**3GPP T****SG-RAN WG4 Meeting #116 R4-2512572**

**Bengaluru, India, August 25th – 29th, 2025**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.115-2** | **CR** | **0044** | **rev** | **1** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | CR to TS 38.115-2 for introduction of expected EIRP mask conformance test for NCR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, ZTE, Ericsson, Huawei, Qualcomm | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_BS\_RF\_req\_evo-Perf | | | | |  | ***Date:*** | | | 2025-08-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-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:*** | | This is CR to NCR test specification with introduction of expected EIRP mask requirement testing.  It reflects all changes introduced into TS 38.141-2 during RAN4#115 meeting. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduction of EEIRP mask. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No conformance testing for EIRP requirement in NCR specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.2, 3.3, 4.1.2.2, 4.6, 4.8, 4.9.3, new clauses: 4.9.3, 6.17, Annex J | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of R4-2511521 | | | | | | | | |

<Start of changes>

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 38.106: "NR repeater radio transmission and reception"

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

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

[5] 3GPP TS 38.104: "NR Base Station (BS) radio transmission and reception"

[6] 3GPP TS 38.141-2: "NR; Base Station (BS) conformance testing; Part 2: Radiated conformance testing"

[7] IEC 60 721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations"

[8] IEC 60 721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Clause 4: Stationary use at non-weather protected locations"

[9] IEC 60 721: "Classification of environmental conditions"

[10] IEC 60 068-2-1: "Environmental testing - Part 2: Tests. Tests A: Cold"

[11] IEC 60 068-2-2: "Environmental testing - Part 2: Tests. Tests B: Dry heat"

[12] IEC 60 068-2-6: "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)"

[13] 3GPP TR 37.941: "Radio Frequency (RF) conformance testing background for radiated Base Station (BS) requirements"

[14] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[15] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[16] 3GPP TS 38.101-4: “NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone”

[17] 3GPP TR 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz"

[18] 3GPP TS 38.211: "NR; Physical channels and modulation[19] 3GPP TR 38.174: "NR; Integrated Access and Backhaul (IAB) radio transmission and reception"

[20] 3GPP TS 38.521-2: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Range 2 standalone"

[21] 3GPP TS 38.176-2: "NR; Integrated Access and Backhaul (IAB) conformance testing; Part 2: Radiated conformance testing"

[22] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification"

[23] 3GPP TS 38.115-1: "NR; Repeater conformance testing, Part 1: Conducted conformance testing"

[24] Commission Implementing Decision (EU) 2020/590 of 24 April 2020 amending Decision (EU) 2019/784 as regards an update of relevant technical conditions applicable to the 24,25-27,5 GHz frequency band.

[25] 3GPP TR 37.941: "Radio Frequency (RF) conformance testing background for radiated Base Station (BS) requirements"

<Next change>

3.1 Terms

For the purposes of the present document, the terms 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].

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

**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

**directional requirement:** requirement which is applied in a specific direction within the *OTA coverage range*.

**Equivalent isotropic radiated power:** equivalent power radiated from an isotropic directivity device producing the same field intensity at a point of observation as the field intensity radiated in the direction of the same point of observation by the discussed device

**Fractional bandwidth:** *fractional bandwidth* FBW is defined as

**gap between passbands:** frequency gap between two consecutive passbands that belong to the same *operating band*, where the RF requirements in the gap are based on co-existence for un-coordinated operation

**Inter-passband gap**: The frequency gap between two supported consecutive *passbands* that belong to different operating bands.

**Maximum passband TRP output power:** mean power level measured perpassband during the *transmitter ON state* in a specified reference condition and corresponding to the declared *rated passband TRP output* power (Prated,p,,TRP)

**Measurement bandwidth**: RF bandwidth in which an emission level is specified

Mechanical tilt: The angle between the vertical reference direction and its projection on BS antenna array plane.

**NCR type 1-H**: NCR-MT or NCR-Fwd operating at FR1 with a *requirement set* consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB.

**NCR type 2-O**: NCR-MT or NCR-Fwd operating at FR2 with a *requirement set* consisting only of OTA requirements defined at the RIB.

**Nominal channel bandwidth:** Bandwidth calculated as min(100MHz, BWpassband) in FR1 or min(400MHz, BWpassband) in FR2. If this bandwidth is not defined for BS channel bandwidth for the operating band, *nominal channel bandwidth* shall be defined as the widest BS channel bandwidth for the operating band which is narrower than BWpassband.

**Non-contiguous spectrum**: spectrum consisting of two or more *passbands* separated by *inter-passband gap*(s).

**Operating band:** frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements

**OTA coverage range**: a common range of directions within which OTA requirements that are neither specified in the *OTA peak directions sets* nor as *TRP requirement* are intended to be met

**OTA peak directions set:** set(s) of *beam peak directions* within which certain OTA requirements are intended to be met, where all *OTA peak directions set(s)* are subsets of the *OTA coverage range.*

**Passband:** The frequency range in which the repeater operates in with operational configuration, this frequency range can correspond to one or several consecutive nominal channels, if they are not consecutive each subset of channels shall be considered as an individual *passband*, a repeater can have one or several *passbands*, all channels within the *passband(s)* shall belong to a single operator or collaborating operators.

**passband edge***:* Frequency at the edge of the passband.

**Repeater RF Bandwidth**: RF bandwidth in which a repeater transmits and/or receives single or multiple passband(s) within a supported operating band

NOTE: In single passband operation, the Repeater RF Bandwidth is equal to the passband bandwidth.

**Radiated interface boundary**: *operating band* specific radiated requirements reference where the radiated requirements apply

**Rated beam EIRP:** For a declared beam and *beam direction pair*, the *rated beam EIRP* level is the maximum power that the repeater is declared to radiate at the associated *beam peak direction* during the *transmitter ON state*

**Rated passband TRP output power**: mean power level declared by the manufacturer per passband, that the manufacturer has declared to be available at the RIB during the *transmitter ON state*

**Rated total TRP output power**: mean power level associated with a particular *operating band*, that the manufacturer has declared to be available at the RIB during the *transmitter ON state* in a specified reference condition

**Reference beam direction pair:** Beam direction pair in the reference direction declared by the manufacturer.

**Repeater type 2-O:** Repeater operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB

**Requirement set**: one of the NR requirements set as defined for *NR repeater*

**Sub-band**: A *sub-band* of an operating band contains a part of the uplink and downlink frequency range of the operating band.

**sub-block:** one contiguous allocated block of spectrum for transmission and reception by the repeater.

**Superseding-band**: A *superseding-band* of an operating band includes the whole of the uplink and downlink frequency range of the operating band.

