**3GPP TSG-RAN WG4 Meeting # 112 R4-2412706**

**Maastricht , NL, 19th – 23th Aug, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** |  | **rev** | **1** | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <http://www.3gpp.org/Change-Requests>.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR for introduction of U6GHz EIRP mask | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_BS\_RF\_req\_evo-Core | | | | |  | ***Date:*** | | | 2024-08-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | *Release 19* |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To introduce the BS EIRP mask requirement for band n104 according to WRC-23 outcome. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | To capture the BS expected EIRP mask requirement for band n104 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The spec is not consistent with WRC-23 outcome | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.2, 3.3, 9.9 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*<Start of the change>*

# 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 TS 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".

[15] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[16] 3GPP TR 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz"

[17] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[18] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone"

[19] ERC Recommendation 74-01, "Unwanted emissions in the spurious domain".

[20] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".

[21] ECC Decision(20)02: “Harmonised use of the paired frequency bands 874.4-880.0 MHz and 919.4-925.0 MHz and of the unpaired frequency band 1900-1910 MHz for Railway Mobile Radio (RMR)”

[22] 3GPP TR 38.852: Introduction of 1900MHz NR band for Europe for Rail Mobile Radio (RMR)

[23] 3GPP TR 38.853: Introduction of 900MHz NR band for Europe for Rail Mobile Radio (RMR)

[24] FCC Report And Order And Further Notice Of Proposed Rulemaking FCC 20-51, April 2020.

[25] World Radiocommunication Conference 2023 (WRC-23) Final Acts

*<Next of the change>*

## 3.2 Symbols

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

 Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel

BeWθ,REFSENS Beamwidth equivalent to the *OTA REFSENS RoAoA* in the θ-axis in degrees. Applicable for FR1 only.

BeWφ,REFSENS Beamwidth equivalent to the *OTA REFSENS RoAoA* in the φ-axis in degrees. Applicable for FR1 only.

BWChannel *BS channel bandwidth*

BWChannel\_CA *Aggregated BS Channel Bandwidth*, expressed in MHz. BWChannel\_CA = Fedge,high- Fedge,low.

BWChannel,block *Sub-block bandwidth*, expressed in MHz. BWChannel,block = Fedge,block,high- Fedge,block,low.

BWConfig *Transmission bandwidth configuration*, where BWConfig = *N*RB x SCS x 12

BWContiguous Contiguous *transmission bandwidth*, i.e. *BS channel bandwidth* for single carrier or *Aggregated BS channel bandwidth* for contiguously aggregated carriers. For non-contiguous operation within a band the term is applied per *sub-block*.

BWGB,low The minimum guard band defined in clause 5.3.3 for lowest assigned component carrier

BWGB,high The minimum guard band defined in clause 5.3.3 for highest assigned component carrier

Δf Separation between the *channel edge* frequency and the nominal -3 dB point of the measuring filter closest to the carrier frequency

ΔfBE\_offset Separation between the edge of the last transmitted channel of the channels assigned for NR-U channel bandwidth and the nominal -3 dB point of the measuring filter closest to the carrier frequency

ΔFGlobal Global frequency raster granularity

Δfmax f\_offsetmax minus half of the bandwidth of the measuring filter

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the downlink *operating band* edge

ΔfOOB Maximum offset of the out-of-band boundary from the uplink *operating band* edge

ΔFR2\_REFSENS Offset applied to the FR2 OTA REFSENS depending on the AoA

ΔminSENS Difference between conducted reference sensitivity and minSENS

ΔOTAREFSENS Difference between conducted reference sensitivity and OTA REFSENS

ΔFRaster Channel raster granularity

Δshift Channel raster offset for SUL

EISminSENS The EIS declared for the *minSENS RoAoA*

EISREFSENS OTA REFSENS EIS value

EISREFSENS\_50M Declared OTA reference sensitivity basis level for FR2 based on a reference measurement channel with 50MHz *BS channel bandwidth*

FFBWhigh Highest supported frequency within supported *operating band*, for which *fractional bandwidth* support was declared

FFBWlow Lowest supported frequency within supported *operating band*, for which *fractional bandwidth* support was declared

FC *RF reference frequency* on the channel raster, given in table 5.4.2.2-1

FC,block,high Fc of the highest transmitted/received carrier in a *sub-block*.

FC,block,low Fc of the lowest transmitted/received carrier in a *sub-block*.

FC,low The Fc of the *lowest carrier*, expressed in MHz.

FC,high The Fc of the *highest carrier*, expressed in MHz.

