**3GPP TSG-RAN WG4 Meeting # 100-e *R4-2115869***

**Electronic meeting, August 16-27, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **-2** | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Big CR for TS 38.176-2 Maintenance | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, Nokia | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IAB-Perf | | | | |  | ***Date:*** | | | 2021-08-31 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CRs merge the mutile endorsed draf CRs . The reason for change in each endorsed draft CR is copied below.   1. **R4-2113490, Draft CR to TS 38.176-2 – alignment for test models acronyms**   This draft CR introduces corrections to test model acronyms used for test models for some of the IAB tests.  Currently in TS 38.176-2 IAB test specification exist different approaches in some IAB test descriptions that use references to IAB test models (TMs).  Some of the tests use acronyms for test models from NR specification directly for example: “NR-FR1-TMx.x”. Such cases were aligned to acronym “IAB-DU-FR1-TMx.x” or “IAB-DU-FR1-TMx.x” or “IAB-MT-FR1-TMx.x” or “IAB-MT-FR  Some of the tests use acronyms “IAB-FR1-TM1.1” – as this refers to both DU and MT, however such acronym is not define in specification thus it should be directly with “DU” or “MT” added like “IAB-DU-FR1-TM1.1” or “IAB-MT-FR1-TM1.1”.  Similar draft CR is also submitted in [1] for conducted IAB test specification TS 38.176-1.  [1] R4-2113489 Draft CR to TS 38.176-1 – alignment for test models acronyms, Nokia, Nokia Shanghai Bell   1. **R4-2114322, CR on conducted performance specification of IAB-RX**   7.1: missing text   1. **R4-2114323, CR on conducted performance specification of IAB – General and TX**   4.6: note 19: ambiguity on rated carrier power or per band power.  Typo in 6.4.1.2.3   1. **R4-2115699, Draft CR to TS 38.176-2 with editorial updates**   This draft CR introduces editorial corrections and updates to 38.176-2 specification excluding demodulation part in clause 8.   1. **R4-2115700, Draft CR to TS 38.176-2: Corrections to OTA emissions**   OTA emission section includes missing or duplicated clause numbers. Different MU/TT in FR2 has not been taken into account in test requirements. In some sections definition and applicability clause includes minimum requirements instead, causing redundancy. Test requirements are not written out and reference core specification.   1. **R4-2115705, Maintenance CR to TS 38.176-2**   1) IAB with integrated Iuant BS modem is not aligned with 38.141-2  2) Editorial changes in section 4.9.2.1, 4.9.2.2.   1. **R4-2115707, Draft CR to TS 38.176-2: Test efficiency optimization**   Test efficiency optimization is not aligned between conducted and radiated requirements. Multi-band related declarations are missing. Test requirement applicability has errors setting wrong or unnecessary rules.   1. **R4-2115709, draftCR to TS 38.176-2 IAB-DU performance requirements and parts of DU and MT appendix**   Provide corrections to the first published version of the TS sections on IAB-DU perefomance requirements and parts of DU and MT appedix as per work split.   1. **R4-2115714, Draft CR to 38.176-2: Applicability for IAB-MT requirements**   Currently the applicability for IAB-MT requirements is not defined.   1. **R4-2115716, draftCR on IAB-MT radiated conformance testing (General and Demodulation) to TS 38.176-2**   Provide updated draft CR for NR IAB-MT radiated conformance testing (General and Demodulation) as per work split.   1. **R4-2115769, Draft CR to TS 38.176-2: Correction of applicability rules for demodulation performance requirements**   Applicability rules agreed for IAB performacnce verification are not captured in specification. PMI test configuration contains paramers for two test cases while only one test were agreed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change in each each endorsed draft CR is copied below.  **1) R4-2113490, Draft CR to TS 38.176-2 – alignment for test models acronyms**   1. Clause 6.4.1.3.4.2: rename NR-FR1-TMx.x to IAB-DU-FR1-TMx.x respectively in step 5 and 7. 2. Clause 6.7.2.4.1: addition of aprioperiate acronyms of TMs instead of undefine acronyms “IAB-FR1-TMx.x” 3. Clause 6.7.5.2.4.2: addition of aprioperiate acronyms of TMs instead of undefine acronyms “IAB-FR1-TMx.x” in step 5   Clause 6.7.5.4.4.2: addition of aprioperiate acronyms of TMs instead of undefine acronyms “IAB-FR1-TMx.x” in step 5  4) Clause 6.7.5.4.4.2: addition of aprioperiate acronyms of TMs instead of undefine acronyms “IAB-FR1-TMx.x” in step 5   1. **R4-2114322, CR on conducted performance specification of IAB-RX**   7.1: add missing text   1. **R4-2114323, CR on conducted performance specification of IAB – General and TX**   4.5.4: remove the test condition of luant modem ON.  4.6: note 19: add D.38 for rated output power,  Type correction in 6.4.1.2.3   1. **R4-2115699, Draft CR to TS 38.176-2 with editorial updates**   Following editorial updates are done:   |  |  |  | | --- | --- | --- | | Clause | Table | Description | | 2 |  | Reference [29] has multiple extra spaces after first quote mark. | | 3.1 |  | Usage of capital letters: Aggregated IAB-DU channel bandwidth vs. Aggregated IAB-MT Channel Bandwidth. | | 3.2 |  | BS channel bandwidth to IAB channel bandwidth, NR BS to IAB | | 4.1.1 | Table 4.1.1-1 | Formatting in table corrected | | 4.1.2.2 | Table 4.1.2.2-1  Table 4.1.2.2-2 | Multiple square brackets in clause numbers, Notes in the table should not be in all caps | | 4.1.2.3 | Table 4.1.2.3-1 | For OTA out-of-band blcoking (Co-location) fwanted and finterferer are not using sub-script, different from the cell above | | 4.13 | Table 4.13-1 | Italic font for IAB for D.33 | | 4.6 | Table 4.6-1 | Italic font for IAB for declaration [D.103] IAB type 2-O corrected for 60/120kHz  D.10 has italics for "value being closest possible…" | | 4.3.1 |  | Italic font for IAB | | 4.3.2 |  | Italic font, addition of 'IAB type' to 2-O | | 4.7.2.1 |  | removal of unnecessary dot in first sentence | | 4.9.2.2 |  | update of reference to 38.141-2 | | 6.2.5.1 |  | Three dots at the end of table? No requirement for extreme conditions | | 6.3.1 | Table 6.3.1-1 and 6.3.1-2 | Should the note for Wide Area be Note | | 6.3.5.1 |  | Italic font for header | | 6.3.5.2 |  | the editor's note is not necessary (it is correct though) | | 6.4.1.2.1 |  | Replace BS to IAB-DU | | 6.4.1.3.1 |  | Term BS used in the note, replace BS to IAB-DU | | 6.4.2.1.4.2 |  | Measurement step 5 has term BS in section for type 2-O | | 6.4.1.3.4.2 |  | Italic font in step 5 and step 7  Term BS used mulitple times in measurement steps 5 and 7 | | 6.4.1.3.5.1 | Table 6.4.1.3.5.1-1 | empty row to be remove | | 6.4.2.1.4.2 |  | Italic font in step 5 and step 7  Measurement step 5 has term BS in section for type 2-O | | 6.4.2.1.5.2 |  | italic for IAB in header | | 6.7.2.4.1 |  | Italic font for IAB | | 6.8.4.2 |  | measurement step 10: for IAB-MT referes to clause 4.9.x. and IAB-DU reference updated | | 7.2.1 |  | Italic font for IAB, non-intalic font for ‘receiver’, italic for “receiver target reference direction | | 7.4.1 |  | removal of brackets for IAB-DU | | 7.5.2.4.2 |  | Measurement step 6: a and b are missing the right parenthesis ) , italics should be removed from "For" in multiple lines. | | 7.6.5.1.2 | Table 7.6.5.1.2-1 | ‘BS’ removed from table header where is not needed; additional space before [2] | | 7.7.5.2 |  | italic for IAB type 2-O | | 7.8.5.3 | Table 7.8.5.3-4 | Notes in the table with all caps | | 7.9.5.2 | Table 7.9.5.2-1 | additional space before 38.174 | | E.1.1 |  | italic for IAB type 2-O | | E.1.4 |  | italic for IAB type 1-O |  1. **R4-2115700, Draft CR to TS 38.176-2: Corrections to OTA emissions**   Specification will still include editorial erros.  - 6.7.1: table number correction  - 6.7.2.4.1: Editorial correction on the use of italics  - 6.7.3.5.1: Test requirement is explicitly written instead of referring to core spec  - 6.7.3.5.2: Correct TT applied, editorial corrections  - 6.7.3.5.3: Correct TT applied, editorial corrections  - 6.7.4.1.1/2/3: Definition and applicability clauses corrected to not include minimum requirements, Editorial corrections  6.7.4.6.3.1: Reference correction  6.7.4.6.4.1: Correct TT applied, editorial corrections  6.7.4.6.4.2: Correct TT applied, editorial corrections  6.7.5.3: Missing clause added as Void   1. **R4-2115705, Maintenance CR to TS 38.176-2** 2. To keep the alignment between IAB and NR BS on integrated Iuant BS modem; 3. Editorial changes in section 4.9.2.1, 4.9.2.2. 4. **R4-2115707, Draft CR to TS 38.176-2: Test efficiency optimization**   Multi-band related declarations added. Corrections to test requirement applicability. Editorial corrections.   1. **R4-2115709, draftCR to TS 38.176-2 IAB-DU performance requirements and parts of DU and MT appendix**   1) Editorial changes in IAB-DU performance requirments  2) Removal of 5MHz cahnnel bendwidth requirements  3) Updates in IAB-MT and IAB-DU test setup figures  4) Update of text in NOTE 2 to test setup figures  5) Removal of square brackets in test tolerances  6) Addition of missing section on Physical signals, channels mapping and precoding   1. **R4-2115714, Draft CR to 38.176-2: Applicability for IAB-MT requirements**   IAB-MT requirements applicability is captured in both declarations and relating to capability signaling. The declarations align the applicability to the approach for IAB-DU and the capability table relates the applicability to RAN2 signaling.   1. **R4-2115716, draftCR on IAB-MT radiated conformance testing (General and Demodulation) to TS 38.176-2**   For introducing IAB-MT radiated conformance testing (General and Demodulation), update clause 8.2.   1. **R4-2115769, Draft CR to TS 38.176-2: Correction of applicability rules for demodulation performance requirements**   Clarification of Applicability rules for IAB-DU  Update of PMI test configuration | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The consequences if not approved for each endorsed draft CR are coppied below.   1. **R4-2113490, Draft CR to TS 38.176-2 – alignment for test models acronyms**   Specification will be misleading.   1. **R4-2114322, CR on conducted performance specification of IAB-RX**   Errors in specificaitons.   1. **R4-2114323, CR on conducted performance specification of IAB – General and TX**   Errors in specificaitons.   1. **R4-2115699, Draft CR to TS 38.176-2 with editorial updates**   Specification will still include editorial erros.   1. **R4-2115700, Draft CR to TS 38.176-2: Corrections to OTA emissions**   Erroneous test requirements remain causing wrong pass/fail criteria to be used.   1. **R4-2115705, Maintenance CR to TS 38.176-2**   IAB conformance testing spec is not defined correctly   1. **R4-2115707, Draft CR to TS 38.176-2: Test efficiency optimization**   Misalignment and errors exist resulting in unfair treatment depending on whether a device conforms to radiated or conducted requirements. Errors in the applicability rules remain   1. **R4-2115709, draftCR to TS 38.176-2 IAB-DU performance requirements and parts of DU and MT appendix**   It will be inconsistencies in the specification 38.176-2   1. **R4-2115714, Draft CR to 38.176-2: Applicability for IAB-MT requirements**   Unclear applicability for IAB-MT requirements.   1. **R4-2115716, draftCR on IAB-MT radiated conformance testing (General and Demodulation) to TS 38.176-2**   There will be inconsistence between the specification 38.176-2 and RAN 4 agreements.   1. **R4-2115769, Draft CR to TS 38.176-2: Correction of applicability rules for demodulation performance requirements**   Performance for IAB node cannot be guaranteed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1. **R4-2113490**: 6.4.1.3.4.2, 6.7.2.4.1, 6.7.5.2.4.2, 6.7.5.4.4.2 2. **R4-2114322**: 7.1 3. **R4-2114323**: 4.6, 6.4.1.2.3 4. **R4-2115699**: 2, 3.1, 3.2, 4.1.1, 4.1.2.2, 4.1.2.3, 4.13, 4.6, 4.3.1, 4.3.2, 4.7.2.1, 4.9.2.2, 6.2.5.1, 6.3.1, 6.3.5.1, 6.3.5.2, 6.4.1.2.1, 6.4.1.3.1, 6.4.2.1.4.2, 6.4.1.3.4.2, 6.4.1.3.5.1, 6.4.2.1.4.2, 6.4.2.1.5.2, 6.7.2.4.1, 6.8.4.2, 7.2.1, 7.4.1, 7.5.2.4.2, 7.6.5.1.2, 7.7.5.2, 7.8.5.3, 7.9.5.2, E.1.1, E.1.4 5. **R4-2115700:** 6.7.1, 6.7.2.4.1, 6.7.3.5.1, 6.7.3.5.2, 6.7.3.5.3, 6.7.4.1.1, 6.7.4.1.2, 6.7.4.1.3, 6.7.4.6.3.1, 6.7.4.6.4.1, 6.7.4.6.4.2 , 6.7.5.3 6. **R4-2115705**: 4.5.4, 4.9.2.1, 4.9.2.2 7. **R4-2115707**: 4.13 8. **R4-2115709**: 8.1, E.3, J.3 9. **R4-2115714**: 4.6, 8.2.3.1 10. **R4-2115716:** 8.2 11. **R4-2115769:** 8.1.1.3.3, 8.1.1.3.4, 8.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

<Start of changes from R4-2115699>

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 38.174: "NR; Integrated access and backhaul radio transmission and reception".

[3] 3GPP TS 38.176-1: " NR; Integrated Access and Backhaul (IAB) conformance testing; Part 1: Conducted conformance testing".

[4] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".

[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] 3GPP TS 38.211: "NR; Physical channels and modulation".

[8] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[9] 3GPP TS 38.213: "NR; Physical layer procedures for control".

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

[11] ERC Recommendation 74-01: "Unwanted emissions in the spurious domain".

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

[13] Recommendation ITU-R SM.328: "Spectra and bandwidth of emissions".

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

[15] 3GPP TR 25.942: "RF system scenarios".

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

[17] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[18] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".

[19] 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".

[20] 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".

[21] IEC 60 721: "Classification of environmental conditions".

[22] IEC 60 068-2-1 (2007): "Environmental testing - Part 2: Tests. Tests A: Cold".

[23] IEC 60 068-2-2: (2007): "Environmental testing - Part 2: Tests. Tests B: Dry heat".

[24] IEC 60 068-2-6: (2007): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)".

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

[26] 3GPP TR 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz".

[27] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[28] 3GPP TS 38.521-1: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Range 1 standalone".

[29] 3GPP TS 38.521-2: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Range 2 standalone”.

<Next modified section from R4-2115699>

3 Definitions of terms, symbols and abbreviations

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].

**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 one or more *IAB type 1-H* *TAB connectors* at the *transceiver array boundary***Aggregated IAB-DU channel bandwidth**: The RF bandwidth in which an IAB-DU transmits and receives multiple contiguously aggregated carriers. The aggregated IAB-DU channel bandwidth is measured in MHz.

**Aggregated IAB-MT channel bandwidth**: The RF bandwidth in which an IAB-MT transmits and receives multiple contiguously aggregated carriers. The aggregated IAB-MT channel bandwidth is measured in MHz.

**basic limit:** emissions limit relating to the power supplied by a single transmitter to a single antenna transmission line in ITU-R SM.329 [16] 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 *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

**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 IAB-DU or IAB-MT aggregates carriers with a specific set of technical requirements

**Channel edge:** lowest or highest frequency of the NR carrier, separated by the *IAB-MT channel bandwidth* or *IAB-DU channel bandwidth*.

**co-location reference antenna**: a passive antenna used as reference for co-location requirements

**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 *OTA REFSENS RoAoA* or the *minSENS RoAoA* as appropriate for the receiver

**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

NOTE: Isotropic directivity is equal in all directions (i.e. 0 dBi).

**equivalent isotropic sensitivity:** sensitivity for an isotropic directivity device equivalent to the sensitivity of the discussed device exposed to an incoming wave from a defined AoA

NOTE 1: The sensitivity is the minimum received power level at which specific requirement is met.