**Total radiated power:** is the total power radiated by the antenna

NOTE: The *total radiated power* is the power radiating in all direction for two orthogonal polarizations. *Total radiated power* is defined in both the near-field region and the far-field region

**Transmitter OFF state:** Time period during which the repeater downlink or uplink is not allowed to transmit in the corresponding direction.

**Transmitter ON state:** Time period during which the repeater is transmitting downlink or uplink signals in the corresponding direction.

**Transmitter transient period:** Time period during which the repeater is changing from the OFF state to the ON state or vice versa.

3.2 Symbols

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

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

BWNominal Nominal channelbandwidth

BWPassband *Passband* bandwidth

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

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

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the *operating band* edgeFDL,low The lowest frequency of the downlink *operating band*

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

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

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

Ffilter Filter centre frequency

Foffset,high Frequency offset from FC,high to the upper *passband edge*

Foffset,low Frequency offset from FC,low to the lower *passband edge*

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

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

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*

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

Prated,in Rated pass band input power to the repeater for the test

Prated,p,EIRP Rated passband EIRP output power

Prated,p,TRP Rated passband TRP output power declared per RIB

Prated,t,TRP Rated total TRP output power declared per RIB

Pin,p,EIRP Input power intended to produce the maximum rated output power (Prated,p,TRP) at the RIB

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

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

Pmax,p,EIRP *Maximum passband EIRP output power* when repeater is configured at the rated passband TRP output power (Prated,p,TRP)

Pmax,p,TRP *Maximum passband TRP output power* measuredper RIB

Wgap *Inter passband Bandwidth gap* size

 The angle in the reference coordinate system, defined in sub-clause 4.14, between the projection of the x/y plane and the radiation vector defined between -90° and 90°. 0° represents the y/z plane. The angle is aligned with the down-tilt angle

θH The angle with respect to the horizon defined between +90° and -90°, above the horizon is positive below the horizon is negative. Note the orientation is opposite to 

θMT The down-tilt angle representing the mechanical tilt defined between -90° and +90° (positive towards the ground). The angle in the reference coordinate system, defined in sub-clause 4.12, between the x-axis and the projection of the radiation vector onto the x/y plane defined between -180° and 180°

The horizontal angle in the global coordinate system, defined with respect to the horizon.

<Next 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].

ACLR Adjacent Channel Leakage Ratio

AoA Angle of Arrival

BW Bandwidth

CACLR Cumulative ACLR

CP-OFDM Cyclic Prefix-OFDM

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

DL Downlink

EIRP Effective Isotropic Radiated Power

EEIRP Expected EIRP

EVM Error Vector Magnitude

FBW Fractional Bandwidth

FR Frequency Range

FSS Fixed Satellite Service

ITU‑R Radiocommunication Sector of the International Telecommunication Union

LA Local Area

MR Medium Range

NCR Network Controlled Repeater

NCR-MT NCR Mobile Termination

NCR-Fwd NCR Forward

NR New Radio

OBUE Operating Band Unwanted Emissions

OOB Out-of-band

OTA Over-The-Air

QAM Quadrature Amplitude Modulation

RF Radio Frequency

RIB Radiated Interface Boundary

RX Receiver

SCS Sub-Carrier Spacing

TX Transmitter

TRP Total Radiated Power

UL Uplink

WA Wide Area

<Next change>

4.1.2.2 Radiated characteristics measurements

The maximum OTA Test System uncertainty for radiated characteristics measurements are given in tables 4.1.2.2-1. Details for derivation of OTA Test System uncertainty are given in corresponding clauses in TR 37.941 [13].

**Table 4.1.2.2-1: Maximum Test System uncertainty for radiated characteristics tests**

| **Clause** | **Maximum Test System Uncertainty** | **Derivation of Test System Uncertainty** |
| --- | --- | --- |
| 6.2 Radiated transmit power (EIRP) | Normal condition:  ±1.7 dB (24.25 – 29.5 GHz)  ±2.0 dB (37 – 43.5 GHz)  ±2.2 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| Extreme condition:  ±3.1 dB (24.25 – 29.5 GHz)  ±3.3 dB (37 – 43.5 GHz)  ±3.5 dB (43.5 GHz < f ≤ 48.2 GHz) |
| 6.3 OTA repeater output power (TRP) | ±2.1 dB (24.25 – 29.5 GHz)  ±2.4 dB (37 – 43.5 GHz)  ±2.6 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| 6.4 OTA frequency stability | ±1] Hz  Measurement results of ± [5000] Hz |  |
| 6.5 OTA out of band gain | ±2.1 dB, 24.25GHz < f ≦ 29.5GHz  ±2.4 dB, 37GHz < f ≦ 43,5GHz  ±2.6 dB, 43.5GHz < f ≦ 48.2GHz |  |
| 6.6.2 OTA ACLR | Relative ACLR:  ±2.3 dB (24.25 – 29.5 GHz)  ±2.6 dB (37 – 43.5 GHz)  ±2.8 dB (43.5 GHz < f ≤ 48.2 GHz)  Absolute ACLR:  ±2.7 dB (24.25 – 29.5 GHz)  ±2.7 dB (37 – 43.5 GHz)  ±2.9 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| 6.6.3 OTA operating band unwanted emission | ±2.7 dB (24.25 – 29.5 GHz)  ±2.7 dB (37 – 43.5 GHz)  ±2.9 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| 6.6.4 OTA spurious emissions | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.7 dB, 6 GHz < f ≤ 40 GHz  ±5.0 dB, 40 GHz < f ≤ 60 GHz |  |
| 6.7 OTA EVM | 1.25% signal analyser  2% stimulus signal |  |
| 6.8 OTA input intermodulation | ±2.0 dB, f ≤ 3.0 GHz  ±2.6 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.2 dB, 4.2 GHz < f ≤ 6.0 GHz |  |
| 6.9 OTA ACRR | ±2.7 dB (24.25 – 29.5 GHz)  ±2.7 dB (37 – 43.5 GHz)  ±2.9 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| 6.10.1 OTA transmitter OFF power | ±2.9 dB (24.25 – 29.5 GHz)  ±3.3 dB (37 – 43.5 GHz)  ±3.6 dB (43.5 GHz < f ≤ 48.2 GHz) |  |
| 6.10.2 OTA transient period | N/A |  |
| 6.11 OTA Output power dynamics | ±0.7 dB, BW ≤ 40MHz  ±1.0 dB, 40MHz < f ≤ 100MHz |  |
| 6.12.1 OTA Frequency Error Requirements for NCR-MT | ± 0.01 ppm |  |
| 6.12.2 OTA Transmit Modulation Quality | 1% |  |
| 6.13 OTA Reference Sensitivity | ±3.3 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.3 dB, 37 GHz < f ≤ 43.5 GHz |  |
| 6.15 OTA Adjacent channel selectivity | ±4.2 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.2 dB, 37 GHz < f ≤ 43.5 GHz |  |
| 6.16 OTA Blocking Characteristics | In-band blocking:  ±4.2 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.2 dB, 37 GHz < f ≤ 43.5 GHz  Out of band blocking:  ±4.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.4 dB, 37 GHz < f ≤ 43.5 GHz |  |
| 6.17 OTA spurious emissions | ± 2.5 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.9 dB, 6 GHz < f ≤ 40 GHz  ±5.2 dB, 40 GHz < f ≤ 60 GHz |  |
| 6.18 OTA spatial emission | ±1.7, 6.425 GHz < f ≤ 7.075 GHz |  |

<Next change>

## 4.6 Manufacturer's declarations

The following repeater manufacturer's declarations listed in table 4.6-1, when applicable to the repeater under test, are required to be provided by the manufacturer for radiated requirements testing for *repeater type 2-O, NCR type 1-H and NCR type 2-O*. Declarations can be made independently for UL and DL.