FDL,low The lowest frequency of the downlink *operating band*

FDL,high The highest frequency of the downlink *operating band*

Fedge,low The lower edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge,low = FC,low - Foffset,low.

Fedge,high The upper edge of *Aggregated BS Channel Bandwidth*, expressed in MHz. Fedge,high = FC,high + Foffset,high.

Fedge,block,low The *lower sub-block edge*, where Fedge,block,low = FC,block,low - Foffset,low.

Fedge,block,high The *upper sub-block edge*, where Fedge,block,high = FC,block,high + Foffset,high.

Ffilter Filter centre frequency

Foffset,high Frequency offset from FC,high to the upper *Base Station RF Bandwidth edge*, or from F C,block,high to the *upper sub-block edge*

Foffset,low Frequency offset from FC,low to the lower *Base Station RF Bandwidth edge*, or from FC,block,low to the *lower sub-block edge*.

f\_BE\_offset Separation between the edge of the last transmitted channel of the channels assigned for NR-U channel bandwidth and the centre of the measuring

f\_offset Separation between the *channel edge* frequency and the centre of the measuring

f\_offsetmax The offset to the frequency ΔfOBUE outside the downlink *operating band*

FREF RF reference frequency

FREF-Offs Offset used for calculating FREF

FREF,shift RF reference frequency for Supplementary Uplink (SUL) bands

Fstep,X Frequency steps for the OTA transmitter spurious emissions (Category B)

FUL,low The lowest frequency of the uplink *operating band*

FUL,high The highest frequency of the uplink *operating band*

GBChannel Minimum guard band defined in clause 5.3.3

Ncells The declared number corresponding to the minimum number of cells that can be transmitted by an *BS type 1-H* in a particular *operating band*

 Physical resource block number

NRB *Transmission bandwidth configuration*, expressed in resource blocks

NRB,high *Transmission bandwidth configuration* for the highest assigned component carrier within a *sub-block* in CA

NRB,low *Transmission bandwidth configuration* for the lowest assigned component carrier within a *sub-block* in CA

NREF NR Absolute Radio Frequency Channel Number (NR-ARFCN)

NREF-Offs Offset used for calculating NREF

NRXU,active The number of active receiver units. The same as the number of *demodulation branches* to which compliance is declared for chapter 8 performance requirements

NRXU,counted The number of active receiver units that are taken into account for conducted Rx spurious emission scaling, as calculated in clause 7.6.1

NRXU,countedpercell The number of active receiver units that are taken into account for conducted RX spurious emissions scaling per cell, as calculated in clause 7.6.1

NTXU,counted The number of *active transmitter units* as calculated in clause 6.1, that are taken into account for conducted TX output power limit in clause 6.2.1, and for unwanted TX emissions scaling

NTXU,countedpercell The number of *active transmitter units* that are taken into account for conducted TX emissions scaling per cell, as calculated in clause 6.1

PEM,n50/n75,ind Declared emission level for Band n50/n75; ind = a, b

PEM,n54,ind Declared emission level for Band n54; ind = a, b, c, d, e, f

PEIRP,N EIRP level for channel N

Pmax,c,AC*Maximum carrier output power* measuredper *antenna connector*

Pmax,c,cell The *maximum carrier output power* per *TAB connector TX min cell group*

Pmax,c,TABC The *maximum carrier output power per TAB connector*

Pmax,c**,**TRP*Maximum carrier TRP output power* measuredat the RIB(s), and corresponding to the declared *rated carrier TRP output power* (Prated,c,TRP)

Pmax,c,EIRP The maximum carrier EIRPwhen the NR BS is configured at the maximum rated carrier output TRP (Prated,c,TRP)

Prated,c,AC The *rated carrier output power per antenna connector*

Prated,c,cell The *rated carrier output power* per *TAB connector TX min cell group*

Prated,c,FBWhigh The rated carrier EIRPfor the higher supported frequency range within supported *operating band,* for which *fractional bandwidth* support was declared

Prated,c,FBWlow The rated carrier EIRP for the lower supported frequency range within supported *operating band,* for which *fractional bandwidth* support was declared

Prated,c,sys The sum of Prated,c,TABC for all *TAB connectors* for a single carrier

Prated,c,TABC The *rated carrier output power per TAB connector*

Prated,c,TRP *Rated carrier TRP output power* declaredper RIB

Prated,t,AC The *rated total output power* declared at the *antenna connector*

Prated,t,TABC The *rated total output power* declared at *TAB connector*

Prated,t,TRP *Rated total TRP output power* declaredper RIB

PREFSENS Conducted Reference Sensitivity power level

SCSlow Sub-Carrier Spacing for the lowest assigned component carrier within a *sub-block* in CA