NOTE 2: Isotropic directivity is equal in all directions (i.e. 0 dBi).

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



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

**IAB-DU channel bandwidth**: RF bandwidth supporting a single IAB-DU RF carrier with the *transmission bandwidth* configured in the uplink or downlink

NOTE 1: The *IAB-DU 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 IAB to transmit to and/or receive from one or more IAB-MT bandwidth parts that are smaller than or equal to the *IAB transmission bandwidth configuration*, in any part of the *IAB transmission bandwidth configuration*.

**IAB-donor**:gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-DU RF Bandwidth:** RF bandwidth in which an IAB-DU transmits and/or receives single or multiple carrier(s) within a supported *operating band*

**IAB-DU RF Bandwidth edge:** frequency of one of the edges of the *IAB-DU RF Bandwidth*.

**IAB-MT channel bandwidth**: RF bandwidth supporting a single IAB-MT RF carrier with the *transmission bandwidth* configured in the uplink or downlink

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

**IAB-MT RF Bandwidth**: RF bandwidth in which an IAB-MT transmits and/or receives single or multiple carrier(s) within a supported *operating band*

NOTE: In single carrier operation, the *IAB-MT RF Bandwidth* is equal to the *IAB-MT channel bandwidth*.

**IAB-MT RF Bandwidth edge:** frequency of one of the edges of the *IAB-MT RF Bandwidth*.

**IAB RF Bandwidth:** RF bandwidth in which an IAB-DU or IAB-MT transmits and/or receives single or multiple carrier(s) within a supported *operating band*

**IAB RF Bandwidth edge:** frequency of one of the edges of the *IAB RF Bandwidth*.

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

**IAB type 1-O:** IAB-DU or IAB-MT operating at FR1 with a *requirement set* consisting only of OTA requirements defined at the RIB

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

**inter-band gap**: The frequency gap between two supported consecutive *operating bands*.

**Inter RF Bandwidth gap:** frequency gap between two consecutive *IAB-DU* or *IAB-MT 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.

**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 perRIB during the *transmitter ON period* for a specific carrier in a specified reference condition and corresponding to the declared *rated carrier TRP output* power (Prated,c,TRP)

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

**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**: *TAB connector* of *IAB 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*

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

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

NOTE: The *operating band*(s) for an IAB-DU and IAB-MT are declared by the manufacturer

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

NOTE: The *beam peak directions* are related to a corresponding contiguous range or discrete list of *beam centre directions*by the *beam direction pairs* included in the set.

**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 assuming that for any AoA, the receiver gain is optimized for that AoA

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

**OTA sensitivity directions declaration:** set of manufacturer declarations comprising at least one set of declared minimum EIS values (with *IAB-DU* or *IAB-MT channel bandwidth*), and related directions over which the EIS applies

NOTE: All the directions apply to all the EIS values in an OSDD.

**Parent node**: IAB-MT's next hop neighbour node; the parent node can be IAB-node or IAB-donor.

**polarization match:** condition that exists when a plane wave, incident upon an antenna from a given direction, has a polarization that is the same as the receiving polarization of the antenna in that direction

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

NOTE: For requirements based on EIRP/EIS, the *radiated interface boundary* is associated to the far-field region

**Radio Bandwidth:** frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier

**rated beam EIRP:** For a declared beam and *beam direction pair*, the *rated beam EIRP* level is the maximum power that the IAB-DU or IAB-MT is declared to radiate at the associated *beam peak direction* during the *transmitter ON period*

**rated carrier output power:** mean power level associated with a particular carrier the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**rated carrier TRP output power:** mean power level declared by the manufacturer per carrier, for IAB-DU or IAB-MT operating in single carrier, multi-carrier, or carrier aggregation configurations that the manufacturer has declared to be available at the RIB during the *transmitter ON period*

**rated total output power:** mean power level associated with a particular *operating band* the manufacturer has declared to be available at the indicated interface, during the *transmitter ON period* in a specified reference condition

**rated total TRP output power:** mean power level declared by the manufacturer, that the manufacturer has declared to be available at the RIB during the *transmitter ON period*

**reference beam direction pair:** declared *beam direction pair*, including reference *beam centre direction* and reference *beam peak direction* where the reference *beam peak direction* is the direction for the intended maximum EIRP within the *OTA peak directions set*

**receiver target:** AoA in which reception is performedby *IAB type 1-H* or *IAB type 1-O*

**receiver target redirection range:** union of all the *sensitivity RoAoA* achievable through redirecting the *receiver target* related to particular OSDD

**receiver target reference direction:** direction inside the *OTA sensitivity directions declaration* declared by the manufacturer for conformance testing. For an OSDD without *receiver target redirection range*, this is a direction inside the *sensitivity RoAoA*

**reference RoAoA**: the *sensitivity RoAoA* associated with the *receiver target reference direction* for each OSDD.

**requirement set:** one of the NR requirement sets as defined for *IAB type 1-H*, *IAB type 1-O*, and *IAB type 2-O*

**sensitivity RoAoA:** RoAoA within the *OTA sensitivity directions declaration*, within which the declared EIS(s) of an OSDD is intended to be achieved at any instance of time for a specific IAB-DU or IAB-MT direction setting

**single-band connector:** *IAB type 1-H* *TAB connector* supporting operation either in a single *operating band* only, or in multiple *operating bands* but does not meet the conditions for a *multi-band connector*.

**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 same IAB-DU or IAB-MT

NOTE: There may be multiple instances of *sub-blocks* within a *IAB RF Bandwidth*.

**sub-block gap:** frequency gap between two consecutive sub-blocks within a *IAB RF Bandwidth*, where the RF requirements in the gap are based on co-existence for un-coordinated operation

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

**TAB connector:** *transceiver array boundary* connector

**TAB connector RX min cell group:** *operating band* specific declared group of *TAB connectors* to which *IAB type 1-H* conducted RX requirements are applied

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for receiving a cell when the *IAB type 1-H* setting corresponding to the declared minimum number of cells with reception on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**TAB connector TX min cell group:** *operating band* specific declared group of *TAB connectors* to which *IAB type 1-H* conducted TX requirements are applied.

NOTE: Within this definition, the group corresponds to the group of *TAB connectors* which are responsible for transmitting a cell when the *IAB type 1-H* setting corresponding to the declared minimum number of cells with transmission on all *TAB connectors* supporting an *operating band*, but its existence is not limited to that condition

**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

**transceiver array boundary:** conducted interface between the transceiver unit array and the composite antenna

**transmission bandwidth:** RF Bandwidth of an instantaneous transmission from an IAB-DU or IAB-MT, measured in resource block units

**transmitter OFF period:** time period during which the IAB-DU or IAB-MT transmitter is not allowed to transmit

**transmitter ON period**: time period during which the IAB-DU or IAB-MT transmitter is transmitting data and/or reference symbols

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

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 *IAB channel bandwidth*

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

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

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

Δf Separation between the *channel 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 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

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 *IAB channel bandwidth*

Ês Received energy per RE (power normalized to the subcarrier spacing) during the useful part of the symbol, i.e. excluding the cyclic prefix, at the IAB-MT antenna connector

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,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 IAB Channel Bandwidth*, expressed in MHz. Fedge,low = FC,low - Foffset,low.

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

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*

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*

Io The total received power density, including signal and interference, as measured at the IAB-MT antenna connector.

Ioc The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the IAB-MT antenna connector.

Iot The received power spectral density of the total noise and interference for a certain IAB-MT (power integrated over the RE and normalized to the subcarrier spacing) as measured at the IAB-MT antenna connector

 The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the IAB-MT antenna connector

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

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

 Timing offset between uplink and downlink radio frames at the UE, as defined in clause 4.2.3 in TS 38.213 [9]

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

PCMAX, *f*, *c* The configured maximum output power for carrier f of serving cell c in each slot

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 IAB is configured at the maximum rated carrier output TRP (Prated,c,TRP)

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

Prated,c,EIRP *The rated carrier EIRP output power* declaredper RIB

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,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

SSB\_RP Received (linear) average power of the resource elements that carry SSB signals and channels, measured at the IAB-MT antenna connector

Tc Basic time unit, defined in clause 4.1 of TS 38.211 [7]

Wgap Sub-block gap or Inter RF Bandwidth gap size

<Next modified section from R4-2115699>

4.1.1 General

The requirements of this clause apply to all applicable tests in TS 38.176-2 (the present document), i.e. to all radiated tests defined in FR1 for *IAB type 1-H*, *IAB type 1-O* and radiated tests defined in FR2 for *IAB type 2-O*. The frequency ranges FR1 and FR2 are defined in clause 5.1 of TS 38.174 [2].

The minimum requirements are given in TS 38.174 [2]. Test Tolerances for the radiated test requirements (TTOTA) explicitly stated in the present document are given in annex C.

Test Tolerances are individually calculated for each test. Test Tolerances are used to relax the minimum requirements to create test requirements.

When a test requirement differs from the corresponding minimum requirement, then the Test Tolerance applied for the test is non-zero. The Test Tolerance for the test and the explanation of how the minimum requirement has been relaxed by the Test Tolerance are given in annex C.

The requirements are classified according to spatial characteristics as shown in table 4.1.1-1 and table 4.1.1-2.

**Table 4.1.1-1: Overview of radiated Tx requirements**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tx requirement** | | **Classification** | **Coverage range** | | **Number of** |
|  | |  | **FR1** | **FR2** | **conformance directions** |
| Radiated transmit power | | Directional | OTA peak directions set | OTA peak directions set | 5 |
| OTA IAB output power | | TRP | See annex I | | |
| OTA output power dynamics | | Directional | OTA peak directions set | OTA peak directions set | 1 |
| OTA transmitter OFF power | | Co-location | See clause 4.12 | N/A | See clause 4.12 |
|  | | Directional | N/A | OTA peak directions set  (Note 2) | 1 |
| OTA transient period | | Co-location | See clause 4.12 | N/A | See clause 4.12 |
|  | | Directional | N/A | OTA peak directions set  (Note 2) | 1 |
| OTA modulation quality | | Directional | OTA coverage range | OTA coverage range | 5 |
| OTA frequency error | | Directional | OTA coverage range | OTA coverage range | 1 |
| OTA time alignment error | | Directional | OTA coverage range | OTA coverage range | 1 |
| OTA occupied bandwidth | | Directional | OTA coverage range | OTA coverage range | 1 |
| OTA ACLR | | TRP | N/A | N/A | See annex I |
| OTA operating band unwanted emission | | TRP | N/A | N/A | See annex I |
| OTA transmitter spurious emission | General requirement | TRP | N/A | N/A | See annex I |
|  | Additional spurious emissions | TRP | N/A | N/A | See annex I |
|  | Co-location with other base stations | Co-location | See clause 4.12 | N/A | See clause 4.12 |
| OTA transmitter intermodulation | | Co-location | See clause 4.12 | N/A | See clause 4.12 |
| NOTE 1: Directional requirement does not imply one compliance direction only. The directional requirement applies to a single direction at a time.  NOTE 2: For FR2, RF Core requirements are defined on TRP levels. Conformance requirements are verified by EIRP measurements in the reference direction. | | | | | |

**Table 4.1.1-2: Overview of radiated Rx requirements**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Rx requirement** | | **Classification** | **Applicability levels** | | **Coverage range** | | **Number of** |
|  | |  | **FR1** | **FR2** | **FR1** | **FR2** | **conformance directions** |
| OTA sensitivity | | Directional | Minimum EIS | N/A | OSDD | N/A | 5 |
| OTA reference sensitivity | | Directional | OTA REFSENS | OTA REFSENS | OTA REFSENS RoAoA | | 5 |
| OTA Dynamic range | | Directional | OTA REFSENS | N/A | OTA REFSENS RoAoA | N/A | 1 |
| OTA adjacent channel selectivity | | Directional | minSENS | OTA REFSENS | minSENS RoAoA | OTA REFSENS RoAoA | 1 |
| OTA in-band blocking | | Directional | OTA REFSENS and minSENS | OTA REFSENS | OTA REFSENS RoAoA and minSENS RoAoA | OTA REFSENS RoAoA | 5 |
| OTA out-of-band blocking | General requirement | Directional | minSENS | OTA REFSENS | minSENS RoAoA | OTA REFSENS RoAoA | 1 |
|  | Co-location with other base stations | Co-location (Note 2) | minSENS | N/A | minSENS RoAoA | N/A | 1 |
| OTA receiver spurious emissions | | TRP | See clause 7.7 | See clause 7.7 | N/A | N/A | See annex I |
| OTA receiver intermodulation | | Directional | OTA REFSENS and minSENS | OTA REFSENS | OTA REFSENS RoAoA and minSENS RoAoA | OTA REFSENS RoAoA | 1 |
| OTA in-channel selectivity | | Directional | minSENS | OTA REFSENS | minSENS RoAoA | OTA REFSENS RoAoA | 1 |
| NOTE 1: Directional requirement does not imply one compliance direction only. The directional requirement applies to a single direction at a time.  NOTE 2: The compliance direction for co-location blocking is applicable for the wanted signal only but not the interfering signal. | | | | | | | |

<Next modified section from R4-2115699>

4.1.2.2 Measurement of transmitter

The maximum OTA Test System uncertainty for OTA transmitter tests minimum requirements are given in tables 4.1.2.2-1 and 4.1.2.2-2. Details for derivation of OTA Test System uncertainty are given in corresponding clauses in TR 37.941 [25].

**Table 4.1.2.2-1: Maximum OTA Test System uncertainty for FR1 OTA transmitter tests**

| **Clause** | **Maximum OTA Test System uncertainty** |
| --- | --- |
| 6.2 Radiated transmit power | Normal condition:  ±1.1 dB, f ≤ 3 GHz  ±1.3 dB, 3 GHz < f ≤ 6 GHz |
|  | Extreme condition:  ±2.5 dB, f ≤ 3 GHz  ±2.6 dB, 3 GHz < f ≤ 6 GHz |
| 6.3 OTA IAB output power | ±1.4 dB, f ≤ 3.0 GHz  ±1.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±1.5 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 6.4.1 IAB-DU OTA Output Power Dynamics | ±0.4 dB |
| 6.4.2 IAB-MT OTA Output Power Dynamics | ±0.7 dB, BW ≤ 40MHz  ±1.0 dB, 40MHz < f ≤ 100MHz |
| 6.5.1 OTA transmitter OFF power | ±3.4 dB, f ≤ 3.0 GHz  ±3.6 dB, 3.0 GHz < f ≤ 6 GHz  (Note 1) |
| 6.5.2 OTA transmitter transient period | N/A |
| 6.6.2.1 IAB-DU OTA Frequency error | ±12 Hz |
| 6.6.2.2 OTA IAB-MT Frequency error | ±15 Hz, f ≤ 3.0GHz  ±36 Hz, f > 3.0GHz |
| 6.6.3 OTA modulation quality | ±1 % |
| 6.6.4 OTA time alignment error | ±25 ns |
| 6.7.2 OTA occupied bandwidth | ±100 kHz, BWChannel 5 MHz, 10 MHz  ±300 kHz, BWChannel 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz  ±600 kHz, BWChannel 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz |
| 6.7.3 OTA ACLR/CACLR | f ≤ 3.0 GHz  ±1 dB, BW ≤ 20MHz  ±1 dB, BW > 20MHz  3.0 GHz < f ≤ 6.0 GHz  ±1.2 dB, BW ≤ 20MHz  ±1.2 dB, BW > 20MHz  Absolute power ±2.2 dB, f ≤ 3.0 GHz  Absolute power ±2.7 dB, 3.0 GHz < f ≤ 4.2 GHz  Absolute power ±2.7 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 6.7.4 OTA operating band unwanted emissions | Absolute power ±1.8 dB, f ≤ 3.0 GHz  Absolute power ±2 dB, 3.0 GHz < f ≤ 4.2 GHz  Absolute power ±2 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 6.7.5.2 OTA transmitter spurious emissions, mandatory requirements | ±2.3 dB, 30 MHz < f ≤ 6 GHz  ±4.2 dB, 6 GHz < f ≤ 26 GHz |
| 6.7.5.4 OTA transmitter spurious emissions, additional spurious emissions requirements | ±2.6 dB, f ≤ 3 GHz  ±3.0, 3 GHz < f ≤ 4.2 GHz  ±3.5, 4.2 GHz < f ≤ 6 GHz |
| 6.7.5.5 OTA transmitter spurious emissions, co-location | ±3.1 dB, f ≤ 3 GHz  ±3.3 dB, 3 GHz < f ≤ 4.2 GHz  ±3.4, 4.2 GHz < f ≤ 6 GHz  (Note 1) |
| 6.8 OTA transmitter intermodulation | The value below applies only to the interfering signal and is unrelated to the measurement uncertainty of the tests in 6.7.3 (ACLR), 6.7.4 (OBUE) and 6.7.5 (spurious emissions) which have to be carried out in the presence of the interferer.  ±3.2 dB, f ≤ 3.0 GHz  ±3.4 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.5 dB, 4.2 GHz < f ≤ 6 GHz  (Note 1) |
| NOTE 1: Fulfilling the criteria for CLTA selection and placement in clause 4.12 is deemed sufficient for the test purposes. When these criteria are met, the measurement uncertainty related to the selection of the co-location test antenna and its alignment as specified in the appropriate measurement uncertainty budget in TR 37.941 [25] shall be used for evaluating the test system uncertainty.  NOTE 2: Test system uncertainty values are applicable for normal condition unless otherwise stated. | |