For the *NCR type 1-H* declarations required for the conducted requirements testing, refer to TS 38.115-1 [3], clause 4.6.

Table 4.6-1: Manufacturers declarations for *repeater type 2-O* radiated test requirements

| Declaration identifier | Declaration | Description |
| --- | --- | --- |
| D.1 | Coordinate system reference point | Location of coordinated system reference point in reference to an identifiable physical feature of the repeater enclosure. |
| D.2 | Coordinate system orientation | Orientation of the coordinate system in reference to an identifiable physical feature of the repeater enclosure. |
| D.3 | Beam identifier | A unique title to identify a beam, e.g. a, b, c or 1, 2, 3. The vendor may declare any number of beams with unique identifiers. The minimum set to declare for conformance, corresponds to the beams at the reference beam direction with the highest intended EIRP, and covering the properties listed below:  1) A beam with the narrowest intended BeWθ and narrowest intended BeWϕ possible when narrowest intended BeWθ is used.  2) A beam with the narrowest intended BeWϕ and narrowest intended BeWθ possible when narrowest intended BeWϕ is used.  3) A beam with the widest intended BeWθ and widest intended BeWϕ possible when widest intended BeWθ is used.  4) A beam with the widest intended BeWϕ and widest intended BeWθ possible when widest intended BeWϕ is used.  5) A beam which provides the highest intended EIRP of all possible beams.  When selecting the above five beam widths for declaration, all beams that the repeater is intended to produce shall be considered, including beams that during operation may be identified by any kind of cell or UE specific reference signals, with the exception of any type of beam that is created from a group of transmitters that are not all phase synchronised.  (Note 1) |
| D.4 | *Operating bands* and passband frequency ranges | List of NR *operating band(s)* supported by the repeater and passband frequency range(s) within the *operating band(s)* that the repeater can operate in.  Supported bands declared for every beam (D.3). (Note 2) |
| D.5 | Repeater class | Declared as Wide Area repeater, Medium Range repeater, or Local Area repeater. |
| D.6 | *OTA peak directions set* reference beam direction pair | The beam direction pair, describing the reference beam peak direction and the reference beam centre direction. Declared for every beam (D.3). |
| D.7 | OTA peak directions set | The OTA peak directions set for each beam. Declared for every beam (D.3). |
| D.8 | *OTA peak directions set* maximum steering direction(s) | The *beam direction pair(s)* corresponding to the following points:  1) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive Φ direction, while the θ value being the closest possible to the reference beam centre direction.  2) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *Φ* direction, while the *θ value being the closest possible to the* reference beam centre direction*.*  3) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction.  4) The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction*.*  The maximum steering direction(s) may coincide with *the reference beam centre direction*.  Declared for every beam (D.3). |
| D.9 | Rated beam EIRP | The rated EIRP level per passband (Prated,p,EIRP) at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.8), as well as the reference *beam direction pair* (D.8). Declared for every beam (D.3).  (Note 5, 6, 7) |
| D.10 | Beamwidth | The *beamwidth* for the reference *beam direction pair* and the four maximum steering directions. Declared for every beam (D.3). |
| D.11 | Equivalent beams | List of beams which are declared to be equivalent.  Equivalent beams imply that the beams are expected to have identical *OTA peak directions sets* and intended to have identical spatial properties at all steering directions within the *OTA peak directions set* when presented with identical signals. All declarations (D.4 – D.10) made for the beams are identical and the transmitter unit*,* RDN and antenna array responsible for generating the beam are of identical design. |
| D.12 | Parallel beams | List of beams which have been declared equivalent (D.11) and can be generated in parallel using independent RF power resources.  Independent power resources mean that the beams are transmitted from mutually exclusive transmitter units. |
| D.13 | OTA coverage range | Declared as a single range of directions within which selected TX OTA requirements are intended to be met.  (Note 3) |
| D.14 | *OTA coverage range* reference direction | The direction describing the reference direction of the *OTA coverage range* (D.13).  (Note 4) |
| D.15 | OTA coverage range maximum directions | The directions corresponding to the following points:  1) The direction determined by the maximum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.  2) The direction determined by the minimum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.  3) The direction determined by the maximum θ value achievable inside the *OTA coverage range*, while φ value being the closest possible to the *OTA coverage range* reference direction.  4) The direction determined by the minimum θ value achievable inside the OTA coverage range, while φ value being the closest possible to the OTA coverage range reference direction. |
| D.16 | The rated passband OTA repeater power, Prated,p,TRP | Prated,p,TRP is declared as TRP OTA power per passband, declared per supported operating band.  (Note 5, 7) |
| D.17 | Rated transmitter TRP, Prated,t,TRP | Rated total radiated output power*.*  Declared per supported *operating band*.  (Note 5, 7) |
| D.18 | Spurious emission category | Declare the repeater spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [4]. |
| D.19 | Additional operating band unwanted emissions | The manufacturer shall declare whether the repeater under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in clause 6.7.4 apply. |
| D.20 | Co-existence with other systems | The manufacturer shall declare whether the repeater under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or PHS operating in another operating band are deployed. |
| D.21 | Supported frequency range of the NR *operating band* | List of supported frequency ranges representing *fractional bandwidths* (FBW) of *operating bands* with FBW larger than 6%. |
| D.22 | Rated beam EIRP at lower end of the *fractional bandwidth* (Prated,out,FBWlow) | The rated EIRP level per passband at lower frequency range of the *fractional bandwidth* (Prated,out,FBWlow), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.6).  Declared per beam for all supported frequency ranges (D.21).  (Note 5, 6, 7) |
| D.23 | Rated beam EIRP at higher frequency range of the *fractional bandwidth* (Prated,out,FBWhigh) | The rated EIRP level per passband at higher frequency range of the *fractional bandwidth* (Prated,out,FBWhigh), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.6).  Declared per beam for all supported frequency ranges in (D.21).  (Note 5, 6, 7)] |
| D.24 | Long delay repeater | Declared only if the repeater internal delay between the input and output for this repeater does not fit within the TDD transient time. The repeater is intended for situations in which it will not cause interference to other nodes. This is achieved by RF isolation or by reservation of longer guard periods, which degrades frame utilization. The length of repeaters internal delay is declared using this declaration. |
| D.25 | Input signal EIRP for maximum output power | Declaration of input signal EIRP required to reach maximum output power. Declared per passband. |
| D.26 | Repeater radiating direction | Declaration on whether the repeater is intended to radiate in DL, UL or both. Testing shall be performed only for the direction(s) in which the repeater radiates. |
| D.27 | Maximum repeater RF Bandwidth | Maximum *repeater RF Bandwidth* in the *operating band* for single-band operation. Declared per supported *operating band.* (Note 8) |
| NOTE 1: Depending on the capability of the system some of these beams may be the same. For those same beams, testing is not repeated.  NOTE 2: These *operating bands* are related to their respective single‑band RIBs.  NOTE 3: *OTA coverage range* is used for conformance testing of such TX OTA requirements as frequency error or EVM.  NOTE 4: The *OTA coverage range* reference direction may be the same as the Reference beam direction pair (D.8) but does not have to be.  NOTE 5: If a *Repeater type 2-O* is capable of 64QAM operation but not capable of 256QAM operation, then up to two rated output power declarations may be made. One declaration is applicable when configured for 64QAM operation and the other declaration is applicable when not configured for 64QAM operation.  NOTE 6: If D.22 and D.23 are declared for certain frequency range (D.21), there shall be no "Rated beam EIRP" declaration (D.9) for the *operating band* containing that particular frequency range.  NOTE 7: If a repeater type 2-O is capable of 256QAM operation, then up to three rated output power declarations may be made. One declaration is applicable when configured for 256QAM operation, a different declaration is applicable when configured for 64QAM operation and the other declaration is applicable when not configured neither for 256QAM nor 64QAM operation.  NOTE 8: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared. When separately declared, they shall still use the same declaration identifier. | | |