SCShigh Sub-Carrier Spacing for the highest assigned component carrier within a *sub-block* in CA

SSREF SS block reference frequency position

Wgap *Sub-block gap* or *Inter RF Bandwidth gap* size

θHL Lowest angle above the Horizon in Expected EIRP vertical angle range

θHH Highest angle above the Horizon in Expected EIRP vertical angle range

*<Next of the change>*

## 3.3 Abbreviations

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

AA Antenna Array

AAS Active Antenna System

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

AoA Angle of Arrival

AWGN Additive White Gaussian Noise

BS Base Station

BW Bandwidth

CA Carrier Aggregation

CACLR Cumulative ACLR

CPE Common Phase Error

CP-OFDM Cyclic Prefix-OFDM

CW Continuous Wave

DFT-s-OFDM Discrete Fourier Transform-spread-OFDM

DM-RS Demodulation Reference Signal

EIS Equivalent Isotropic Sensitivity

EIRP Effective Isotropic Radiated Power

EEIRP Expected EIRP

E-UTRA Evolved UTRA

EVM Error Vector Magnitude

FBW Fractional Bandwidth

FR Frequency Range

FRC Fixed Reference Channel

FSS Fixed Satellite Service

GSCN Global Synchronization Channel Number

GSM Global System for Mobile communications

HAPS High Altitude Platform Station

ITU‑R Radiocommunication Sector of the International Telecommunication Union

ICS In-Channel Selectivity

LA Local Area

LNA Low Noise Amplifier

MCS Modulation and Coding Scheme

MR Medium Range

NB-IoT Narrowband – Internet of Things

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

OBUE Operating Band Unwanted Emissions

OCC Orthogonal Covering Code

OOB Out-of-band

OSDD OTA Sensitivity Directions Declaration

OTA Over-The-Air

PRB Physical Resource Block

PT-RS Phase Tracking Reference Signal

QAM Quadrature Amplitude Modulation

RB Resource Block

RDN Radio Distribution Network

RE Resource Element

REFSENS Reference Sensitivity

RF Radio Frequency

RIB Radiated Interface Boundary

RMS Root Mean Square (value)

RoAoA Range of Angles of Arrival

QAM Quadrature Amplitude Modulation

RB Resource Block

RX Receiver

SCS Sub-Carrier Spacing

SDL Supplementary Downlink

SS Synchronization Symbol

SSB Synchronization Signal Block

SUL Supplementary Uplink

TAB Transceiver Array Boundary

TAE Time Alignment Error

TDL Tapped Delay Line

TX Transmitter

TRP Total Radiated Power

UCI Uplink Control Information

UEM Unwanted Emissions Mask

UTRA Universal Terrestrial Radio Access

WA Wide Area

ZF Zero Forcing

*<Next of the change>*

## 9.9 OTA spatial emission

### 9.9.1 General

OTA spatial emission requirements are defined to set upper limits on radiated power in specific directions.

### 9.9.2 Protection of FSS UL

This requirement shall be applied to BS operating in band n104 to protect FSS (Earth-to-space) satellite receiver.

#### 9.9.2.1 Minimum requirement for BS type 1-H and BS type 1-O

For BS type 1-H and BS type 1-O operating in band n104, the Expected EIRP (EEIRP) in the frequency range 6425 – 7075 MHz , shall not exceed the values specified in table 9.9.2.1-1.

Expected EIRP (EEIRP) is defined as the average value of the EIRP, with the averaging being performed over the supported weighted beamforming directions within the BS horizontal and vertical steering range and the averaging being performed over horizontal angles from −180° to +180° and the specified elevation angle range θHL ≤ θ < θHH in Table 9.9.2-1.

Table 9.9.2.1-1: EEIRP limits as function of elevation above horizon

| **Elevation angular range**  θHL ≤ θ < θHH **(Degrees)** | **EEIRP limit (dBm/MHz)** |
| --- | --- |
| 0<<5 | 27 |
| 5<<10 | 23 |
| 10<<15 | 19 |
| 15<<20 | 18 |
| 20<<30 | 16 |
| 30<<60 | 15 |
| 60<<90 | 15 |
| NOTE: The requirement shall apply to all supported mechanical tilts. | |

A diagram of a sphere with lines and arrows

Description automatically generated

**Figure 9.9.2.1-1: Definitions of θHL and θHH angles.**

*<End of the change>*