**Table 4.1.2.2-2: Maximum OTA Test System uncertainty for FR2 OTA transmitter tests**

|  |  |  |
| --- | --- | --- |
| **Clause** | **Maximum OTA Test System uncertainty** | |
| IAB-DU | IAB-MT |
| 6.2 Radiated transmit power | Normal condition:  ±1.7 dB (24.25 – 29.5 GHz)  ±2.0 dB (37 – 43.5 GHz) | Normal condition:  ±2.6 dB (24.25 – 29.5 GHz)  ±2.6 dB (37 – 43.5 GHz) |
|  | Extreme condition:  ±3.1 dB (24.25 – 29.5 GHz)  ±3.3 dB (37 – 43.5 GHz) | Extreme condition:  ±3.7 dB (24.25 – 29.5 GHz)  ±3.7 dB (37 – 43.5 GHz) |
| 6.3 OTA base station output power | ±2.1 dB (24.25 – 29.5 GHz)  ±2.4 dB (37 – 43.5 GHz) | ±2.8 dB (24.25 – 29.5 GHz)  ±2.9 dB (37 – 43.5 GHz) |
| 6.4.1 IAB-DU OTA Output Power Dynamics | ±0.4 dB | N/A |
| 6.4.2 IAB-MT OTA Output Power Dynamics | N/A | ±0.7 dB, BW ≤ 40MHz  ±1.0 dB, 40MHz < f ≤ 100MHz |
| 6.5.1 OTA transmitter OFF power | ±2.9 dB (24.25 – 29.5 GHz)  ±3.3 dB (37 – 43.5 GHz) | |
| 6.5.2 OTA transmitter transient period | N/A | |
| 6.6.2 OTA frequency error | ±12 Hz | ± 0.01 ppm |
| 6.6.3 OTA modulation quality | 1% | |
| 6.6.4 OTA time alignment error | ±25 ns | |
| 6.7.2 OTA occupied bandwidth | 600 kHz | |
| 6.7.3 OTA ACLR | Relative ACLR:  ±2.3 dB (24.25 – 29.5 GHz)  ±2.6 dB (37 – 43.5 GHz)  Absolute ACLR:  ±2.7 dB (24.25 – 29.5 GHz)  ±2.7 dB (37 – 43.5 GHz) | Relative ACLR:  ±2.8 dB (24.25 – 29.5 GHz)  ±2.9 dB (37 – 43.5 GHz)  Absolute ACLR:  ±2.9 dB (24.25 – 29.5 GHz)  ±3.0 dB (37 – 43.5 GHz) |
| 6.7.4 OTA operating band unwanted emissions | ±2.7 dB (24.25 – 29.5 GHz)  ±2.7 dB (37 – 43.5 GHz) | ±2.9 dB (24.25 – 29.5 GHz)  ±3.0 dB (37 – 43.5 GHz) |
| 6.7.5.2 OTA transmitter spurious emissions, mandatory requirements | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.7 dB, 6 GHz < f ≤ 40 GHz  ±5.0 dB, 40 GHz < f ≤ 60 GHz | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.9 dB, 6 GHz < f ≤ 40 GHz  ±5.2 dB, 40 GHz < f ≤ 60 GHz |
| 6.7.5.4 OTA transmitter spurious emissions, additional requirements | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.7 dB, 6 GHz < f ≤ 40 GHz  ±5.0 dB, 40 GHz < f ≤ 60 GHz | ±2.3 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.9 dB, 6 GHz < f ≤ 40 GHz  ±5.2 dB, 40 GHz < f ≤ 60 GHz |
| Note: Test system uncertainty values are applicable for normal condition unless otherwise stated. | | |

4.1.2.3 Measurement of receiver

The maximum OTA Test System uncertainty for OTA receiver tests minimum requirements are given in tables 4.1.2.3-1 and 4.1.2.3-2. Details for derivation of OTA Test System uncertainty are given in corresponding clauses in TR 37.941 [25].

**Table 4.1.2.3-1: Maximum OTA Test System uncertainty for FR1 OTA receiver tests**

|  |  |
| --- | --- |
| **Clause** | **Maximum OTA Test System uncertainty** |
| 7.2 OTA sensitivity | ±1.3 dB, f ≤ 3.0 GHz  ±1.4 dB, 3.0 GHz < f ≤ 4.2 GHz  ±1.6 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 7.3 OTA reference sensitivity level | ±1.3 dB, f ≤ 3.0 GHz  ±1.4 dB, 3.0 GHz < f ≤ 4.2 GHz  ±1.6 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 7.4 OTA dynamic range | ±0.3 dB |
| 7.5.1 OTA adjacent channel selectivity | ±1.7 dB, f ≤ 3.0 GHz  ±2.1 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.4 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 7.5.2 In-band blocking (General) | ±1.9 dB, f ≤ 3.0 GHz  ±2.2 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.5 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 7.5.2 In-band blocking (Narrowband) | ±1.7 dB, f ≤ 3.0 GHz  ±2.1 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.4 dB, 4.2 GHz < f ≤ 6.0 GHz |
| 7.6 OTA out-of-band blocking (General) | fwanted ≤ 3.0 GHz:  ±2.0 dB, finterferer ≤ 3.0 GHz  ±2.1 dB, 3.0 GHz < finterferer ≤ 6.0 GHz  ±3.5 dB, 6.0 GHz < finterferer ≤ 12.75 GHz  3 GHz < fwanted ≤ 4.2 GHz:  ±2.0 dB, finterferer ≤ 3.0 GHz  ±2.1 dB, 3.0 GHz < finterferer ≤ 6.0 GHz  ±3.6 dB, 6.0 GHz < finterferer ≤ 12.75 GHz  4.2 GHz < fwanted ≤ 6.0 GHz:  ±2.2 dB, finterferer ≤ 3.0 GHz  ±2.3 dB, 3.0 GHz < finterferer ≤ 6.0 GHz  ±3.6 dB, 6.0 GHz < finterferer ≤ 12.75 GHz |
| 7.6 OTA out-of-band blocking (Co-location)  (Note 1) | fwanted ≤ 3.0 GHz:  ±3.4 dB, finterferer ≤ 3.0 GHz  ±3.5 dB, 3.0 GHz < finterferer ≤ 4.2 GHz  ±3.7 dB, 4.2 GHz < finterferer ≤ 6.0 GHz  3 GHz < fwanted ≤ 4.2 GHz:  ±3.5 dB, finterferer ≤ 3.0 GHz  ±3.6 dB, 3.0 GHz < finterferer ≤ 4.2 GHz  ±3.7 dB, 4.2 GHz < finterferer ≤ 6.0 GHz  4.2 GHz < fwanted ≤ 6.0 GHz:  ±3.6 dB, finterferer ≤ 3.0 GHz  ±3.7 dB, 3.0 GHz < finterferer ≤ 4.2 GHz  ±3.8 dB, 4.2 GHz < finterferer ≤ 6.0 GHz |
| 7.7 OTA receiver spurious emissions | ±2.5 dB, 30 MHz ≤ f ≤ 6.0 GHz  ±4.2 dB, 6.0 GHz < f ≤ 26 GHz |
| 7.8 OTA receiver 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 |
| 7.9 OTA in-channel selectivity | ±1.7 dB, f ≤ 3.0 GHz  ±2.1 dB, 3.0 GHz < f ≤ 4.2 GHz  ±2.4 dB, 4.2 GHz < f ≤ 6.0 GHz |
| NOTE 1: Fulfilling the criteria for CLTA selection and placement in clause 4.12 is deemed sufficient for the test purposes. When these criteria are met, the measurement uncertainty related to the selection of the co-location test antenna and its alignment as specified in the appropriate measurement uncertainty budget in TR 37.941 [25], shall be used for evaluating the test system uncertainty.  NOTE 2: Test system uncertainty values are applicable for normal condition unless otherwise stated. | |

**Table 4.1.2.3-2: Maximum OTA Test System uncertainty for FR2 OTA receiver tests**

|  |  |  |
| --- | --- | --- |
| **Clause** | **Maximum OTA Test System uncertainty** | |
| **IAB-DU** | **IAB-MT** |
| 7.3 OTA reference sensitivity level | ±2.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±2.4 dB, 37 GHz < f ≤ 43.5 GHz | ±3.3 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.3 dB, 37 GHz < f ≤ 43.5 GHz |
| 7.5.1 OTA adjacent channel selectivity | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.4 dB, 37 GHz < f ≤ 43.5 GHz | ±4.2 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.2 dB, 37 GHz < f ≤ 43.5 GHz |
| 7.5.2 In-band blocking (General) | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.4 dB, 37 GHz < f ≤ 43.5 GHz | ±4.2 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.2 dB, 37 GHz < f ≤ 43.5 GHz |
| 7.6 OTA out-of-band blocking | ±3.6 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.6 dB, 37 GHz < f ≤ 43.5 GHz | ±4.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±4.4 dB, 37 GHz < f ≤ 43.5 GHz |
| 7.7 OTA receiver spurious emissions | ±2.5 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.7 dB, 6 GHz < f ≤ 40 GHz  ±5.0 dB, 40 GHz < f ≤ 60 GHz | ± 2.5 dB, 30 MHz ≤ f ≤ 6 GHz  ±2.9 dB, 6 GHz < f ≤ 40 GHz  ±5.2 dB, 40 GHz < f ≤ 60 GHz |
| 7.8 OTA receiver intermodulation | ±3.9 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.9 dB, 37 GHz < f ≤ 43.5 GHz | N/A |
| 7.9 OTA in-channel selectivity | ±3.4 dB, 24.25 GHz < f ≤ 29.5 GHz  ±3.4 dB, 37 GHz < f ≤ 43.5 GHz | N/A |
| NOTE: Test system uncertainty values are applicable for normal condition unless otherwise stated. | | |

<Next modified section from R4-2115699>

4.3 IAB classes

4.3.1 *IAB-DU class*

The requirements in the present document apply to Wide Area IAB-DU, Medium Range IAB-DU and Local Area IAB-DU unless otherwise stated. The associated deployment scenarios for each class are exactly the same for IAB-DU with and without connectors.

For *IAB* *type 1-O* and 2-O, IAB-DU classes are defined as indicated below:

- Wide Area IAB-DU are characterised by requirements derived from Macro Cell scenarios with a BS to UE minimum distance along the ground equal to 35 m.

- Medium Range IAB-DU are characterised by requirements derived from Micro Cell scenarios with a BS to UE minimum distance along the ground equal to 5 m.

- Local Area IAB-DU are characterised by requirements derived from Pico Cell scenarios with a BS to UE minimum distance along the ground equal to 2 m.

The manufacturer shall declare the intended class of the IAB under test.

4.3.2 *IAB-MT class*

The requirements in the present document apply to Wide Area IAB-MT and Local Area IAB-MT classes unless otherwise stated.

For *IAB type 1-O*, and *IAB type 2-O*, IAB-MT classes are defined as indicated below:

- Wide Area IAB-MT are characterised by requirements derived from Macro Cell and/or Micro Cell scenarios.

- Local Area IAB-MT are characterised by requirements derived from Pico Cell and /or Micro Cell scenarios.

<End of changes from R4-2115699>

<Start of change from R4-2115705>

4.5.4 IAB with integrated Iuant BS modem

Unless otherwise stated, for the tests in the present document, the integrated Iuant BS modem shall be switched OFF.

<End of change from R4-2115705>

<Start of changes from R4-2114323 (includes changes from R4-2115699 and R4-2115714) >

4.6 Manufacturer's declarations

The following IAB manufacturer's declarations listed in table 4.6-1, when applicable to the IAB under test, are required to be provided by the manufacturer for radiated requirements testing for *IAB type 1-H,* *IAB type 1-O* and *IAB type 2-O*. Declarations may be provided independently for IAB-MT and IAB-DU. The applicability columns for different IAB-types in table 4.6-1 designate applicability for both IAB-DU and IAB-MT, unless otherwise stated.

For the *IAB type 1-H* declarations required for the conducted requirements testing, refer to TS 38.176-1 [3], clause 4.6.