The following NCR manufacturer's declarations listed in table 4.6-2, when applicable to the NCR under test, are required to be provided by the manufacturer for radiated requirements testing for *NCR type 1-H* and *NCR type 2-O*. Declarations can be made independently for UL and DL.

**Table 4.6-2: Manufacturers declarations for *NCR type 1-H* and *NCR type 2-O* radiated test requirements**

| Declaration identifier | Declaration | Description | Applicability | | |
| --- | --- | --- | --- | --- | --- |
| NCR type 1-H | NCR-Fwd type 2-O | NCR-MT type 2-O |
| D.1 | Coordinate system reference point | Location of coordinated system reference point in reference to an identifiable physical feature of the NCR enclosure. | X | X | X |
| D.2 | Coordinate system orientation | Orientation of the coordinate system in reference to an identifiable physical feature of the NCR enclosure. | X | x | x |
| D.3 | Beam identifier | A unique title to identify a beam, e.g. a, b, c or 1, 2, 3. The vendor may declare any number of beams with unique identifiers. The minimum set to declare for conformance, corresponds to the beams at the reference beam direction with the highest intended EIRP, and covering the properties listed below:  1) A beam with the narrowest intended BeWθ and narrowest intended BeWϕ possible when narrowest intended BeWθ is used.  2) A beam with the narrowest intended BeWϕ and narrowest intended BeWθ possible when narrowest intended BeWϕ is used.  3) A beam with the widest intended BeWθ and widest intended BeWϕ possible when widest intended BeWθ is used.  4) A beam with the widest intended BeWϕ and widest intended BeWθ possible when widest intended BeWϕ is used.  5) A beam which provides the highest intended EIRP of all possible beams.  When selecting the above five beam widths for declaration, all beams that the NCR is intended to produce shall be considered, including beams that during operation may be identified by any kind of cell or UE specific reference signals, with the exception of any type of beam that is created from a group of transmitters that are not all phase synchronised.  (Note 1) | x | x | x |
| D.4 | *Operating bands* and passband frequency ranges | List of NR *operating band(s)* supported by the NCR and passband frequency range(s) within the *operating band(s)* that the NCR can operate in.  Supported bands declared for every beam (D.3). (Note 2) | c | x | x |
| D.5 | NCR class | Declared as Wide Area NCR, Medium Range NCR, or Local Area NCR. | c | x | x |
| D.6 | *OTA peak directions set* reference beam direction pair | The beam direction pair, describing the reference beam peak direction and the reference beam centre direction. Declared for every beam (D.3). | c | x | x |
| D.7 | OTA peak directions set | The OTA peak directions set for each beam. Declared for every beam (D.3). | c | x | x |
| D.8 | *OTA peak directions set* maximum steering direction(s) | The *beam direction pair(s)* corresponding to the following points:  1) Φmax: The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive Φ direction, while the θ value being the closest possible to the reference beam centre direction.  2) Φmax: The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *Φ* direction, while the *θ value being the closest possible to the* reference beam centre direction*.*  3) Φmax: The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the positive *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction.  4) Φmax: The beam peak direction corresponding to the maximum steering from the reference beam centre direction in the negative *θ* direction, while the *Φ value being the closest possible to the* reference beam centre direction*.*  The maximum steering direction(s) may coincide with *the reference beam centre direction*.  Declared for every beam (D.3).  For the EEIRP requirement in subclause 6.17, the OTA peak direction set maximum steering direction(s) describes the BS steering range(s) for a declared mechanical tilt range (D.33).  (Note 11) | x | x | x |
| D.9 | Rated beam EIRP | The rated EIRP level per passband (Prated,p,EIRP) at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.8), as well as the reference *beam direction pair* (D.8). Declared for every beam (D.3).  (Note 5, 6, 7) | x | x | x |
| D.10 | Beamwidth | The *beamwidth* for the reference *beam direction pair* and the four maximum steering directions. Declared for every beam (D.3). | x | x | x |
| D.11 | Equivalent beams | List of beams which are declared to be equivalent.  Equivalent beams imply that the beams are expected to have identical *OTA peak directions sets* and intended to have identical spatial properties at all steering directions within the *OTA peak directions set* when presented with identical signals. All declarations (D.4 – D.10) made for the beams are identical and the transmitter unit*,* RDN and antenna array responsible for generating the beam are of identical design. | x | x | x |
| D.12 | Parallel beams | List of beams which have been declared equivalent (D.11) and can be generated in parallel using independent RF power resources.  Independent power resources mean that the beams are transmitted from mutually exclusive transmitter units. | x | x | x |
| D.13 | OTA coverage range | Declared as a single range of directions within which selected TX OTA requirements are intended to be met.  (Note 3) | x | x | x |
| D.14 | *OTA coverage range* reference direction | The direction describing the reference direction of the *OTA coverage range* (D.13).  (Note 4) | x | x | x |
| D.15 | OTA coverage range maximum directions | The directions corresponding to the following points:  1) The direction determined by the maximum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.  2) The direction determined by the minimum φ value achievable inside the *OTA coverage range*, while θ value being the closest possible to the *OTA coverage range* reference direction.  3) The direction determined by the maximum θ value achievable inside the *OTA coverage range*, while φ value being the closest possible to the *OTA coverage range* reference direction.  4) The direction determined by the minimum θ value achievable inside the OTA coverage range, while φ value being the closest possible to the OTA coverage range reference direction. | x | x | x |
| D.16 | The rated passband OTA NCR power, Prated,p,TRP | Prated,p,TRP is declared as TRP OTA power per passband, declared per supported operating band.  (Note 5, 7) | N/A | x | x |
| D.17 | Rated transmitter TRP, Prated,t,TRP | Rated total radiated output power*.*  Declared per supported *operating band*.  (Note 5, 7) | N/A | x | x |
