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NR;
Base Station (BS) radio transmission and reception
(3GPP TS 38.104 version 15.3.0 Release 15)**

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1 Scope

The present document establishes the minimum RF characteristics and minimum performance requirements of NR Base Station (BS).

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] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".
- [3] Recommendation ITU-R SM.328: "Spectra and bandwidth of emissions".
- [4] 3GPP TR 25.942: "RF system scenarios".
- [5] 3GPP TS 38.141-1: "NR; Base Station (BS) conformance testing; Part 1: Conducted conformance testing".
- [6] 3GPP TS 38.141-2: "NR; Base Station (BS) conformance testing; Part 2: Radiated conformance testing".
- [7] Recommendation ITU-R 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 TR 38.211: "NR; Physical channels and modulation".
- [10] 3GPP TS 38.213: "NR; Physical layer procedures for control".
- [11] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".
- [12] [ECC/DEC/\(17\)06](#): "The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)"
- [13] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception"
- [14] 3GPP TS 37.105: "Active Antenna System (AAS) Base Station (BS) transmission and reception"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

Aggregated BS Channel Bandwidth: The RF bandwidth in which a Base Station transmits and receives multiple contiguously aggregated carriers. The *aggregated BS channel bandwidth* is measured in MHz.

antenna connector: connector at the conducted interface of the *BS type 1-C*

active transmitter unit: transmitter unit which is ON, and has the ability to send modulated data streams that are parallel and distinct to those sent from other transmitter units to a *BS type 1-C antenna connector*, or to one or more *BS type 1-H TAB connectors* at the *transceiver array boundary*

Base Station RF Bandwidth: RF bandwidth in which a base station transmits and/or receives single or multiple carrier(s) within a supported *operating band*

NOTE: In single carrier operation, the *Base Station RF Bandwidth* is equal to the *BS channel bandwidth*.

Base Station RF Bandwidth edge: frequency of one of the edges of the *Base Station RF Bandwidth*.

basic limit: emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [2] used for the formulation of unwanted emission requirements for FR1

beam: beam (of the antenna) is the main lobe of the radiation pattern of an *antenna array*

NOTE: For certain BS *antenna array*, there may be more than one beam.

beam centre direction: direction equal to the geometric centre of the half-power contour of the beam

beam direction pair: data set consisting of the *beam centre direction* and the related *beam peak direction*

beam peak direction: direction where the maximum EIRP is found

beamwidth: beam which has a half-power contour that is essentially elliptical, the half-power beamwidths in the two pattern cuts that respectively contain the major and minor axis of the ellipse

BS channel bandwidth: RF bandwidth supporting a single NR RF carrier with the transmission bandwidth configured in the uplink or downlink

NOTE 1: The *BS channel bandwidth* is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE 2: It is possible for the BS to transmit to and/or receive from one or more UE bandwidth parts that are smaller than or equal to the BS transmission bandwidth configuration, in any part of the BS transmission bandwidth configuration.

BS type 1-C: NR base station operating at FR1 with requirements set consisting only of conducted requirements defined at individual *antenna connectors*

BS type 1-H: NR base station operating at FR1 with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB

BS type 1-O: NR base station operating at FR1 with a requirement set consisting only of OTA requirements defined at the RIB

BS type 2-O: NR base station operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB

Channel edge: lowest or highest frequency of the NR carrier, separated by the *BS channel bandwidth*.

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

Carrier aggregation configuration: a set of one or more *operating bands* across which the BS aggregates carriers with a specific set of technical requirements

co-location reference antenna: a passive antenna used as reference for base station to base station co-location requirements

Contiguous carriers: 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.

Contiguous spectrum: spectrum consisting of a contiguous block of spectrum with no *sub-block gap(s)*.

directional requirement: requirement which is applied in a specific direction within the OTA coverage range for the Tx and when the AoA of the incident wave of a received signal is within the *FR1 OTA REFSENS RoAoA* or *FR2 OTA REFSENS RoAoA* or the minSENS RoAoA as appropriate for the receiver

fractional bandwidth: fractional bandwidth FBW is defined as $FBW = 200 \cdot \frac{F_{DL_high} - F_{DL_low}}{F_{DL_high} + F_{DL_low}} \%$

FR1 OTA REFSENS RoAoA: the RoAoA determined by the contour defined by the points at which the achieved EIS is 3dB higher than the achieved EIS in the reference direction in FR1

NOTE: This contour will be related to the average element/sub-array radiation pattern 3dB beam width.

FR2 OTA REFSENS RoAoA: the RoAoA within which the reference sensitivity is achieved in FR2

Highest Carrier: The carrier with the highest carrier frequency transmitted/received in a specified frequency band.

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

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

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

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

[Inter RF Bandwidth gap: frequency gap between two consecutive Base Station RF Bandwidths that are placed within two supported *operating bands*]

Lowest Carrier: The carrier with the lowest carrier frequency transmitted/received in a specified frequency band.

Lower sub-block edge: frequency at the lower edge of one *sub-block*.

NOTE: It is used as a frequency reference point for both transmitter and receiver requirements.

maximum carrier output power: mean power level measured per carrier at the indicated interface, during the *transmitter ON period* in a specified reference condition

maximum carrier TRP output power: mean power level measured per RIB during the *transmitter ON period* for a specific carrier in a specified reference condition and corresponding to the declared *rated carrier TRP output power* ($P_{rated,c,TRP}$)

maximum total output power: mean power level measured within the *operating band* at the indicated interface, during the *transmitter ON period* in a specified reference condition

maximum total TRP output power: mean power level measured per RIB during the *transmitter ON period* in a specified reference condition and corresponding to the declared *rated total TRP output power* ($P_{rated,t,TRP}$)

measurement bandwidth: RF bandwidth in which an emission level is specified

minimum EIRP level under extreme condition: For a declared beam and *beam direction pair*, the *minimum EIRP level under extreme condition* is the minimum power that the base station is declared to radiate at the associated *beam peak direction* during the *transmitter ON period* under extreme condition.

minSENS: the lowest declared EIS value for the OSDD's declared for OTA sensitivity requirement.

minSENS RoAoA: The reference RoAoA associated with the OSDD with the lowest declared EIS

multi-band connector: Antenna Connector of *BS type 1-C* or *TAB connector* of *BS type 1-H* associated with a transmitter or receiver that is characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band than the other carrier(s) and where this different operating band is not a sub-band or superseding-band of another supported operating band

multi-band RIB: *operating band* specific RIB associated with a transmitter or receiver that is characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band than the other carrier(s) and where this different operating band is not a sub-band or superseding-band of another supported operating band