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

| **Declaration identifier** | **Declaration** | **Description** | **Applicability**  **(Note 1)** | | |
| --- | --- | --- | --- | --- | --- |
|  |  |  | ***IAB* *type 1-H***  **(Note 2)** | ***IAB type 1-O*** | ***IAB type 2-O*** |
| D.1 | Coordinate system reference point | Location of coordinated system reference point in reference to an identifiable physical feature of the IAB-MT or IAB-DU enclosure. | x | x | x |
| D.2 | Coordinate system orientation | Orientation of the coordinate system in reference to an identifiable physical feature of the IAB 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 IAB 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 3) | x | x | x |
| D.4 | *Operating bands* and frequency ranges | List of NR *operating band(s)* supported by the IAB-DU or IAB-MT and if applicable, frequency range(s) within the *operating band(s)* that the IAB can operate in supported bands declared for every beam (D.3).  (Note 4) | c | x | x |
| D.5 | IAB requirements set | Declaration of one of the IAB *requirement*'*s set* as defined for *IAB type 1-H*, *IAB type 1-O*, *or IAB type 2-O*. | c | x | x |
| D.6 | IAB class | Declared as Wide Area IAB-DU, Medium Range IAB-DU, or Local Area IAB-DU.  Declared as Wide Area IAB-MT, or Local Area IAB-MT. | c | x | x |
| D.7 | IAB channel band width and SCS support | IAB-DU or IAB-MT supported SCS and channel bandwidth per supported SCS. Declared for each beam (D.3) and each *operating band* (D.4). | c | x | x |
| D.8 | *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). | x | x | x |
| D.9 | OTA peak directions set | The OTA peak directions set for each beam. Declared for every beam (D.3). | x | x | x |
| D.10 | *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 thereference 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 theΦ 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 thereference beam centre direction*.*  The maximum steering direction(s) may coincide with the reference beam centre direction.  Declared for every beam (D.3). | x | x | x |
| D.11 | Rated beam EIRP | The rated EIRP level per carrier (Prated,c,EIRP) 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.8). Declared for every beam (D.3).  (Note 12, 14, 18) | x | x | x |
| D.12 | 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.13 | 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.12) 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.14 | Parallel beams | List of beams which have been declared equivalent (D.13) 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.15 | Number of carriers at maximum TRP | The number of carriers per operating band the IAB is capable of generating at maximum TRP declared for every beam (D.3). | n/a | x | x |
| D.16 | Operating bands with multi-band dependencies | List of *operating bands* which are generated using transceiver units supporting operation in multiple *operating bands* through common active RF components. Declared for each *operating band* for which multi-band transceiver is used. | c | x | n/a |
| D.17 | Maximum radiated IAB RF Bandwidth | Maximum *Base Station RF Bandwidth* in the *operating band*, declared for each supported operating band (D.4).  (Note 15) | c | x | x |
| D.18 | Maximum *Radio Bandwidth* of the *operating band* with multi-band dependencies | Largest *Radio Bandwidth* that can be supported by the *operating bands* with multi-band dependencies.  Declared for each supported *operating band* which has multi-band dependencies (D.16). | c | x | n/a |
| D.19 | Total RF bandwidth (BWtot) | Total RF bandwidth BWtot of transmitter and receiver, declared per the band combinations (D.52). | c | x | x |
| D.20 | CA-only operation | Declared of CA-only (with equal power spectral density among carriers) but not multiple carriers operation, declared per *operating band* (D.4) and per beam (D.3). | c | x | x |
| D.21 | Maximum number of supported carriers per *operating band* in multi-band operations | Maximum number of supported carriers per supported *operating band* declared to have multi-band dependencies (D.16). | c | x | n/a |
| D.22 | Contiguous or non-contiguous spectrum operation support | Ability of IAB-DU or IAB-MT to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier in an operating band. | c | x | x |
| D.23 | OSDD identifier | A unique identifier for the OSDD. | x | x | n/a |
| D.24 | OSDD operating band support | Operating band supported by the OSDD, declared for every OSDD (D.23).  (Note 5) | x | x | n/a |
| D.25 | OTA sensitivity supported IAB channel bandwidth and SCS | The IAB-DU or IAB-MTsupported SCS and channel bandwidth per supported SCS by each OSDD. | x | x | n/a |
| D.26 | Redirection of receiver target support | Ability to redirect the receiver target related to the OSDD. | x | x | n/a |
| D.27 | Minimum EIS for FR1 (EISminSENS) | The minimum EISminSENS requirement (i.e. maximum allowable EIS value) applicable to all sensitivity RoAoA per OSDD.  Declared per NR supported channel BW for the OSDD (D.30).  The lowest EIS value for all the declared OSDD's is called minSENS, while its related range of angles of arrival is called *minSENS RoAoA*.  (Note 6) | x | x | n/a |
| D.28 | EIS REFSENS for FR2 (EISREFSENS\_50M) | The EISREFSENS\_50M level applicable in the OTA REFSENS RoAoA, (used as a basis for the derivation of the FR2 EISREFSENS for other channel bandwidths supported by IAB).(Note 7) | n/a | n/a | x |
| D.29 | Receiver target reference direction Sensitivity Range of Angle of Arrival | The sensitivity RoAoA associated with the receiver target reference direction (D.31) for each OSDD. | x | x | n/a |
| D.30 | Receiver target redirection range | For each OSDD the associated union of all the sensitivity RoAoA achievable through redirecting the receiver target related to the OSDD.  (Note 8) | x | x | n/a |
| D.31 | Receiver target reference direction | For each OSDD an associated direction inside the receiver target redirection range (D.30).  (Note 9) | x | x | n/a |
| D.32 | Conformance test directions sensitivity RoAoA | For each OSDD that includes a receiver target redirection range, four sensitivity RoAoA comprising the conformance test directions (D.33). | x | x | n/a |
| D.33 | Conformance test directions | For each OSDD four conformance test directions.  If the OSDD includes a receiver target redirection range the following four directions shall be declared:  1) The direction determined by the maximum φ value achievable inside the receiver target redirection range, while θ value being the closest possible to the receiver target reference direction.  2) The direction determined by the minimum φ value achievable inside the receiver target redirection range, while θ value being the closest possible to the receiver target reference direction.  3) The direction determined by the maximum θ value achievable inside the receiver target redirection range, while φ value being the closest possible to the receiver target reference direction.  4) The direction determined by the minimum θ value achievable inside the receiver target redirection range, while φ value being the closest possible to the receiver target reference direction.  If an OSDD does not include a receiver target redirection range the following 4 directions shall be declared:  1) The direction determined by the maximum φ value achievable inside the sensitivity RoAoA, while θ value being the closest possible to the receiver target reference direction.  2) The direction determined by the minimum φ value achievable inside the sensitivity RoAoA, while θ value being the closest possible to the receiver target reference direction.  3) The direction determined by the maximum θ value achievable inside the sensitivity RoAoA, while φ value being the closest possible to the receiver target reference direction.  4) The direction determined by the minimum θ value achievable inside the sensitivity RoAoA, while φ value being the closest possible to the receiver target reference direction. | x | x | n/a |
| D.34 | OTA coverage range | Declared as a single range of directions within which selected TX OTA requirements are intended to be met.  (Note 10) | x | x | x |
| D.35 | *OTA coverage range* reference direction | The direction describing the reference direction of the *OTA converge range* (D.34).  (Note 11) | x | x | x |
| D.36 | 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.37 | The rated carrier OTA IAB power, Prated,c,TRP | Prated,c,TRP is declared as TRP OTA power per carrier, declared per supported operating band.  (Notes 12, 14, 18) | n/a | x | x |
| D.38 | Rated transmitter TRP, Prated,t,TRP | Rated total radiated output power*.*  Declared per supported *operating band*.  (Notes 12,14, 18) | n/a | x | x |
| D.39 | CLTA placement for co-location test | The manufacturer shall declare the side of EUT where radiating elements are placed closest to the edge of EUT when applicable. The CLTA shall be placed at the EUT side where radiating elements are placed closest. | n/a | x | n/a |
| D.40 | Spurious emission category | Declare the IAB-DU or IAB-MTspurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [5]. | c | x | x |
| D.41 | Additional operating band unwanted emissions | The manufacturer shall declare whether the IAB 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.42 | Co-existence with other systems | The manufacturer shall declare whether the IAB 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.43 | Co-location with other base stations | The manufacturer shall declare whether the IAB under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD and/or E-UTRA operating in another operating band. | c | x | n/a |
| D.44 | Single-band RIB or multi-band RIB | List of single-band RIB and/or multi-band RIB for the supported operating bands (D.4). | c | x | n/a |
| D.45 | Single or multiple carrier | IAB capability to operate with a single carrier (only) or multiple carriers. Declared per supported operating band, per RIB.  (Note 17) | c | x | x |
| D.46 | Maximum number of supported carriers per *operating band* | Maximum number of supported carriers. Declared per supported operating band, per RIB.  (Note 15) | c | x | x |
| D.47 | Total maximum number of supported carriers | Maximum number of supported carriers for all supported operating bands. Declared per RIB. | c | x | x |
| D.48 | Other band combination multi-band restrictions | Declare any other limitation under simultaneous operation in the declared band combinations (D.16), which have any impact on the test configuration generation. | c | x | n/a |
| D.49 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by an IAB-DU or IAB-MT in a particular *operating band*. Declared per *operating band* (D.4). | c | n/a | n/a |
| D.50 | Maximum supported power difference between carriers | Maximum supported power difference between carriers in each supported *operating band*. Declared per *operating band* (D.4). | c | x | x |
| D.51 | Maximum supported power difference between carriers is different *operating bands* | Maximum supported power difference between any two carriers in any two different supported *operating bands*. Declared per operating bands combination (D.52). (Note 19) | c | x | n/a |
| D.52 | Operating band combination support | List of *operating bands* combinations supported by *single-band RIB(s)* and/or *multi-band RIB(s)* of the IAB-DU or IAB-MT. | c | x | n/a |
| D.53 | OTA REFSENS RoAoA | Range of angles of arrival associated with the OTA REFSENS. | n/a | x | x |
| D.54 | OTA REFSENS receiver target reference direction | Reference direction inside the OTA REFSENS RoAoA (D.53). | n/a | x | x |
| D.55 | 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 | x | x |
| D.56 | 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%. | x | x | x |
| D.57 | Rated beam EIRP at lower end of the *fractional bandwidth* (Prated,c,FBWlow) | The rated EIRP level per carrier at lower frequency range of the *fractional bandwidth* (Prated,c,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.8).  Declared per beam for all supported frequency ranges (D.56).  (Notes 12, 13, 14, 15, 18) | x | x | x |
| D.58 | Rated beam EIRP at higher frequency range of the *fractional bandwidth* (Prated,c,FBWhigh) | The rated EIRP level per carrier at higher frequency range of the *fractional bandwidth* (Prated,c,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.8).  Declared per beam for all supported frequency ranges in (D.56).  (Notes 12, 13, 14 ,15, 18) | x | x | x |
| D.59 | Relation between supported maximum RF bandwidth, number of carriers and Rated maximum TRP | If the rated transmitter TRP and total number of supported carriers are not simultaneously supported, the manufacturer shall declare the following additional parameters:  - The reduced number of supported carriers at the rated transmitter TRP;  - The reduced total output power at the maximum number of supported carriers. | n/a | x | x |
| D.60 | Inter-band CA | Declaration of operating band(s) combinations supporting inter‑band CA. Declared per operating band combination (D.52). | c | x | x |
| D.61 | Intra-band contiguous CA | Declaration of operating band(s) supporting intra-band contiguous CA. Declared per *operating band* with CA support. | c | x | x |
| D.62 | Intra-band non-contiguous CA | Declaration of operating band(s) supporting intra-band non‑contiguous CA. Declared per operating band with CA support. | c | x | x |
| D.63 | Total maximum number of supported carriers in multi-band operation | Maximum number of supported carriers for all supported *operating bands* declared to have multi-band dependencies (D.16)*.* | c | x | n/a |
| D.IAB-1 | Same RF implementation | Declaration whether IAB-MT and IAB-DU have the same RF implementation. | c | x | x |
| D.IAB-2 | IAB-MT test model PT-RS configuration | Declaration of PT-RS configuration in IAB-MT test model: without PT-RS, with PT-RS or both. |  |  | x |
| [D.100] | PUSCH mapping type | IAB-DU only: Declaration of the supported PUSCH mapping type for FR1 as specified in [x], i.e., type A, type B or both. | c | x | n/a |
| [D.101] | PUSCH additional DM-RS positions | IAB-DU only: Declaration of the supported additional DM-RS position(s) for FR2, i.e., pos0, pos1, or both. | n/a | n/a | x |
| [D.102] | PUCCH format | IAB-DU only: Declaration of the supported PUCCH format(s) as specified in [x], i.e., format 0, format 1, format 2, format 3, format 4. | c | x | x |
| [D.103] | PRACH format and SCS | IAB-DU only: Declaration of the supported PRACH format(s) as specified in [x], i.e., format: 0, A1, A2, A3, B4, C0, C2.  Declaration of the supported SCS(s) per supported PRACH format with short sequence, as specified in [x], i.e.:  - For *IAB type 1-O*: 15 kHz, 30 kHz or both.  - For *IAB type 2-O*: 60 kHz, 120 kHz or both. | c | x | x |
| [D.104] | Additional DM-RS for PUCCH format 3 | IAB-DU only: Declaration of the supported additional DM-RS for PUCCH format 3: without additional DM-RS, with additional DM-RS or both. | c | x | x |
| [D.105] | Additional DM-RS for PUCCH format 4 | IAB-DU only: Declaration of the supported additional DM-RS for PUCCH format 4: without additional DM-RS, with additional DM-RS or both. | c | x | x |
| [D.106] | PUSCH PT-RS | IAB-DU only: Declaration of PT-RS in PUSCH support: without PT-RS, with PT-RS or both. | n/a | n/a | x |
| [D.107] | PUCCH multi-slot | Declaration of multi-slot PUCCH support. | c | x | n/a |
| [D.108] | UL CA | IAB-DU only: For the highest supported SCS, declaration of the carrier combination with the largest aggregated bandwidth. If there is more than one combination, the carrier combination with the largest number of carriers shall be declared. | c | x | x |
| [D.109] | Modulation order | IAB-DU only: Declaration of the supported modulation orders:  QPSK, 16QAM, 64QAM | TBA | TBA | TBA |
| [D.110] | Transform precoding | IAB-DU only: Declaration on the supporting of transform precoding | TBA | TBA | TBA |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| D.200 | 256QAM for PDSCH for FR1 | Declaration of the supported of 256QAM modulation scheme for PDSCH for FR1, i.e. supported or not supported. | c | x |  |
| D.201 | Maximum number of ports across all configured NZP-CSI-RS resources per CC | Declaration of the maximum number of ports across all configured NZP-CSI-RS resources per CC, i.e. 2, 4, 8, 12, 16, 24, 32, 40, 48 … ,256 or not supported. | c | x |  |
| D.202 | Maximum number of PDSCH MIMO layers | Declaration of the the maximum number of spatial multiplexing layer(s) supported by the UE for DL reception, i.e. 2, 4, 8 or not supported. | c | x |  |
| D.203 | 1 port of DL PTRS | Declaration of the supported of PT-RS with 1 antenna port in DL reception, i.e. supported or not supported. | c | x |  |
| NOTE 1: Manufacturer declarations applicable per IAB *requirement set* were marked as "x". Manufacturer declarations not applicable per IAB *requirement set* were marked as "n/a".  NOTE 2: For *IAB type 1-H*, the only radiated declarations are related to EIRP and EIS requirements. For *IAB type 1-H* declarations required for the conducted requirements testing, refer to TS 38.176-1 [3]. For declarations marked as 'c', related conducted declarations in TS 38.176-1 [3] apply. When separately declared, they shall still use the same declaration identifier.  NOTE 3: Depending on the capability of the system some of these beams may be the same. For those same beams, testing is not repeated.  NOTE 4: These *operating bands* are related to their respective single‑band RIBs.  NOTE 5: As each identified OSDD has a declared minimum EIS value (D.27), multiple operating band can only be declared if they have the same minimum EIS declaration.  NOTE 6: If the *IAB type 1-H* or *IAB type 1-O* is not capable of redirecting the receiver target related to the OSDD then there is only one RoAoA applicable to the OSDD.  NOTE 7: Although EISREFSENS\_50M level is based on a reference measurement channel with BWChannel = 50 MHz, it does not imply that IAB-DU or IAB-MT has to support 50 MHz channel bandwidth.  NOTE 8: Not applicable for *IAB type 2-O*.  NOTE 9: For an OSDD without receiver target redirection range, this is a direction inside the sensitivity RoAoA.  NOTE 10: *OTA coverage range* is used for conformance testing of such TX OTA requirements as occupied bandwidth, frequency error, TAE or EVM.  NOTE 11: The *OTA coverage reference* direction may be the same as the Reference beam direction pair (D.8) but does not have to be.  NOTE 12: If an *IAB type 2-O* is capable of 64QAM DL operation but not capable of 256QAM DL operation, then up to two rated output power declarations may be made. One declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured for 64QAM transmissions.  NOTE 13: If D.57 and D.58 are declared for certain frequency range (D.56), there shall be no "Rated beam EIRP" declaration (D.11) for the *operating band* containing that particular frequency range.  NOTE 14: If an *IAB type 1-H* or *IAB type 1-O* is capable of 256QAM DL operation then two rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions and the other declaration is applicable when not configured for 256QAM transmissions.  NOTE 15: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared.  NOTE 16: void  NOTE 17: In case of IAB *type 1-H*, this declaration applies per *TAB connector*.  NOTE 18: If a *IAB type 2-O* is capable of 256QAM DL operation, then up to three rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions, a different declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured neither for 256QAM nor 64QAM transmissions.  NOTE 19: The power difference is declared at highest rated output power (D.38). | | | | | |

<End of changes from R4-2114323>

<Start of changes from R4-2115699>

4.7.2.1 Test signal used to build Test Configurations

The signal's *IAB-DU and IAB-MT channel bandwidth* and subcarrier spacing used to build IAB-DU and IAB-MT Test Configurations shall be selected according to tables 4.7.2.1-1 and 4.7.2.1-2.

**Table 4.7.2.1-1: Signal to be used to build IAB TCs for *IAB type 1-H* and *IAB type 1-O***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Operating band* characteristics** | | **FDL\_high – FDL\_low < 100 MHz** | **FDL\_high – FDL\_low ≥ 100 MHz** |
| TC signal | BWchannel | 10 MHz (Note) | 20 MHz (Note) |
| characteristics | Subcarrier spacing | Smallest supported subcarrier spacing declared per operating band (D.7) | |
| NOTE: If this *IAB channel bandwidth* is not supported, the narrowest supported *IAB channel bandwidth* declared per *operating band* (D.7) shall be used. | | | |

**Table 4.7.2.1-2: Signal to be used to build IAB TCs for *IAB type 2-O***

|  |  |  |
| --- | --- | --- |
| ***Operating band* characteristics** | | **FDL\_high – FDL\_low ≤ 3250 MHz** |
| TC signal | BWchannel | 100 MHz (Note 1, Note 2) |
| characteristics | Subcarrier spacing | Smallest supported subcarrier spacing declared per operating band (D.7) |
| NOTE 1: *IAB* vendor can decide to test with 50 MHz *IAB channel bandwidth* and smallest supported SCS declared per *operating band* (D.7) instead of 100 MHz *IAB channel bandwidth* in certain regions, where spectrum allocation and regulation require testing with 50 MHz.  NOTE 2: If this *IAB channel bandwidth* is not supported, the narrowest supported *IAB channel bandwidth* declared per *operating band* (D.7) shall be used. | | |

<Next modified section from R4-2115705 >

4.9.2.1 General

The following clauses will describe the test models needed for *IAB type* *2-O*. Note the IAB FR1 test models described in TS 38.176-1 [3] are also applicable for *IAB type 1-O* conformance testing.