| D.18 | Spurious emission category | Declare the NCR spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [4]. | c | x | x |
| D.19 | Additional operating band unwanted emissions | The manufacturer shall declare whether the NCR under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in clause 6.7.4 apply. | c | x | x |
| D.20 | Co-existence with other systems | The manufacturer shall declare whether the NCR under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or PHS operating in another operating band are deployed. | c | x | x |
| D.21 | Supported frequency range of the NR *operating band* | List of supported frequency ranges representing *fractional bandwidths* (FBW) of *operating bands* with FBW larger than 6%. | c | x | x |
| D.22 | Rated beam EIRP at lower end of the *fractional bandwidth* (Prated,out,FBWlow) | The rated EIRP level per passband at lower frequency range of the *fractional bandwidth* (Prated,out,FBWlow), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.6).  Declared per beam for all supported frequency ranges (D.21).  (Note 5, 6, 7) | c | x | x |
| D.23 | Rated beam EIRP at higher frequency range of the *fractional bandwidth* (Prated,out,FBWhigh) | The rated EIRP level per passband at higher frequency range of the *fractional bandwidth* (Prated,out,FBWhigh), at the *beam peak direction* associated with a particular *beam direction pair* for each of the declared maximum steering directions (D.10), as well as the reference *beam direction pair* (D.6).  Declared per beam for all supported frequency ranges in (D.21).  (Note 5, 6, 7)] | c | x | x |
| D.24 | Long delay NCR | Declared only if the NCR internal delay between the input and output for this NCR does not fit within the TDD transient time. The NCR is intended for situations in which it will not cause interference to other nodes. This is achieved by RF isolation or by reservation of longer guard periods, which degrades frame utilization. The length of NCRs internal delay is declared using this declaration. | c | x |  |
| D.25 | Input signal EIRP for maximum output power | Declaration of input signal EIRP required to reach maximum output power. Declared per passband. | c | x |  |
| D.26 | NCR radiating direction | Declaration on whether the NCR is intended to radiate in DL, UL or both. Testing shall be performed only for the direction(s) in which the NCR radiates. | c | x |  |
| D.27 | Maximum NCR RF Bandwidth | Maximum *NCR RF Bandwidth* in the *operating band* for single-band operation. Declared per supported *operating band.* (Note 8) | c | x |  |
| D.28 | Support of simultaneous Tx of NCR-Fwd and NCR-MT | Declaration on whether the NCR support the simultaneous Tx of NCR-Fwd and NCR-MT | c | x | x |
| D.29 | OTA REFSENS RoAoA | Range of angles of arrival associated with the OTA REFSENS. | N/A | N/A | x |
| D.30 | OTA REFSENS receiver target reference direction | Reference direction inside the OTA REFSENS RoAoA (D.29). | N/A | N/A | x |
| D.31 | OTA REFSENS conformance test directions | The following four OTA REFSENS conformance test directions shall be declared:  1) The direction determined by the maximum φ value achievable inside the OTA REFSENS RoAoA, while θ value being the closest possible to the OTA REFSENS receiver target reference direction.  2) The direction determined by the minimum φ value achievable inside the OTA REFSENS RoAoA, while θ value being the closest possible to the OTA REFSENS receiver target reference direction.  3) The direction determined by the maximum θ value achievable inside the OTA REFSENS RoAoA, while φ value being the closest possible to the OTA REFSENS receiver target reference direction.  4) The direction determined by the minimum θ value achievable inside the OTA REFSENS RoAoA, while φ value being the closest possible to the OTA REFSENS receiver target reference direction. | N/A | N/A | x |
| D.32 | Single-band RIB or multi-band RIB | Declaration whether it is single band RIB or multi-band RIB. (Note 9) | c | x | x |
| D.33 | The mechanical down-tilt | For EEIRP the declaration of mechanical tilt together with D.8.(Note 10) | x | n/a | n/a |
| NOTE 1: Depending on the capability of the system some of these beams may be the same. For those same beams, testing is not repeated.  NOTE 2: These *operating bands* are related to their respective single‑band RIBs.  NOTE 3: *OTA coverage range* is used for conformance testing of such TX OTA requirements as frequency error or EVM.  NOTE 4: The *OTA coverage range* reference direction may be the same as the Reference beam direction pair (D.8) but does not have to be.  NOTE 5: If a NCR type 1-H or *NCR type 2-O* is capable of 64QAM operation but not capable of 256QAM operation, then up to two rated output power declarations may be made. One declaration is applicable when configured for 64QAM operation and the other declaration is applicable when not configured for 64QAM operation.  NOTE 6: If D.22 and D.23 are declared for certain frequency range (D.21), there shall be no "Rated beam EIRP" declaration (D.9) for the *operating band* containing that particular frequency range.  NOTE 7: If a NCR type 1-H or NCR type 2-O is capable of 256QAM operation, then up to three rated output power declarations may be made. One declaration is applicable when configured for 256QAM operation, a different declaration is applicable when configured for 64QAM operation and the other declaration is applicable when not configured neither for 256QAM nor 64QAM operation.  NOTE 8: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared. When separately declared, they shall still use the same declaration identifier.  NOTE 9: In case of NCR type 1-H, this declaration applies per TAB connector.  NOTE 10: The minimum mechanical down tilt and the maximum electrical steering range shall be declared. If the maximum steering range and the minimum mechanical down tilt are not simultaneously supported, the manufacturer shall declare and test the following two instances: One instance is minimum mechanical down tilt and the reduced electrical steering range, and the other instance is maximum electrical steering range and increased mechanical down tilt.  NOTE 11: EEIRP requirement applies only to NCR type 1-H. | | | | | |

<Next change>

## 4.8 Applicability of requirements

4.8.1 Applicability of test configurations

The applicable test configurations are specified in the tables below for each the supported RF configuration, which shall be declared according to clause 4.6. The generation and power allocation for each test configuration is defined in clause 4.7. This clause contains the test configurations for a RF repeater or NCR capable of single passband, and/or multi-bandoperation in both contiguous and non-contiguous spectrum in single band.

