
$BW_{RF,max}$	Maximum Base Station RF bandwidth
CA_X	CA for band X where X is the applicable E-UTRA operating band
CA_X-Y	CA for band X and Band Y where X and Y are the applicable E-UTRA operating band
DwPTS	Downlink part of the special subframe (for E-UTRA TDD operation
f	Frequency
Δf	Separation between the Base Station RF bandwidth edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency
Δf_{max}	The largest value of Δf used for defining the requirement
F_C	Carrier centre frequency
F_{filter}	Filter centre frequency
f_offset	Separation between the Base Station RF bandwidth edge frequency and the centre of the measuring filter
f_offset_{max}	The maximum value of f_offset used for defining the requirement
$F_{block,high}$	Upper sub-block edge, where $F_{block,high} = F_{C,block,high} + F_{offset,\ RAT}$
$F_{block,low}$	Lower sub-block edge, where $F_{block,low} = F_{C,block,low} - F_{offset,\ RAT}$
$F_{BW\ RF,high}$	Upper RF bandwidth edge, where $F_{BW\ RF,high} = F_{C,high} + F_{offset,\ RAT}$
$F_{BW\ RF,low}$	Lower RF bandwidth edge, where $F_{BW\ RF,low} = F_{C,low} - F_{offset,\ RAT}$
$F_{C,block,\ high}$	Center frequency of the highest transmitted/received carrier in a sub-block.
$F_{C,block,\ low}$	Center frequency of the lowest transmitted/received carrier in a sub-block.
$F_{C,high}$	Center frequency of the highest transmitted/received carrier.
$F_{C,low}$	Center frequency of the lowest transmitted/received carrier.
$F_{offset,\ RAT}$	Frequency offset from the centre frequency of the *highest* transmitted/received carrier to the *upper* RF bandwidth edge or sub-block edge, or from the centre frequency of the *lowest* transmitted/received carrier to the *lower* RF bandwidth edge or sub-block edge for a specific RAT.
F_{DL_low}	The lowest frequency of the downlink operating band