<Next modified section from R4-2115699 >

4.9.2.2 FR2 test models for IAB-DU

FR2 test model in clause 4.9.2.2 in TS 38.141-2 [6] applies to IAB-DU as below:

NR-FR2-TM1.1 applies to IAB-DU-FR2-TM1.1

NR-FR2-TM2 applies to IAB-DU-FR2-TM2

NR-FR2-TM2a applies to IAB-DU-FR2-TM2a

NR-FR2-TM3.1 applies to IAB-DU-FR2-TM3.1

NR-FR2-TM3.1a applies to IAB-DU-FR2-TM3.1a

< Start of changes from R4-2115707, includes changes from R4-2115699 >

## 4.13 Test efficiency optimization

When manufacture declares the same RF implementation for IAB-MT and IAB-DU (D.IAB-1) and the declarations in table 4.13-1 are the same for IAB-DU and IAB-MT, it is sufficient to test only IAB-MT or IAB-DU with the test requirement applicability according to table 4.13-2 for Tx requirements and table 4.13-3 for Rx requirements.

For *IAB type 1-H* the test efficiency optimization for radiated requirements apply only for radiated transmit power and OTA sensitivity. Test efficiency optimization for conducted requirements is defined in TS 38.176-1 [3].

For *IAB type 1-O* and *IAB type 2-O* it is required that the DUT selection between requirements follows following rules:

- out of radiated transmit power, OTA modulation quality and OTA frequency error, IAB-DU and IAB-MT are required to be the DUT at least once,

- out of OTA ACLR, OTA operating band unwanted emissions and OTA transmitter general spurious emissions, are required to be the DUT at least once,

- out of OTA reference sensitivity, OTA ACS, OTA receiver intermodulation, IAB-DU and IAB-MT are required to be the DUT at least once.

In some cases, the test requirements are the same but the MU for the IAB-MT is larger than for the IAB-DU. When the test efficiency optimization is applicable for such cases, the lower MU value should be used.

Table 4.13-1: Declarations required to be the same for IAB-DU and IAB-MT for test efficiency optimization to apply

| **Declaration identifier** | **Declaration** | **Additional conditions** | **Applicability (Note 1)** | | |
| --- | --- | --- | --- | --- | --- |
| ***IAB type 1-H*** | ***IAB type 1-O*** | ***IAB type 2-O*** |
| D.4 | *Operating bands* and frequency ranges |  | c | x | x |
| D.6 | IAB class | Medium range IAB-DU can apply test efficiency optimization with wide area IAB-MT other declarations in this table are the same. | c | x | x |
| D.11 | Rated beam EIRP |  | x | x | x |
| D.17 | Maximum radiated IAB RF Bandwidth |  | c | x | x |
| D.19 | Total RF bandwidth (BWtot) |  | c | x | x |
| D.21 | Maximum number of supported carriers per *operating band* in multi-band operations |  | c | x | n/a |
| D.27 | Minimum EIS for FR1 (EISminSENS) |  | x | x | n/a |
| D.28 | EIS REFSENS for FR2 (EISREFSENS\_50M) |  | n/a | n/a | x |
| D.33 | Conformance test directions | Required only for *IAB* *type 1-H* | x | x | n/a |
| D.34 | OTA coverage range |  | x | x | x |
| D.37 | The rated carrier OTA IAB power, Prated,c,TRP |  | n/a | x | x |
| D.44 | Single-band RIB or multi-band RIB |  | c | x | n/a |
| D.46 | Maximum number of supported carriers per *operating band* |  | c | x | x |
| D.48 | Other band combination multi-band restrictions |  | c | x | n/a |
| D.53 | OTA REFSENS RoAoA |  | n/a | x | x |
| D:63 | Total maximum number of supported carriers in multi-band operation |  | c | x | n/a |
| NOTE 1: Manufacturer declarations applicable per IAB *requirement set* were marked as "x". Manufacturer declarations not applicable per IAB *requirement set* were marked as "n/a". For declarations marked as 'c', related conducted declarations in TS 38.176-1 [3] apply. | | | | | |

Table 4.13-2: Test requirement applicability for TX requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Tx requirement** | | **Test efficiency optimization applicable** | **Test requirement applicability**  **(Note 1)** |
| Radiated transmit power | | Yes | FR2: IAB-DU |
| OTA output power | | Yes | FR2: IAB-DU |
| OTA Output power dynamics (only for IAB-DU) | | No | (Note 3) |
| OTA Output power dynamics (only for IAB-MT) | | No | (Note 3) |
| OTA Transmitter OFF power | | Yes |  |
| OTA Transient period | | Yes |  |
| IAB-DU OTA Frequency Error | | No |  |
| IAB-MT OTA Frequency Error | | No |  |
| OTA Modulation quality | | Yes |  |
| OTA Time alignment error (only for IAB-DU) | | No | (Note 3) |
| OTA Occupied bandwidth | | Yes |  |
| OTA ACLR | | Yes | FR2: IAB-DU (Note 2) |
| OTA Operating band unwanted emission | | Yes | FR2: IAB-DU |
| OTA Transmitter spurious emission | General requirement | Yes | FR2: IAB-DU |
| Additional spurious emissions | Yes | FR2: IAB-DU |
| Co-location with other base stations | Yes |  |
| OTA transmitter intermodulation | | Yes | FR2: IAB-DU |
| NOTE 1: Test requirement applicability defines how to select whether IAB-DU or IAB-MT test requirement is applied. In case no applicability definition is provided or the applicability definition test requirement is the same for IAB-DU and IAB-MT, either can apply.  NOTE 2: Local Area *IAB-MT type 2-O* is required to use IAB-DU test requirement  NOTE 3: Test efficiency optimization is not applicable and therefore original test requirement applies. | | | |

Table 4.13-3: Test requirement applicability for Rx requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Rx requirement** | | **Test efficiency optimization applicable** | **Test requirement applicability (Note 1)** |
| OTA sensitivity | | Yes | FR2: IAB-DU |
| OTA reference sensitivity | | Yes | FR2: IAB-DU |
| OTA Dynamic range (only for IAB-DU) | | No | (Note 2) |
| OTA Adjacent channel selectivity | | Yes | IAB-MT |
| OTA In-band blocking | | Yes | IAB-MT |
| OTA Out-of-band blocking | General requirement | Yes |  |
|  | Co-location requirement | Yes |  |
| OTA Receiver spurious emissions | | Yes | FR2: IAB-DU |
| OTA Receiver intermodulation | | Yes | IAB-MT |
| OTA In-channel selectivity (only for IAB-DU) | | No | (Note 2) |
| NOTE 1: Test requirement applicability defines how to select whether IAB-DU or IAB-MT test requirement is applied. In case no applicability definition is provided or the applicability definition test requirement is the same for IAB-DU and IAB-MT, either can apply.  NOTE 2: Test efficiency optimization is not applicable and therefore original test requirement applies. | | | |

<Next modified section from R4-2115699>

6.2.5.1 IAB-DU

For each declared conformance *beam direction pair*, the EIRP measurement results in clause 6.2.4.2 shall remain within the values provided in table 6.2.5.1-1, relative to the manufacturer's declared rated beam EIRP (D.11) value:

**Table 6.2.5.1-1: Test requirement for radiated transmit power for IAB-DU**

|  |  |
| --- | --- |
|  | **Normal test environment** |
| *IAB-DU type 1-H* | f ≤ 3 GHz: ± 3.3 dB |
|  | 3 GHz < f ≤ 6 GHz: ± 3.5 dB |
| *IAB-DU type 1-O* | f ≤ 3 GHz: ± 3.3 dB |
|  | 3 GHz < f ≤ 6 GHz: ± 3.5 dB |
|  |  |
| *IAB-DU type 2-O* | 24.15 GHz < f ≤ 29.5 GHz: ± 5.1 dB  37 GHz < f ≤ 43.5 GHz: ± 5.4 dB |

6.2.5.2 IAB-MT

For each declared conformance *beam direction pair*, the EIRP measurement results in clause 6.2.4.2 shall remain within the values provided in table 6.2.5.2-1, relative to the manufacturer's declared rated beam EIRP (D.11) value:

**Table 6.2.5.2-1: Test requirement for radiated transmit power for IAB-MT**

|  |  |
| --- | --- |
|  | **Normal test environment** |
| *IAB-MT type 1-H* | f ≤ 3 GHz: ± 3.3 dB |
|  | 3 GHz < f ≤ 6 GHz: ± 3.5 dB |
| *IAB-MT type 1-O* | f ≤ 3 GHz: ± 3.3 dB |
|  | 3 GHz < f ≤ 6 GHz: ± 3.5 dB |
|  |  |
| *IAB-MT type 2-O* | 24.15 GHz < f ≤ 29.5 GHz: ± 6 dB  37 GHz < f ≤ 43.5 GHz: ± 6 dB |

<Next modified section from R4-2115699>

6.3.1 Definition and applicability

OTA IAB output power is declared as the TRP radiated requirement, with the output power accuracy requirement defined at the RIB during the *transmitter ON period*. TRP does not change with beamforming settings as long as the *beam peak direction* is within the *OTA peak directions set*. Thus the TRP accuracy requirement must be met for any beamforming setting for which the *beam peak direction* is within the *OTA peak directions set*. Declarations are made separately for IAB-DU and IAB-MT.

The IAB *rated carrier TRP output power* for *IAB type 1-O* shall be within limits as specified in table 6.3.1-1 for *IAB-DU type 1-O* and in table 6.3.1-2 for *IAB-MT type 1-O*.

**Table 6.3.1-1: IAB-DU *rated carrier TRP output power* limits for *IAB-DU type 1-O***

|  |  |
| --- | --- |
| **IAB-DU class** | **Prated,c,TRP** |
| Wide Area IAB-DU | (Note) |
| Medium Range IAB-DU | ≤ + 47 dBm |
| Local Area IAB-DU | ≤ + 33 dBm |
| NOTE: There is no upper limit for the Prated,c,TRP of the Wide Area IAB-DU | |

**Table 6.3.1-2: IAB-MT *rated carrier TRP output power* limits for *IAB-MT type 1-O***

|  |  |
| --- | --- |
| **IAB-MT class** | **Prated,c,TRP** |
| Wide Area IAB-MT | (Note) |
| Local Area IAB-MT | ≤ 24 dBm + 10log(NTXU,counted) |
| NOTE: There is no upper limit for the Prated,c,TRP of the Wide Area IAB-MT. | |

There is no upper limit for the *rated carrier TRP output power* of *IAB type 2-O*.

Despite the general requirements for the IAB output power described in clauses 6.3.2 – 6.3.3, additional regional requirements might be applicable.

NOTE: In certain regions, power limits corresponding to IAB classes may apply for *IAB type 2-O*.

<Next modified section from R4-2115699>

6.3.5 Test requirement

6.3.5.1 *IAB type 1-O*

The final TRP measurement result in clause 6.3.4.2 shall remain:

- within +3.4 dB and -3.4 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP carrier frequency f ≤ 3.0 GHz;

- within +3.5 dB and –3.5 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP for carrier frequency 3.0 GHz < f ≤ 4.2 GHz.

- within +3.5 dB and –3.5 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP for carrier frequency 4.2 GHz < f ≤ 6.0 GHz.

<Next modified section from R4-2115699>

6.3.5.2 *IAB type 2-O*

The final TRP measurement result in clause 6.3.4.2 shall remain:

- within +5.1 dB and -5.1 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP carrier frequency 24.25 GHz < f ≤ 29.5 GHz.

- within +5.4 dB and –5.4 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP for carrier frequency 37 GHz < f ≤ 43.5 GHz.

<Next modified section from R4-2115699>

6.4.1.2.1 Definition and applicability

The OTA RE power control dynamic range is the difference between the power of an RE and the average RE power for a IAB-DU at maximum output power (Pmax,c,EIRP) for a specified reference condition.

This requirement shall apply at each RIB supporting transmission in the *operating band*.

<End of changes from R4-2115699>

<Start of changes from R4-2114323>

6.4.1.2.3 Test purpose

No specific test or test requirements are defined for RE power control dynamic range. The Error Vector Magnitude (EVM) test, as described in clause 6.5.4 provides sufficient test coverage for this requirement.

<End of changes from R4-2114323>

<Start of changes from R4-2113490, includes changes from R4-2115699>

6.4.1.3 OTA total power dynamic range

6.4.1.3.1 Definition and applicability

The OTA total power dynamic range is the difference between the maximum and the minimum transmit power of an OFDM symbol for a specified reference condition.

This requirement shall apply at each RIB supporting transmission in the *operating band*.

NOTE: The upper limit of the OTA total power dynamic range is the IAB-DU maximum carrier EIRP (Pmax,c,EIRP) when transmitting on all RBs. The lower limit of the OTA total power dynamic range is the average EIRP for single RB transmission in the same direction using the same beam. The OFDM symbols shall carry PDSCH and not contain PDCCH, RS or SSB.

6.4.1.3.2 Minimum requirement

The minimum requirement for *IAB type 1-O* is in TS 38.174 [2], clause 9.4.1.3.2.

The minimum requirement for *IAB type 2-O* is in TS 38.174 [2], clause 9.4.1.3.3.

6.4.1.3.3 Test purpose

The test purpose is to verify that the total power dynamic range is within the limits specified by the minimum requirement.

6.4.1.3.4 Method of test

6.4.1.3.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

Beams to be tested: Declared beam with the highest intended EIRP for the narrowest intended beam corresponding to the smallest BeWθ, or for the narrowest intended beam corresponding to the smallest BeWϕ (D.3, D.11).

Directions to be tested: The OTA peak directions set reference beam direction pair (D.8).

6.4.1.3.4.2 Procedure

1) Place the IAB-DU at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB-DU with the test system.

3) Orient the positioner (and IAB-DU) in order that the direction to be tested aligns with the test antenna.

4) Configure the beam peak direction of the IAB-DU according to the declared beam direction pair.

5) For *IAB type 1-O*, set the IAB-DU to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-DU-FR1-TM3.1a if 256QAM is supported by IAB-DU without power back off;

- IAB-DU-FR1-TM3.1 if 256QAM is not supported by IAB-DU;

- IAB-DU-FR1-TM3.1 if 256QAM is supported by IAB-DU with power back off;

For *IAB type 2-O*, set the BS to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model:

- IAB-DU-FR2-TM3.1a if 256QAM is supported by IAB-DU without power back off, or

- IAB-DU-FR2-TM3.1 if 256QAM is supported by BS with power back off, or 256QAM is not supported by IAB-DU; with 64QAM signals if 64QAM is supported by IAB-DU without power back off, or;

- IAB-DU-FR2-TM3.1 with highest modulation order supported without power back off if 64QAM is not supported by IAB-DU, or;

- IAB-DU-FR2-TM3.1 with highest modulation order supported without power back off if 64QAM is supported by IAB-DU with power back off;

6) Measure the OFDM symbol TX power as defined in annex L by measuring the EIRP for any two orthogonal polarizations (denoted p1 and p2) and calculate total radiated transmit power for particular *beam direction pair* as EIRP = EIRPp1 + EIRPp2.

7) For *IAB type 1-O*, set the BS to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-DU-FR1-TM2a if 256QAM is supported by IAB-DU;

- IAB-DU-FR1-TM2 if 256QAM is not supported by IAB-DU;

For IAB *type 2-O*, set the BS to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-DU-FR2-TM2a if 256QAM is supported by IAB-DU, or;

- IAB-DU-FR2-TM2 with highest modulation order supported if 256QAM is not supported by IAB-DU;

8) Measure the OFDM symbol TX power (OSTP) as defined in annex L by measuring the EIRP for any two orthogonal polarizations (denoted p1 and p2) and calculate total radiated transmit power for particular *beam direction pair* as EIRP = EIRPp1 + EIRPp2.

The measured OFDM symbols shall not contain RS or SSB.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

9) For *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

<Next modified section from R4-2115699>

6.4.1.3.5.1 *IAB type 1-O*

The downlink (DL) total power dynamic range for each NR carrier shall be larger than or equal to the level in table 6.4.1.3.5.1-1.