For a repeater or NCRdeclared to support a single *passband* within a single band, the test configurations in the second column of table 4.8.1-1 shall be used for testing.

For a repeater or NCRdeclared to support more than one *passband* within a single band (D.4) and where the parameters in the manufacture's declaration according to clause 4.6 are identical for all passbands, the test configurations in the third column of table 4.8.1-1 shall be used for testing.

For a repeater or NCRdeclared to support more than one *passband* within a single band (D.4) and where the parameters in the manufacture's declaration according to clause 4.6 are not identical for all passbands, the test configurations in the fourth column of table 4.8.1-1 shall be used for testing.

Table 4.8.1-1: Test configurations for a repeater capable of single or multiple *passbands* in a single band

|  |  |  |  |
| --- | --- | --- | --- |
| Test case | Single passband repeater | Multiple passband capable repeater with identical parameters per passband | Multiple passband capable repeater with different parameters per passband |
| Repeater output power | RTC1 | RTC1 | RTC1, RTC2 |
| Frequency stability | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude |
| Out of band gain | N/A | N/A | N/A |
| Transmit ON/OFF power (only applied for NR TDD repeater) | RTC1 | RTC1 | RTC1, RTC2 |
| Error Vector Magnitude | RTC1 | RTC1 | RTC1, RTC2 |
| Adjacent Channel Leakage power Ratio (ACLR) | RTC1 | RTC1, RTC2 | RTC1, RTC2 |
| Cumulative ACLR requirement in non-contiguous spectrum | - | RTC2 | RTC2 |
| Operating band unwanted emissions | RTC1 | RTC1, RTC2 | RTC1, RTC2 |
| Transmitter spurious emissions | RTC1 | RTC1, RTC2 | RTC1, RTC2 |
| Output intermodulation | RTC1 | RTC1, RTC2 | RTC1, RTC2 |
| Input intermodulation | N/A | N/A | N/A |
| Adjacent Channel Rejection Ratio (ACRR) | RTC1 | RTC2 | RTC1, RTC2 |
| Receiver spurious emissions | RTC1 | RTC1, RTC2 | RTC1, RTC2 |

Table 4.8.1-2: Test configurations for a NCR capable of single or multiple *passbands* in a single band

|  |  |  |  |
| --- | --- | --- | --- |
| Test case | Single passband NCR | Multiple passband capable NCR with identical parameters per passband | Multiple passband capable NCR with different parameters per passband |
| NCR output power | NCRTC1 | NCRTC1 | NCRTC1, NCRTC2 |
| Frequency stability | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude |
| Out of band gain | N/A | N/A | N/A |
| Transmit ON/OFF power | NCRTC1 | NCRTC1 | NCRTC1, NCRTC2 |
| Error Vector Magnitude | NCRTC1 | NCRTC1 | NCRTC1, NCRTC2 |
| Adjacent Channel Leakage power Ratio (ACLR) | NCRTC1 | NCRTC1, NCRTC2 | NCRTC1, RTC2 |
| Cumulative ACLR requirement in non-contiguous spectrum | - | NCRTC2 | NCRTC2 |
| Operating band unwanted emissions | NCRTC1 | NCRTC1, NCRTC2 | NCRTC1, NCRTC2 |
| Transmitter spurious emissions | NCRTC1 | NCRTC1, NCRTC2 | NCRTC1, NCRTC2 |
| Input intermodulation | N/A | N/A | N/A |
| Adjacent Channel Rejection Ratio (ACRR) | NCRTC1 | NCRTC2 | NCRTC1, NCRTC2 |
| Output power dynamics (Note 1) | SC | SC | SC |
| OTA spatial emission | SC | SC | SC |
| Transmitter signal quality (Note 1) | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude | Tested with Error Vector Magnitude |
| Reference sensitivity (Note 1) | SC | SC | SC |
| Adjacent channel selectivity (Note 1) | NCRTC1 | NCRTC2 | NCRTC1, INCRTC2 |
| Reveiver Blocking characteristics (Note 1) | NCRTC1 | NCRTC2 | NCRTC1, NCRTC2 |
| Receiver spurious emissions (Note 1) | NCRTC1 | NCRTC1, NCRTC2 | NCRTC1, NCRTC2 |

<Next change>

4.9.3 Test beam direction set

4.9.3.1 General

Conformance testing of *OTA spatial emission requirement* is based on a test beam direction set.

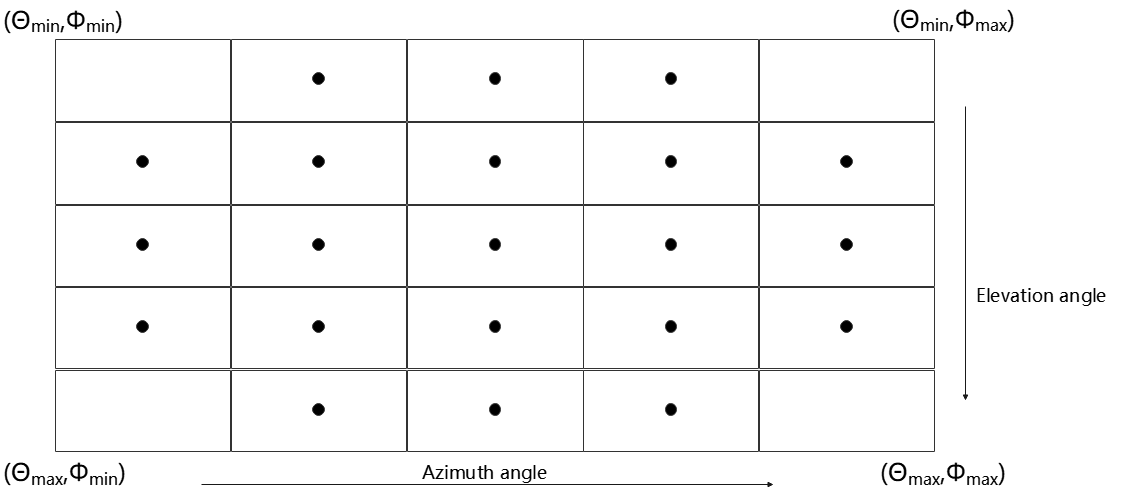
4.9.3.2 Test beam direction set for protection of FSS UL

The following beam direction set is utilized for conformance testing of requirements in clause 6.17.5.1 for *NCR type 1-H* operating in band n104. The test beam directions are defined in table 4.9.3.2-1.