**Table 6.4.1.3.5.1-1: Total power dynamic range**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB channel bandwidth (MHz)** | **Total power dynamic range**  **(dB)** | | |
|  | **15 kHz SCS** | **30 kHz SCS** | **60 kHz SCS** |
|  |  |  |  |
| 10 | 16.7 | 13.4 | 10 |
| 15 | 18.5 | 15.3 | 12.1 |
| 20 | 19.8 | 16.6 | 13.4 |
| 25 | 20.8 | 17.7 | 14.5 |
| 30 | 21.6 | 18.5 | 15.3 |
| 40 | 22.9 | 19.8 | 16.6 |
| 50 | 23.9 | 20.8 | 17.7 |
| 60 | N/A | 21.6 | 18.5 |
| 70 | N/A | 22.3 | 19.2 |
| 80 | N/A | 22.9 | 19.8 |
| 90 | N/A | 23.4 | 20.4 |
| 100 | N/A | 23.9 | 20.9 |

NOTE: Additional test requirements for the Error Vector Magnitude (EVM) at the lower limit of the dynamic range are defined in clause 6.6.

<Next modified section from R4-2115699>

6.4.2.1.4.2 Procedure

1) Place the IAB-MT at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB-MT with the test system.

3) Orient the positioner (and IAB-MT) in order that the direction to be tested aligns with the test antenna.

4) Configure the beam peak direction of the IAB-MT according to the declared beam direction pair.

5) For *IAB type 1-O*, set the IAB-MT to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-MT-FR1-TM3.1

For *IAB type 2-O*, set the IAB-MT to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model:

- IAB-MT-FR2-TM3.1;

6) Measure the power by measuring the EIRP for any two orthogonal polarizations (denoted p1 and p2) over 1ms and calculate total EIRP for particular *beam direction pair* as EIRP = EIRPp1 + EIRPp2.

7) For *IAB type 1-O*, set the IAB-MT to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-MT-FR1-TM2

For IAB *type 2-O*, set the IAB-MT to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test models:

- IAB-MT-FR2-TM2;

8) Measure the power by measuring the EIRP for any two orthogonal polarizations (denoted p1 and p2) over 1ms and calculate total EIRP for particular *beam direction pair* as EIRP = EIRPp1 + EIRPp2..

In addition, for *multi-band RIB(s)*, the following steps shall apply:

9) For *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

<Next modified section from R4-2115699>

6.4.2.1.5.2 *IAB type 2-O*

For IAB-MT the ΔP between the power measured in step 6 and step 8 of clause 6.4.2.1.4.2 shall be:

**Table 6.4.2.1.5.2-1: IAB type 2-0 Output power dynamics test requirements.**

|  |  |  |
| --- | --- | --- |
| **IAB-MT Type** | **IAB-MT channel bandwidth** | **Requirement** |
| Wide area | ≤40MHz | 10 log(Maximum RB) -1.2 < ΔP ≤ 10 log(Maximum RB) + 11.2 |
| 40MHz < BW ≤ 100MHz | 10 log(Maximum RB) -1.5 < ΔP ≤ 10 log(Maximum RB) + 11.5 |
| Local area | ≤40MHz | 10 log(Maximum RB) + 3.8 < ΔP ≤ 10 log(Maximum RB) + 15.2 |
| 40MHz < BW ≤ 100MHz | 10 log(Maximum RB) + 3.5 < ΔP ≤ 10 log(Maximum RB) + 16.5 |

<Next modified section from R4-2115699>

6.7.2.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

Directions to be tested: OTA coverage range reference direction (D.35).

Beams to be tested: Declared beam with the highest intended EIRP for the narrowest intended beam corresponding to the smallest BeWθ, or for the narrowest intended beam corresponding to the smallest BeWϕ (D.3, D.11).

*Aggregated IAB channel bandwidth* positions to be tested for contiguous carrier aggregation: MBW Channel CA; see clause 4.9.1.

For a IAB declared to be capable of single carrier operation, start transmission according to the applicable test configuration in clause 4.8 using the corresponding test model IAB-FR1-TM1.1 for *IAB type 1-O* or NR-FR2-TM1.1 for *IAB type 2-O* in clause 4.9.2 at manufacturers declared rated carrier EIRP (Prated,c,EIRP, D.11).

For a IAB declared to be capable of contiguous carrier aggregation operation, set the IAB to transmit according to IAB-FR1-TM1.1 for *IAB type 1-O* or IAB-FR2-TM1.1 for *IAB type 2-O* in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clauses 4.7.2.3.1 and 4.8.

<Next modified section>

< Start of changes from R4-2115700]

6.7 OTA unwanted emissions

6.7.1 General

Unwanted emissions consist of so-called out-of-band emissions and spurious emissions according to ITU definitions ITU-R SM.329 [10]. In ITU terminology, out of band emissions are unwanted emissions immediately outside the *channel bandwidth* resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The OTA out-of-band emissions requirement for the *IAB-MT type 1-O. IAB-DU type 1-O, IAB-DU type 1-O* and *IAB-DU type 2-O* transmitter is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and operating band unwanted emissions (OBUE). OTA Unwanted emissions outside of this frequency range are limited by an OTA spurious emissions requirement.

The maximum offset of the operating band unwanted emissions mask from the *operating band* edge is ΔfOBUE. The value of ΔfOBUE is defined in table 6.7.1-1 *IAB-DU type 1-O* and *type 2-O* and in table 6.7.1-2 *IAB-MT type 1-O* and *type 2-O* for NR *operating bands*.

**Table 6.7.1-1: Maximum offset ΔfOBUE outside the downlink *operating band* for IAB-DU**

|  |  |  |
| --- | --- | --- |
| **IAB-DU type** | ***Operating band* characteristics** | **ΔfOBUE (MHz)** |
| *IAB-DU type 1-O* | FDL,high – FDL,low < 100 MHz | 10 |
|  | 100 MHz ≤ FDL,high – FDL,low ≤ 900 MHz | 40 |
| *IAB-DU type 2-O* | FDL,high – FDL,low ≤ 4000 MHz | 1500 |

**Table 6.7.1-2: Maximum offset ΔfOBUE outside the uplink *operating band* for IAB-MT**

|  |  |  |
| --- | --- | --- |
| **IAB-MT type** | ***Operating band* characteristics** | **ΔfOBUE (MHz)** |
| *IAB-MT type 1-O* | FUL,high – FUL,low < 100 MHz | 10 |
|  | 100 MHz ≤ FUL,high – FUL,low ≤ 900 MHz | 40 |
| *IAB-MT type 2-O* | FUL,high – FUL,low ≤ 4000 MHz | 1500 |

The unwanted emission requirements are applied per cell for all the configurations. Requirements for OTA unwanted emissions are captured using TRP, *directional requirements* or co-location requirements as described per requirement.

There is in addition a requirement for occupied bandwidth.

6.7.2 OTA occupied bandwidth

6.7.2.1 Definition and applicability

The OTA occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage b/2 of the total mean transmitted power. See also recommendation ITU-R SM.328 [13].

The value of b/2 shall be taken as 0.5%.

The OTA occupied bandwidth requirement shall apply during the *transmitter ON period* for a single transmitted carrier. The minimum requirement below may be applied regionally. There may also be regional requirements to declare the OTA occupied bandwidth according to the definition in the present clause.

The OTA occupied bandwidth is defined as a *directional requirement* and shall be met in the manufacturer's declared *OTA coverage range* at the RIB.

6.7.2.2 Minimum requirement

The minimum requirement for *IAB-DU type 1-O* and *IAB-DU type 2-O* are in TS 38.174 [2], clause 9.7.2.2.

The minimum requirement for *IAB-MT type 1-O* and *IAB-MT type 2-O* are in TS 38.174 [2], clause 9.7.2.3.

6.7.2.3 Test purpose

The test purpose is to verify that the emission at the *RIB* does not occupy an excessive bandwidth for the service to be provided and is, therefore, not likely to create interference to other users of the spectrum beyond undue limits.

6.7.2.4 Method of test

6.7.2.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

Directions to be tested: OTA coverage range reference direction (D.35).

Beams to be tested: Declared beam with the highest intended EIRP for the narrowest intended beam corresponding to the smallest BeWθ, or for the narrowest intended beam corresponding to the smallest BeWϕ (D.3, D.11).

*Aggregated IAB channel bandwidth* positions to be tested for contiguous carrier aggregation: MBW Channel CA; see clause 4.9.1.

For a IAB declared to be capable of single carrier operation, start transmission according to the applicable test configuration in clause 4.8 using the corresponding test model IAB-DU-FR1-TM1.1 for *IAB-DU type 1-O*, IAB-MT-FR1-TM1.1 for *IAB-MT type 1-O,* IAB-DU-FR2-TM1.1 for *IAB-DU type 2-O* or IAB-MT-FR2-TM1.1 for *IAB-MT type 2-O* in clause 4.9.2 at manufacturers declared rated carrier EIRP (Prated,c,EIRP, D.11).

For a IAB declared to be capable of contiguous carrier aggregation operation, set the IAB to transmit according to IABDU-FR1-TM1.1 for *IAB-DU type 1-O,* IAB-MT-FR1-TM1.1 for *IAB-MT type 1-O,* IAB-DU-FR2-TM1.1 for *IAB-DU type 2-O* or IAB-MT-FR2-TM1.1 for *IAB-MT type 2-O* in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clauses 4.7.2.3.1 and 4.8.

6.7.2.4.2 Procedure

1) Place the IAB at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB with the test system.

3) Orient the positioner (and IAB) in order that the direction to be tested aligns with the test antenna..

4) Configure the beam peak direction of the IAB according to the declared beam direction pair.

5) Set the IAB to transmit signal.

6) Measure the spectrum emission of the transmitted signal using at least the number of measurement points, and across a span, as listed in table 6.7.2.4.2-1 and table 6.7.2.4.2-2. The selected resolution bandwidth (RBW) filter of the analyser shall be 30 kHz or less.

NOTE: The detection mode of the spectrum analyser will not have any effect on the result if the statistical properties of the out-of-OBW power are the same as those of the inside-OBW power. Both are expected to have the Rayleigh distribution of the amplitude of Gaussian noise. In any case where the statistics are not the same, though, the detection mode is power responding. There are at least two ways to be power responding. The spectrum analyser can be set to "sample" detection, with its video bandwidth setting at least three times its RBW setting. Or the analyser may be set to respond to the average of the power (root-mean-square of the voltage) across the measurement cell.

**Table 6.7.2.4.2-1: Span and number of measurement points for OBW measurements for FR1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bandwidth** | **IAB channel bandwidth**  **BWChannel (MHz)** | | | | **Aggregated IAB channel bandwidth BWChannel\_CA (MHz)** |
|  | **10** | **15** | **20** | **> 20** | **> 20** |
| Span (MHz) | 20 | 30 | 40 |  |  |
| Minimum number of measurement points | 400 | 400 | 400 |  |  |

**Table 6.7.2.4.2-2: Span and number of measurement points for OBW measurements for FR2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Bandwidth** | **IAB channel bandwidth**  **BWChannel (MHz)** | | | | **Aggregated IAB channel bandwidth BWChannel\_CA (MHz)** |
|  | **50** | **100** | **200** | **400** | **> 50** |
| Span (MHz) |  | | | |  |
| Minimum number of measurement points |  | | | |  |

7) Compute the total of the EIRP, P0, (in power units, not decibel units) of all the measurement cells in the measurement span. Compute P1, the EIRP outside the occupied bandwidth on each side. P1 is half of the total EIRP outside the bandwidth. P1 is half of (100 % - (occupied percentage)) of P0. Measure the EIRP for any two orthogonal polarizations (denoted p1 and p2) and calculate total radiated transmit power for particular *beam direction pair* as EIRP = EIRPp1 + EIRPp2.

8) Determine the lowest frequency, f1, for which the sum of all EIRP in the measurement cells from the beginning of the span to f1 exceeds P1.

9) Determine the highest frequency, f2, for which the sum of all EIRP in the measurement cells from the end of the span to f2 exceeds P1.

10) Compute the OTA occupied bandwidth as f2 - f1.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

11) For *multi-band RIBs* and single band tests, repeat the steps 6) - 10) above per involved band where single band test configurations and test models shall apply with no carriers activated in the other band.

6.7.2.5 Test requirement

6.7.2.5.1 *IAB-DU type 1-O* and *IAB-DU type 2-O*

The OTA occupied bandwidth for each NR carrier shall be less than the *IAB-DU channel bandwidth*. For intra-band contiguous CA, the OTA occupied bandwidth shall be less than or equal to the *Aggregated IAB-DU Channel Bandwidth*.

6.7.2.5.2 *IAB-MT type 1-O* and *IAB-MT type 2-O*

The OTA occupied bandwidth for each NR carrier shall be less than the *IAB-MT channel bandwidth*. For intra-band contiguous CA, the OTA occupied bandwidth shall be less than or equal to the *Aggregated IAB-MT Channel Bandwidth*.

6.7.3 OTA Adjacent Channel Leakage Power Ratio (ACLR)

6.7.3.1 Definition and applicability

OTA Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The measured power is TRP.

The requirement shall be applied per RIB during the *transmitter ON period*.

6.7.3.2 Minimum requirement

The minimum requirement for *IAB-DU type 1-O* and *IAB-MT type 1-O* is in TS 38.174 [2], clause 9.7.3.2.

The minimum requirement for *IAB-DU type 2-O* and *Wide Area IAB-MT type 2-O* is in TS 38.174 [2], clause 9.7.3.3.

6.7.3.3 Test purpose

To verify that the OTA adjacent channel leakage ratio requirement shall be met as specified by the minimum requirement.

6.7.3.4 Method of test

6.7.3.4.1 Initial conditions

Test environment: normal; see annex B.2.

RF channels to be tested for single carrier: B and T; see clause 4.9.1.

*IAB RF Bandwidth* positions to be tested for multi-carrier and/or CA:

- BRFBW and TRFBW in single-band operation, see clause 4.9.1;

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see clause 4.9.1.

Directions to be tested: As the requirement is TRP the beam pattern(s) may be set up to optimise the TRP measurement procedure (see annex I) as long as the required TRP level is achieved.

6.7.3.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 6, 8, 9, 10, 11, 12 and 13.

1) Place the IAB at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB with the test system.

3) The measurement devices characteristics shall be:

- measurement filter bandwidth: defined in clause 6.7.3.5.

- detection mode: true RMS voltage or true power averaging.

4) For single carrier operation, set the IAB to transmit according to the applicable test configuration in clause 4.8 using the corresponding test model(s) in clause 4.9.2 at manufacturers declared *rated carrier output power* (Prated,c,TRP).

For a IAB declared to be capable of multi-carrier and/or CA operation use the applicable test signal configuration and corresponding power setting specified in clauses 4.7.2 and 4.8 using the corresponding test model(s) in clause 4.9.2 on all carriers configured.

5) Orient the positioner (and IAB) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

6) Measure the absolute power of the assigned channel frequency and the (adjacent channel frequency).

7) Repeat step 5-6 for all directions in the appropriated TRP measurement grid needed for TRPEstimate (see annex I).

8) Calculate TRPEstimate for the absolute total radiated power of the wanted channel and the adjacent channel using the measurements made in Step 7.

9) Calculate relative ACLR estimate.

NOTE 1: ACLR is calculated by the ratio of the absolute TRP of the assigned channel frequency and the absolute TRP of the adjacent frequency channel.

NOTE 2: For FR1 the measurement uncertainty of the reverberation chamber for the relative ACLR is higher than the measurement uncertainty in clause 4.1.2 the test requirements in table 6.7.3.5.1-1 shall be tightened following the procedure in clause 4.1.3.

10) Measure OTA ACLR for the frequency offsets both side of channel frequency as specified in table 6.7.3.5.1-1 for *IAB type 1-O* or table 6.7.3.5.2-1for *IAB type 2-O* respectively. In multiple carrier case only offset frequencies below the lowest and above the highest carrier frequency used shall be measured.

11) For the OTA ACLR requirement applied inside sub-block gap for non-contiguous spectrum operation or inside *Inter RF Bandwidth gap* for multi-band operation:

a) Measure OTA ACLR inside sub-block gap or *Inter RF Bandwidth gap*, if applicable.

b) Measure OTA CACLR inside sub-block gap or *Inter RF Bandwidth gap*, if applicable.

12) Repeat the test with the channel set-up using IAB- FR1-TM1.2 defined in clause 4.9.2 in TS 38.176-1 [3] for *IAB type 1-O*.

In addition, for *multi-band RIB*, the following steps shall apply:

13) For *IAB type 1-O* and *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6.7.3.5 Test requirements

6.7.3.5.1 *IAB-DU type 1-O* and *IAB-MT type 1-O*

For the OTA ACLR requirement either the OTA ACLR limits in tables 6.7.3.5.1-1/3 or the OTA ACLR absolute limits in table 6.7.3.5.1-2 shall apply, whichever is less stringent. The OTA CACLR limits in table 6.7.3.5.1-4 or the OTA CACLR absolute limits in table 6.7.3.5.1-5 shall apply, whichever is less stringent.

The CACLR in a sub-block gap and Inter RF Bandwidth gap is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the sub-block gap or the Inter RF Bandwidth gap, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective sub-block edges or Base Station RF Bandwidth edges.

The assumed filter for the adjacent channel frequency is defined in table 6.7.3.5.1-4 and the filters on the assigned channels are defined in table 6.7.3.5.1-6.

For operation in paired and unpaired spectrum, the OTA ACLR measurement result shall not be less than the OTA ACLR limit specified in table 6.7.3.5.1-1.

**Table 6.7.3.5.1-1: *IAB-DU* and *IAB-MT type 1-O* ACLR limit**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***IAB channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)** | **IAB adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted** | **Assumed adjacent channel carrier (informative)** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **OTA ACLR limit**  **(0 – 3 GHz)** | **OTA ACLR limit (3 – 6 GHz)** |
| 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90,100 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44 dB (Note 3) | 43.8 dB (Note 3) |
|  | BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44 dB (Note 3) | 43.8 dB (Note 3) |
| NOTE 1: BWChannel and BWConfig are the *IAB channel bandwidth* and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: The requirements are applicable when the band is also defined for E-UTRA or UTRA. | | | | | |

The absolute total power measurement shall not exceed the OTA ACLR absolute limit specified in table 6.7.3.5.1-2.

**Table 6.7.3.5.1-2: *IAB-DU* and *IAB-MT type 1-O* ACLR absolutelimit**

|  |  |
| --- | --- |
| **IAB category / IAB class** | **OTA ACLR absolute limit** |
| Category A Wide Area IAB-DU and Category A Wide Area IAB-MT | -4 dBm/MHz |
| Category B Wide Area IAB-DU and Category B Wide Area IAB-MT | -6 dBm/MHz |
| Medium Range IAB-DU | -16 dBm/MHz |
| Local Area IAB-DU and  Local Area IAB-MT | -23 dBm/MHz |
| NOTE 1: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | |

For operation in non-contiguous spectrum or multiple bands, the OTA ACLR measurement result shall not be less than the OTA ACLR limit specified in table 6.7.3.5.1-3.

**Table 6.7.3.5.1-3: *IAB-DU* and *IAB-MT type 1-O* ACLR limit in non-contiguous spectrum or multiple bands**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***IAB-DU* and *IAB-MT channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)** | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | ***IAB-DU* and *IAB-MT* adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **OTA ACLR limit**  **(0-3GHz)** | **OTA ACLR limit (3-6GHz)** |
| 10, 15, 20 | Wgap ≥ 15 (Note 3)  Wgap ≥ 45 (Note 4) | 2.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | Wgap ≥ 20 (Note 3)  Wgap ≥ 50 (Note 4) | 7.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
| 25, 30, 40, 50, 60, 70, 80, 90, 100 | Wgap ≥ 60 (Note 4)  Wgap ≥ 30 (Note 3) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | Wgap ≥ 80 (Note 4)  Wgap ≥ 50 (Note 3) | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *IAB channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 10, 15, 20 MHz.  NOTE 4: Applicable in case the *IAB channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz. | | | | | | |

The OTA CACLR measurement result shall not less than the OTA CACLR limit specified in table 6.7.3.5.1-4.

**Table 6.7.3.5.1-4: *IAB-DU* and *IAB-MT type 1-O* CACLR limit**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***IAB-DU* and *IAB-MT channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)** | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | ***IAB-DU* and *IAB-MT* adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **OTA CACLR limit**  **(0-3 GHz)** | **OTA CACLR limit (3-6 GHz)** |
| 10, 15, 20 | 5 ≤ Wgap < 15 (Note 3)  5 ≤ Wgap < 45 (Note 4) | 2.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | 10 < Wgap < 20 (Note 3)  10 ≤ Wgap < 50 (Note 4) | 7.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
| 25, 30, 40, 50, 60, 70, 80,90, 100 | 20 ≤ Wgap < 60 (Note 4)  20 ≤ Wgap < 30 (Note 3) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
|  | 40 < Wgap < 80 (Note 4)  40 ≤ Wgap < 50 (Note 3) | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44 dB | 43.8 dB |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *IAB channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 10, 15, 20 MHz.  NOTE 4: Applicable in case the *IAB channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz. | | | | | | |

The absolute total power measurement shall not exceed the OTA CACLR absolute limit specified in table 6.7.3.5.1-5.

**Table 6.7.3.5.1-5: *IAB-DU* and *IAB-MT type 1-O* CACLR absolutelimit**

|  |  |
| --- | --- |
| **IAB category / IAB class** | **OTA CACLR absolutelimit** |
| Category A Wide Area IAB-DU and Category A Wide Area IAB-MT | -4 dBm/MHz |
| Category B Wide Area IAB-DU and Category B Wide Area IAB-MT | -6 dBm/MHz |
| Medium Range IAB-DU | -16 dBm/MHz |
| Local Area IAB-DU and  Local Area IAB-MT | -23 dBm/MHz |
| NOTE 1: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | |

**Table 6.7.3.5.1-6: Filter parameters for the assigned channel**

|  |  |
| --- | --- |
| **RAT of the carrier adjacent to the sub-block or Inter RF Bandwidth gap** | **Filter on the assigned channel frequency and corresponding filter bandwidth** |
| NR | NR of same BW with SCS that provides largest transmission bandwidth configuration |

6.7.3.5.2 *IAB-DU type 2-O* and *Wide Area IAB-MT type 2-O*

The OTA ACLR absolute limit in table 6.7.3.5.2-2 or the OTA ACLR limit in table 6.7.3.5.2-1/3, whichever is less stringent, shall apply. The OTA CACLR absolute limit in table 6.7.3.5.2-5 or the OTA CACLR limit in table 6.7.3.5.2-4, whichever is less stringent, shall apply.

For a *RIB* operating in multi-carrier or contiguous CA, the OTA ACLR requirements in table 6.7.3.5.2-1 shall apply to *IAB-DU* and *IAB-MT channel bandwidths* of the outermost carrier for the frequency ranges defined in the table. For a RIB operating in *non-contiguous spectrum*, the OTA ACLR requirement in table 6.7.3.5.2-3 shall apply in *sub-block gaps* for the frequency ranges defined in the table, while the OTA CACLR requirement in table 6.7.3.5.2-4 shall apply in *sub-block gaps* for the frequency ranges defined in the table.

The CACLR in a *sub-block gap* is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the *sub-block gap*, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective *sub-block* edges.

The assumed filter for the adjacent channel frequency is defined in table 6.7.3.5.2-4 and the filters on the assigned channels are defined in table 6.7.3.5.2-6.

For operation in *non-contiguous spectrum*, the CACLR for NR carriers located on either side of the *sub-block gap* shall be higher than the value specified in table 6.7.3.5.2-4.

**Table 6.7.3.5.2-1: *IAB-DU type 2-O* and Wide area *IAB-MT type 2-O* ACLR limit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***IAB-DU* and *IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted**  **BWChannel (MHz)** | ***IAB-DU* and *IAB-MT* adjacent channel centre frequency offset below the *lowest* or above the *highest carrier* centre frequency transmitted** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit**  **(dB)** |
| 50, 100, 200, 400 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 25.7 for IAB-DU (Note 3)  23.4 for IAB-DU (Note 4)  25.2 for IAB-MT (Note 3)  23.1 for IAB-MT (Note 4) |
| NOTE 1: BWChannel and BWConfig are the *IAB-DU* and *IAB-MT channel bandwidth* and *transmission bandwidth configuration* of the *lowest/highest carrier* transmitted on the assigned channel frequency.  NOTE 2: With SCS that provides largest *transmission bandwidth configuration* (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | | | | |

**Table 6.7.3.5.2-2: *IAB-DU type 2-O* and Wide area I*AB-MT type 2-O* ACLR absolute limit**

|  |  |
| --- | --- |
| **IAB-DU and IAB-MT class** | **ACLR absolute limit** |
| Wide area IAB-DU | -10.3 dBm/MHz |
| Wide Area IAB-MT | -10.1 dBm/MHz (Note 1)  -10.0 dBm/MHz (Note 2) |
| Medium range IAB-DU | -17.3 dBm/MHz |
| Local area IAB-DU | -17.3 dBm/MHz |
| NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | |

**Table 6.7.3.5.2-3: *IAB DU type 2-O* and Wide Area *IAB-MT type 2-O* ACLR limit in non-contiguous spectrum**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***IAB-DU* and *IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted (MHz)** | ***Sub-block gap* size (Wgap) where the limit applies (MHz)** | ***IAB-DU* and *IAB-MT* adjacent channel centre frequency offset below or above the *sub-block* edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit**  **(dB)** |
| 50, 100 | Wgap≥ 100 (Note 5)  Wgap≥ 250 (Note 6) | 25 MHz | 50 MHz NR (Note 2) | Square (BWConfig) | 25.7 for IAB-DU (Note 3)  23.4 for IAB-DU (Note 4)  25.2 for IAB-MT (Note 3)  23.1 for IAB-MT (Note 4) |
| 200, 400 | Wgap≥ 400 (Note 6)  Wgap≥ 250 (Note 5) | 100 MHz | 200 MHz NR (Note 2) | Square (BWConfig) | 25.7 for IAB-DU (Note 3)  23.4 for IAB-DU (Note 4)  25.2 for IAB-MT (Note 3)  23.1 for IAB-MT (Note 4) |
| NOTE 1: BWConfig is the *transmission bandwidth configuration* of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest *transmission bandwidth configuration* (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz.  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz.  NOTE 5: Applicable in case the *IAB-DU or IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 50 or 100 MHz.  NOTE 6: Applicable in case the *IAB-DU or IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 200 or 400 MHz. | | | | | |

**Table 6.7.3.5.2-4: *IAB DU type 2-O* and Wide Area *IAB-MT type 2-O* CACLR limit in non-contiguous spectrum**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***IAB-DU* and *IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted (MHz)** | ***Sub-block gap* size (Wgap) where the limit applies (MHz)** | ***IAB-DU* and *IAB-MT* adjacent channel centre frequency offset below or above the *sub-block* edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **CACLR limit**  **(dB)** |
| 50, 100 | 50 ≤Wgap< 100 (Note 5)  50 ≤Wgap< 250 (Note 6) | 25 MHz | 50 MHz NR (Note 2) | Square (BWConfig) | 25.7 for IAB-DU (Note 3)  23.4 for IAB-DU (Note 4)  25.2 for IAB-MT (Note 3)  23.1 for IAB-MT (Note 4) |
| 200, 400 | 200 ≤Wgap< 400 (Note 6)  200 ≤Wgap< 250 (Note 5) | 100 MHz | 200 MHz NR (Note 2) | Square (BWConfig) | 25.7 for IAB-DU (Note 3)  23.4 for IAB-DU (Note 4)  25.2 for IAB-MT (Note 3)  23.1 for IAB-MT (Note 4) |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz.  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz.  NOTE 5: Applicable in case the *IAB-DU* or *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 50 or 100 MHz.  NOTE 6: Applicable in case the *IAB-DU* or *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 200 or 400 MHz. | | | | | |

**Table 6.7.3.5.2-5: *IAB-DU type 2-O* and Wide area *IAB-MT type 2-O* CACLR absolute limit**

|  |  |
| --- | --- |
| **IAB-DU and IAB-MT class** | **CACLR absolute limit** |
| Wide area IAB-DU | -10.3 dBm/MHz |
| Wide area IAB-MT | -10.1 dBm/MHz (Note 1)  -10.0 dBm/MHz (Note 2) |
| Medium range IAB-DU | -17.3 dBm/MHz |
| Local area IAB-DU | -17.3 dBm/MHz |
| NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | |

**Table 6.7.3.5.2-6: Filter parameters for the assigned channel**

|  |  |
| --- | --- |
| **RAT of the carrier adjacent to the *sub-block gap*** | **Filter on the assigned channel frequency and corresponding filter bandwidth** |
| NR | NR of same BW with SCS that provides largest *transmission bandwidth configuration* |

6.7.3.5.3 *Local Area IAB-MT type 2-O*

The OTA ACLR absolute limit in table 6.7.3.5.3-2 or the ACLR limit in table 6.7.3.5.3-1/3, whichever is less stringent, shall apply. The OTA CACLR absolute limit in table 6.7.3.5.3-5 or the CACLR limit in table 6.7.3.5.3-4, whichever is less stringent, shall apply.

Requirements specified for Local Area *IAB-DU type 2-O* in clause 6.7.3.5.3 shall apply to Local Area *IAB-MT type 2-O* during transmission in DL timeslot.

For a *RIB* operating in multi-carrier or contiguous CA, the OTA ACLR requirements in table 6.7.3.5.3-1 shall apply to *IAB-MT channel bandwidths* of the outermost carrier for the frequency ranges defined in the table. For a RIB operating in *non-contiguous spectrum*, the OTA ACLR requirement in table 6.7.3.5.3-3 shall apply in *sub-block gaps* for the frequency ranges defined in the table, while the OTA CACLR requirement in table 6.7.3.5.3-4 shall apply in *sub-block gaps* for the frequency ranges defined in the table.

The CACLR in a *sub-block gap* is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the *sub-block gap*, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective *sub-block* edges.

The assumed filter for the adjacent channel frequency is defined in table 6.7.3.5.3-4 and the filters on the assigned channels are defined in table 6.7.3.5.3-6.

For operation in *non-contiguous spectrum*, the CACLR for NR carriers located on either side of the *sub-block gap* shall be higher than the value specified in table 6.7.3.5.3-4.

**Table 6.7.3.3.5-1: Local Area *IAB-MT type 2-O* ACLR limit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted**  **BWChannel (MHz)** | ***IAB-MT* adjacent channel centre frequency offset below the *lowest* or above the *highest carrier* centre frequency transmitted** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit**  **(dB)** |
| 50, 100, 200, 400 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 21.2 (Note 3)  21.1 (Note 4) |
| NOTE 1: BWChannel and BWConfig are the *IAB-MT channel bandwidth* and *transmission bandwidth configuration* of the *lowest/highest carrier* transmitted on the assigned channel frequency.  NOTE 2: With SCS that provides largest *transmission bandwidth configuration* (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 4: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | | | | |

**Table 6.7.3.5.3-2: Local Area *IAB-MT type 2-O* ACLR absolute limit**

|  |  |
| --- | --- |
| **IAB-MT class** | **ACLR absolute limit** |
| Local area IAB-MT | -17.1 dBm/MHz (Note 1)  -17.0 dBm/MHz (Note 2) |
| NOTE 1: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 2: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | |

**Table 6.7.3.5.3-3: Local Area *IAB-MT type 2-O* ACLR limit in non-contiguous spectrum**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted (MHz)** | ***Sub-block gap* size (Wgap) where the limit applies (MHz)** | ***IAB-MT* adjacent channel centre frequency offset below or above the *sub-block* edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit** |
| 50, 100 | Wgap≥ 100 (Note 4)  Wgap≥ 250 (Note 5) | 25 MHz | 50 MHz NR (Note 2) | Square (BWConfig) | 21.2 (Note 3)  21.1 (Note 6) |
| 200, 400 | Wgap≥ 400 (Note 5)  Wgap≥ 250 (Note 4) | 100 MHz | 200 MHz NR (Note 2) | Square (BWConfig) | 21.2 (Note 3)  21.1 (Note 6) |
| NOTE 1: BWConfig is the *transmission bandwidth configuration* of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest *transmission bandwidth configuration* (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz.  NOTE 4: Applicable in case the *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 50 or 100 MHz.  NOTE 5: Applicable in case the *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 200 or 400 MHz.  NOTE 6: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz. | | | | | |

**Table 6.7.3.5.3-4: Local Area *IAB-MT type 2-O* CACLR limit in non-contiguous spectrum**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***IAB-MT channel bandwidth* of *lowest/highest carrier* transmitted (MHz)** | ***Sub-block gap* size (Wgap) where the limit applies (MHz)** | ***IAB-MT* adjacent channel centre frequency offset below or above the *sub-block* edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **CACLR limit** |
| 50, 100 | 50 ≤Wgap< 100 (Note 4)  50 ≤Wgap< 250 (Note 5) | 25 MHz | 50 MHz NR (Note 2) | Square (BWConfig) | 21.2 (Note 3)  21.1 (Note 6) |
| 200, 400 | 200 ≤Wgap< 400 (Note 5)  200 ≤Wgap< 250 (Note 4) | 100 MHz | 200 MHz NR (Note 2) | Square (BWConfig) | 21.2 (Note 3)  21.1 (Note 6) |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz.  NOTE 4: Applicable in case the *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 50 or 100 MHz.  NOTE 5: Applicable in case the *IAB-MT channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 200 or 400 MHz.  NOTE 6: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz. | | | | | | |

**Table 6.7.3.5.3-5: Local Area *IAB-MT type 2-O* CACLR absolute limit**

|  |  |
| --- | --- |
| **IAB-MT class** | **CACLR absolute limit** |
| Local area IAB-MT | -17.1 dBm/MHz (Note 1)  -17.0 dBm/MHz (Note 2) |
| NOTE 1: Applicable to bands defined within the frequency spectrum range of 24.25 – 33.4 GHz  NOTE 2: Applicable to bands defined within the frequency spectrum range of 37 – 52.6 GHz | |

**Table 6.7.3.5.3-6: Filter parameters for the assigned channel**

|  |  |
| --- | --- |
| **RAT of the carrier adjacent to the *sub-block gap*** | **Filter on the assigned channel frequency and corresponding filter bandwidth** |
| NR | NR of same BW with SCS that provides largest *transmission bandwidth configuration* |

6.7.4 OTA operating band unwanted emissions

6.7.4.1 Definition and applicability

The OTA limits for operating band unwanted emissions are specified as TRP per RIB, unless otherwise stated.