**Table 4.9.3.2-1: Test beam direction set for protection of FSS UL**

|  |  |  |  |
| --- | --- | --- | --- |
| **Beam index** | **Elevation angle** | **Azimuth angle** | **Weighting factor** |
| 1 | *Θ*min+2.5(*Θ*max-*Θ*min)/25 | Φmin+7.5(Φmax-Φmin)/25 | 1/21 |
| 2 | *Θ*min+2.5(*Θ*max-*Θ*min)/25 | Φmin+12.5(Φmax-Φmin)/25 | 1/21 |
| 3 | *Θ*min+2.5(*Θ*max-*Θ*min)/25 | Φmin+17.5(Φmax-Φmin)/25 | 1/21 |
| 4 | *Θ*min+7.5(*Θ*max-*Θ*min)/25 | Φmin+2.5(Φmax-Φmin)/25 | 1/21 |
| 5 | *Θ*min+7.5(*Θ*max-*Θ*min)/25 | Φmin+7.5(Φmax-Φmin)/25 | 1/21 |
| 6 | *Θ*min+7.5(*Θ*max-*Θ*min)/25 | Φmin+12.5(Φmax-Φmin)/25 | 1/21 |
| 7 | *Θ*min+7.5(*Θ*max-*Θ*min)/25 | Φmin+17.5(Φmax-Φmin)/25 | 1/21 |
| 8 | *Θ*min+7.5(*Θ*max-*Θ*min)/25 | Φmin+22.5(Φmax-Φmin)/25 | 1/21 |
| 9 | *Θ*min+12.5(*Θ*max-*Θ*min)/25 | Φmin+2.5(Φmax-Φmin)/25 | 1/21 |
| 10 | *Θ*min+12.5(*Θ*max-*Θ*min)/25 | Φmin+7.5(Φmax-Φmin)/25 | 1/21 |
| 11 | *Θ*min+12.5(*Θ*max-*Θ*min)/25 | Φmin+12.5(Φmax-Φmin)/25 | 1/21 |
| 12 | *Θ*min+12.5(*Θ*max-*Θ*min)/25 | Φmin+17.5(Φmax-Φmin)/25 | 1/21 |
| 13 | *Θ*min+12.5(*Θ*max-*Θ*min)/25 | Φmin+22.5(Φmax-Φmin)/25 | 1/21 |
| 14 | *Θ*min+17.5(*Θ*max-*Θ*min)/25 | Φmin+2.5(Φmax-Φmin)/25 | 1/21 |
| 15 | *Θ*min+17.5(*Θ*max-*Θ*min)/25 | Φmin+7.5(Φmax-Φmin)/25 | 1/21 |
| 16 | *Θ*min+17.5(*Θ*max-*Θ*min)/25 | Φmin+12.5(Φmax-Φmin)/25 | 1/21 |
| 17 | *Θ*min+17.5(*Θ*max-*Θ*min)/25 | Φmin+17.5(Φmax-Φmin)/25 | 1/21 |
| 18 | *Θ*min+17.5(*Θ*max-*Θ*min)/25 | Φmin+22.5(Φmax-Φmin)/25 | 1/21 |
| 19 | *Θ*min+22.5(*Θ*max-*Θ*min)/25 | Φmin+7.5(Φmax-Φmin)/25 | 1/21 |
| 20 | *Θ*min+22.5(*Θ*max-*Θ*min)/25 | Φmin+12.5(Φmax-Φmin)/25 | 1/21 |
| 21 | *Θ*min+22.5(*Θ*max-*Θ*min)/25 | Φmin+17.5(Φmax-Φmin)/25 | 1/21 |
| NOTE 1: *Θ*min, *Θ*max, Φmax, Φmin is defined in the declaration D.8 with the associated declaration D.33. | | | |

The test beam directions are visualised in Figure 4.9.3.2-1.



**Figure 4.9.3.2-1 Test beam set for conformance testing**

<Next change>

6.17 OTA spatial emission

6.17.1 Definition and applicability

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

6.17.2 Minimum requirement

The minimum requirement for *NCR type 1-H* operation is defined in TS 38.106 [2], clause 7.18.2.

6.17.3 Test purpose

The test purpose is to verify the ability of the transmitter units associated with the *RIB* under test to radiated power in specified elevation angle ranges with respect to the horizon.

6.17.4 Method of test

6.17.4.1 Initial conditions

Test environment: normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1. SC carrier, the one characterised by all of requirements below:

- Highest supported Power Spectral Density (PSD) level with the corresponding BW.

6.17.4.2 Procedure

When calibrated and operated within the guidance of 3GPP TR 37.941 [25] the measurement methods are applicable and selected depending on availability at the test facility.

The test range shall be calibrated according to calibration method described in TR 37.941, clause 8.3.

1. Place the NCR at the positioner, such that blocking effect in the vertical domain is minimized.

2. Align the manufacturer declared coordinate system orientation (D.2) of the NCR with the coordinate system used by the test system.

3. The measurement device characteristics shall be: Detection mode set to True RMS.

4. Set the NCR to transmit on both polarizations according to applicable test configuration in clause 4.8 using the corresponding test model NR-FR1-TM1.1 described in TS 38.141-1 [3], clause 4.9.2. The configured EIRP for each of the test beams shall be in direct relation to the intended use of the NCR.

5. Orient the positioner (and the NCR) to the angle for measurement point for and N. Spatial sampling grid is defined in Annex J, clause J.3.

6. Configure test beam(s) and test equipment for measuring test beam k for k=1..K, as defined in clause 4.9.3.2.

7. For all *m*, *n*, *k*, measure EIRP as a sum of two orthogonal polarizations:

where p1 and p2 denote two orthogonal polarizations.

8. Calculate from measured for bins i=1..7, as described in Annex J.

In case the EEIRP measurement is performed for non-zero mechanical tilt and the NCR is fixed on the positioner without any elevation angular offset, then coordinates are translated as described in Annex J, clause J.2.

In case the EEIRP measurement is performed for non-zero mechanical tilt and the NCR is fixed on the positioner at an elevation angular offset as large as the mechanical tilt, then sign is inverted and other coordinate translation in Annex J.2 is not needed.

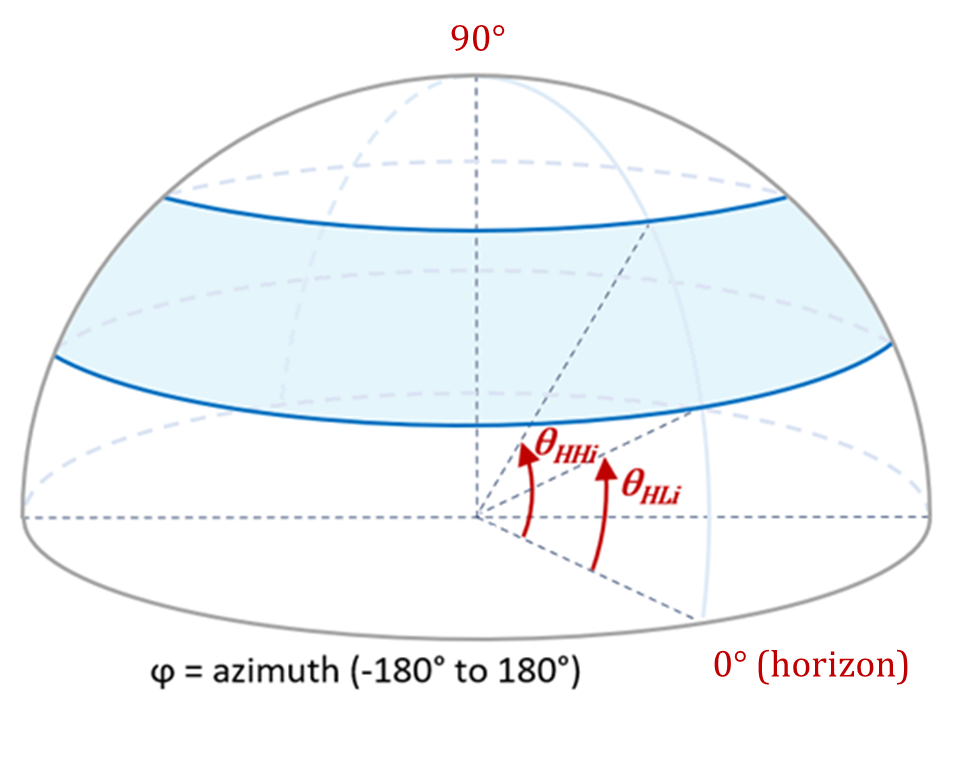
6.17.5 Test requirements

6.17.5.1 Requirement for NCR type 1-H

For NCR type 1-H operating in band n104, the Expected EIRP (EEIRP) in the frequency range 6425 – 7075 MHz, the power measured EEIRP shall not exceed the limits specified in table 6.17.5.1-1 for mechanical down-tilt angle equal to zero.NOTE: OTA spatial emissions in table 6.17.5.1-1 are defined with respect to the horizon with angles above the horizon positive and below the horizon negative The reference NCR coordinate system in sub-clause 4.12 system is defined with respect to the BS enclosure with angles above the boresight negative and below the boresight positive. If the NCR is aligned with the horizon (mechanical tilt is zero) then the coordinate systems sign is inverted.

**Table 6.17.5.1-1: EEIRP limits as function of elevation above horizon**

| **Bin**  **number**  **i** | **Elevation angular range**  **θHLi ≤ θ < θHHi (Degrees)** | **EEIRP limit (dBm/MHz)** |
| --- | --- | --- |
| 1 | 0≤<5 | 27 |
| 2 | 5≤<10 | 23 |
| 3 | 10≤<15 | 19 |
| 4 | 15≤<20 | 18 |
| 5 | 20≤<<30 | 16 |
| 6 | 30≤<<60 | 15 |
| 7 | 60≤<<90 | 15 |
| NOTE 1: The requirement shall apply to all supported mechanical tilts. | | |

**Figure 6.17.5.1-1: Definitions of θHLi and θHHi angles.**

<Next change>

Annex J (normative):

Expected EIRP calculation and spatial sampling grid

J.1 General

The Expected EIRP calculation is based on two averaging processes:

* Averaging over the test beam directions.
* Averaging over horizontal and vertical angles within specified vertical angles bins.

Clause N.2 describes the details of the calculation of the EEIRP from the measured EIRP samples.

NOTE: Clause N.2 assumes that averaging over beam directions is performed first. It is also correct to perform first the averaging over horizontal and vertical angles (as described in N.2.2) and then averaging over the test beams (as described in N.2.1).

The required sampling resolution for the EIRP measurement per test beam direction is described in Annex J.3

J.2 Averaging processes

J.2.1 Averaging over beam directions

The first averaging process involves averaging over different test beam directions. For a given vertical angle and horizontal angle with a sampling of *K* beamforming directions, the equation can be written as:

The power measured is the sum of the EIRP in both polarisations. The is the average over the K number of test beam directions for the angle .

For the case where non-zero mechanical tilt is considered the reference coordinate system in clause 4.12 in this document needs to be converted to the coordinate system used by the test requirement (Figure 6.17.5.1-1). The angles in the reference coordinate system can be translated to the coordinate system with respect to horizon as:

,

where:

The angle in the reference coordinate system defined in sub-clause 4.12 between the projection of the x/y plane and the radiation vector defined between -90° and 90°. 0° represents the direction perpendicular to the y/z plane. The angle is aligned with the down-tilt angle.

is the angle in the reference coordinate system defined in sub-clause 4.14 between the x-axis and the projection of the radiation vector onto the x/y plane defined between -180° and 180°.

is the angle with respect to the horizon defined between +90° and -90°, above the horizon is positive below the horizon is negative. Note the orientation is opposite to 

is the down-tilt angle representing the mechanical tilt defined between -90° and +90° (positive towards the ground).

The horizontal angle in the global coordinate system, defined with respect to the horizon.

J.2.2 Averaging over horizontal and vertical angles

The second averaging process is over a spherical strip. This EEIRP for a spherical strip is therefore:

,

Where

(qn, jm) represents discrete spatial measurement points in the measured average EIRP samples. The sample resolution is defined in Annex J.3.

is the elevation angular range bounded by and in degrees, e.g. for bin 1, this will be 0⁰ and 5⁰ respectively.

is the corresponding angle of the midpoint between the elevation intervals, referenced from the horizon. Midpoint is the middle point between the intervals, e.g. for the interval 1°-2°, the midpoint is 1.5°.

is the corresponding angle of the midpoint between the azimuth intervals

is the lowest elevation index of sampling points within the range

is the highest elevation index of sampling points within the range

is the number of azimuth points within the (-180°, 180°) range

is the number of elevation points within the range

Note: All angles are in degrees.

J.3 Spatial sampling grid

The maximum EIRP sampling resolution in degrees required for the EIRP pattern measurement is given by:

,

where ** is the wavelength and *D* is the physical length of the array antenna diagonal. The physical length of the array antenna diagonal can be determined by following expression:

,

where *w* is the array antenna width, and *h* is the array antenna height.

<End of changes>