6.7.4.1.1 *IAB-DU type 1-O*

For *IAB-DU type 1-O*, for a *RIB* operating in multi-carrier or contiguous CA, the requirements apply to *IAB-DU channel bandwidths* of the outermost carrier. In addition, for a *RIB* operating in non-contiguous spectrum, the requirements shall apply inside any sub-block gap. In addition, for a *multi-band RIB*, the requirements shall apply inside any Inter RF Bandwidth gap.

6.7.4.1.2 *IAB-MT type 1-O*

For *IAB-MT type 1-O*, for a *RIB* operating in multi-carrier or contiguous CA, the requirements apply to *IAB-MT channel bandwidths* of the outermost carrier. In addition, for a *RIB* operating in non-contiguous spectrum, the requirements shall apply inside any sub-block gap. In addition, for a *multi-band RIB*, the requirements shall apply inside any Inter RF Bandwidth gap.

6.7.4.1.3 *IAB-DU type 2-O* and *IAB-MT type 2-O*

For *IAB-DU type 2-O* and *IAB-MT type 2-O*, for a *RIB* operating in multi-carrier or contiguous CA, the requirements apply to the frequencies (ΔfOBUE) starting from the edge of the *contiguous transmission bandwidth.* In addition, for a *RIB* operating in non-contiguous spectrum, the requirements apply inside any sub-block gap.

6.7.4.2 Minimum requirement

The minimum requirement for *IAB-DU type 1-O* is defined in TS 38.174 [2], clause 9.7.4.2.

The minimum requirement for IA*B-MT type 1-O* is defined in TS 38.174 [2], clause 9.7.4.3.

The minimum requirement for IA*B-DU type 2-O* and IA*B-MT type 2-O* are defined in TS 38.174 [2], clause 9.7.4.5.

6.7.4.3 Test purpose

This test measures the emissions of the IAB-Node, close to the assigned channel bandwidth of the wanted signal, while the IAB-Node is in operation.

6.7.4.4 Method of test

6.7.4.4.1 Initial conditions

Test environment: normal; see annex B.2.

RF channels to be tested for single carrier: B, M and T; see clause 4.9.1.

*IAB RF Bandwidth* positions to be tested for multi-carrier and/or CA:

- BRFBW, MRFBW and TRFBW in single-band operation, see clause 4.9.1;

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in multi-band operation, see clause 4.9.1.

Directions to be tested: As the requirement is TRP the beam pattern(s) may be set up to optimise the TRP measurement procedure (see annex I) as long as the required TRP level is achieved.

6.7.4.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 6 and 9.

1) Place the IAB-Node at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB-Node with the test system.

3) The measurement devices characteristics shall be:

- measurement filter bandwidth: defined in clause 6.7.4.5.

- detection mode: true RMS voltage or true power averaging.

4) For single carrier operation, set the IAB-Node to transmit according to the applicable test configuration in clause 4.8 using the corresponding test model(s) in clause 4.9.2 at manufacturers declared *rated carrier output power* (Prated,c,TRP).

For a IAB declared to be capable of multi-carrier and/or CA operation, use the applicable test signal configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test model(s) in clause 4.9.2 on all carriers configured.

5) Orient the positioner (and IAB) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

6) Sweep the centre frequency of the measurement filter in contiguous steps and measure emission power within the specified frequency ranges with the specified measurement bandwidth.

7) Repeat step 5-6 for all directions in the appropriated TRP measurement grid needed for TRPEstimate (see annex I).

8) Calculate TRPEstimate using the measurements made in step 6.

9) For *IAB type 1-O* and *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6.7.4.5 Test requirements

6.7.4.5.1 *IAB* *type 1-O*

The emission measurement result shall not exceed the maximum levels specified in tables 6.7.4.5.1.1-1 to 6.7.4.5.1.5-3, where:

- Δf is the separation between the channel edge frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency.

- f\_offset is the separation between the channel edge frequency and the centre of the measuring filter.

- f\_offsetmax is the offset to the frequency ΔfOBUE MHz outside the downlink operating band.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

For a *multi-band RIB* inside any *Inter RF Bandwidth gaps* with Wgap < 2\*ΔfOBUE, emissions shall not exceed the cumulative sum of the test requirements specified at the *IAB RF Bandwidth edges* on each side of the *Inter RF Bandwidth gap*. The test requirement for *IAB RF Bandwidth edge* is specified in the tables 6.7.4.5.1.1-1 to 6.7.4.5.1.5-3 below, where in this case:

- Δf is the separation between the *IAB RF Bandwidth edge* frequency and the nominal -3 dB point of the measuring filter closest to the *IAB RF Bandwidth edge*.

- f\_offset is the separation between the *IAB RF Bandwidth edge* frequency and the centre of the measuring filter.

- f\_offsetmax is equal to the *Inter RF Bandwidth gap* minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

For a *multi-band RIB*, the operating band unwanted emission limits apply also in a supported operating band without any carrier transmitted, in the case where there are carrier(s) transmitted in another supported operating band. In this case, no cumulative limit is applied in the *inter-band gap* between a supported downlink operating band with carrier(s) transmitted and a supported downlink operating band without any carrier transmitted and

- In case the *inter-band gap* between a supported downlink operating band with carrier(s) transmitted and a supported downlink operating band without any carrier transmitted is less than 2\*ΔfOBUE, f\_offsetmax shall be the offset to the frequency ΔfOBUE MHz outside the outermost edges of the two supported downlink operating bands and the operating band unwanted emission limit of the band where there are carriers transmitted, as defined in the tables of the present clause, shall apply across both downlink bands.

- In other cases, the operating band unwanted emission limit of the band where there are carriers transmitted, as defined in the tables of the present clause for the largest frequency offset (Δfmax), shall apply from ΔfOBUE MHz below the lowest frequency, up to ΔfOBUE MHz above the highest frequency of the supported downlink operating band without any carrier transmitted.

For a multicarrier *single-band RIB* or a *single-band RIB* configured for intra-band contiguous or non-contiguous carrier aggregation the definitions above apply to the lower edge of the carrier transmitted at the lowest carrier frequency and the upper edge of the carrier transmitted at the highest carrier frequency within a specified frequency band.

In addition inside any sub-block gap for a *single-band RIB* operating in non-contiguous spectrum, emissions shall not exceed the cumulative sum of the test requirements specified for the adjacent sub blocks on each side of the sub block gap. The test requirement for each sub block is specified in the tables 6.7.4.5.1.1-1 to 6.7.4.5.1.5-3 below, where in this case:

- Δf is the separation between the sub block edge frequency and the nominal -3 dB point of the measuring filter closest to the sub block edge.

- f\_offset is the separation between the sub block edge frequency and the centre of the measuring filter.

- f\_offsetmax is equal to the sub block gap bandwidth minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

6.7.4.5.1.1 Wide Area IAB-DU and Wide Area IAB-MT (Category A)

For operating in Bands n41, n77, n78, n79, emissions shall not exceed the maximum levels specified in tables 6.7.4.5.1.1-1 to 6.7.4.5.1.1-3:

**Table 6.7.4.5.1.1-1: Wide Area IAB-DU and Wide Area IAB-MT *operating band* unwanted emission limits   
(1 GHz < NR bands ≤ 3 GHz) for Category A**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 3.8 dBm - 7/5(f\_offset/MHz - 0.05) dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -4 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -4 dBm/100 kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.5.1.1-2: Wide Area IAB-DU and Wide Area IAB-MT *operating band* unwanted emission limits   
(3 GHz < NR bands ≤ 4.2 GHz) for Category A**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 4 dBm-7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -4 dBm (Note 3) | 1MHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be ‑4 dBm/1 MHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.5.1.1-3: Wide Area IAB-DU and Wide Area IAB-MT *operating band* unwanted emission limits   
(4.2 GHz < NR bands ≤ 6 GHz) for Category A**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 4 dBm-7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -4 dBm (Note 3) | 1MHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be ‑4 dBm/1 MHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT.  NOTE 5: Void | | | |

6.7.4.5.1.2 Wide Area IAB-DU and Wide Area IAB-MT (Category B)

For IAB-DU and IAB-MT operating in Bands n41, n77, n78, n79 for Category B emissions shall not exceed the maximum levels specified in tables 6.7.4.5.1.2-1 to 6.7.4.5.1.2-3:

**Table 6.7.4.5.1.2-1: Wide Area IAB-DU and IAB-MT operating band unwanted emission limits   
(1 GHz < NR bands ≤ 3 GHz) for Category B**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 3.8 dBm-7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -6 dBm (3) | 1MHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be ‑6 dBm/1 MHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.5.1.2-2: Wide Area IAB-DU and IAB-MT operating band unwanted emission limits   
(1 GHz < NR bands ≤ 3 GHz) for Category B**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 4 dBm-7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -6 dBm (Note 3) | 1MHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be ‑6 dBm/1 MHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.5.1.2-2: Wide Area IAB-DU and IAB-MT operating band unwanted emission limits   
(4.2 GHz < NR bands ≤ 6 GHz) for Category B**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | 4 dBm-7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -3 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -6 dBm (Note 3) | 1MHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band*, the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be ‑6 dBm/1 MHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

6.7.4.6.1 Medium Range IAB-DU (Category A and B)

For Medium Range IAB-DU in NR bands ≤ 3 GHz, emissions shall not exceed the maximum levels specified in tables 6.7.4.6.1-1 and 6.7.4.6.1-4.

For Medium Range IAB-DU in 3GHz <NR bands ≤ 4.2 GHz, emissions shall not exceed the maximum levels specified in tables 6.7.4.6.1-2 and 6.7.4.6.1-5.

For Medium Range IAB-DU in 4.2GHz <NR bands ≤ 6 GHz, emissions shall not exceed the maximum levels specified in tables 6.7.4.6.1-3 and 6.7.4.6.1-6.

For the tables in this clause for *IAB-DU type 1-H* and *IAB-DU type 1-O* Prated,x = Prated,c,cell – 10\*log10(NTXU,countedpercell),

**Table 6.7.4.6.1-1: Medium Range IAB-DU *operating band* unwanted emission limits, 31< Prated,x ≤ 38 dBm (NR bands ≤ 3 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | – 58.2 dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(Prated,c,TRP - 60 dB, -16 dBm)  (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be Min(Prated,c,TRP – 60 dB, ‑16 dBm)/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.1-2: Medium Range IAB-DU *operating band* unwanted emission limits, 31< Prated,x ≤ 38 dBm (3 GHz < NR bands ≤ 4.2 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | Prated,c,TRP - 58 dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(Prated,c,TRP – 60 dB, -16 dBm)  (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be Min(Prated,c,TRP – 60 dB, ‑16 dBm)/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.1-3: Medium Range IAB-DU *operating band* unwanted emission limits, 31< Prated,x ≤ 38 dBm (3 GHz < NR bands ≤ 4.2 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | Prated,c,TRP - 58 dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(Prated,c,TRP – 60 dB, -16 dBm)  (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be Min(Prated,c,TRP – 60 dB, ‑16 dBm)/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.1-4: Medium Range IAB-DU operating band unwanted emission limits, Prated,x ≤ 31 dBm (NR bands ≤ 3 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -18.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -20 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -20 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.1-5: Medium Range IAB-DU operating band unwanted emission limits, Prated,x ≤ 31 dBm (3 GHz < NR bands ≤ 4.2 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -18 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -20 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -20 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.1-6: Medium Range IAB-DU operating band unwanted emission limits, Prated,x ≤ 31 dBm (4.2 GHz < NR bands ≤ 6 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -18 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -20 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -20 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

6.7.4.6.2 Local Area IAB-DU and Local Area IAB-MT (Category A and B)

For Local Area IAB-DU and Local Area IAB-MT in NR bands ≤ 3 GHz, emissions shall not exceed the maximum levels specified in table 6.7.4.6.2-1.

For Local Area IAB-DU and Local Area IAB-MT in 3 GHz < NR bands ≤ 4.2 GHz, emissions shall not exceed the maximum levels specified in table 6.7.4.6.2-2.

For Local Area IAB-DU and Local Area IAB-MT in 4.2 GHz < NR bands ≤ 6 GHz, emissions shall not exceed the maximum levels specified in table 6.7.4.6.2-3.

**Table 6.7.4.6.2-1: Local Area IAB-DU and Local Area IAB-MT operating band unwanted emission limits (NR bands ≤ 3 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -26.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -28 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -28 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT.  NOTE 5: Void | | | |

**Table 6.7.4.6.2-2: Local Area IAB-DU and Local Area IAB-MT operating band unwanted emission limits (3 GHz < NR bands ≤ 4.2 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -26 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -28 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -28 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

**Table 6.7.4.6.2-3: Local Area IAB-DU and Local Area IAB-MT operating band unwanted emission limits (4.2 GHz < NR bands ≤ 6 GHz)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter ‑3dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test requirement (Note 1, 2, 4)** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -26 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -28 dBm (Note 3) | 100 kHz |
| NOTE 1: For a IAB supporting non-contiguous spectrum operation within any *operating band* the emission limits within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is Df ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the emission limits within sub-block gaps shall be -28 dBm/100kHz.  NOTE 2: For a *multi-band RIB* with Inter RF Bandwidth gap < 2\*ΔfOBUE the emission limits within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.  NOTE 3: The requirement is not applicable when Δfmax < 10 MHz.  NOTE 4: The test requirement is derived from the basic limit a scaling factor of 9 dB and any applicable TT. | | | |

6.7.4.6.3 Additional requirements

6.7.4.6.3.1 Limits in FCC Title 47

In addition to the requirements in clauses 6.6.4.2.1, 6.6.4.2.2, 6.6.4.2.3 and 6.6.4.2.4 in TS 38.174 [2], the IAB-DU and IAB-MT may have to comply with the applicable emission limits established by FCC Title 47 [14], when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

6.7.4.6.4 *IAB type 2-O*

The requirements of either clause 6.7.4.6.4.1 (Category A limits) or clause 6.7.4.6.4.1 (Category B limits) shall apply. The application of either Category A or Category B limits shall be the same as for General OTA transmitter spurious emissions requirements (*IAB type 2-O*) in clause 6.7.5.2.5.2. In addition, the limits in clause 6.7.4.5.2.4 may also apply. The emission measurement result shall not exceed the maximum levels specified in the tables below, where:

- Δf is the separation between the *contiguous transmission bandwidth* edge frequency and the nominal -3dB point of the measuring filter closest to the *contiguous transmission bandwidth* edge.

- f\_offset is the separation between the *contiguous transmission bandwidth* edge frequency and the centre of the measuring filter.

- f\_offsetmax is the offset to the frequency ΔfOBUE outside thedownlink *operating band*, where ΔfOBUE is defined in table 6.7.1-1.

In addition, inside any sub-block gap for a *RIB* operating in non-contiguous spectrum, emissions shall not exceed the cumulative sum of the test requirements specified for the adjacent sub blocks on each side of the sub block gap. The test requirement for each sub-block is specified in the clauses 6.7.4.5.2.2 and 6.7.4.5.2.3 below, where in this case:

- Δf is the separation between the sub block edge frequency and the nominal -3 dB point of the measuring filter closest to the sub block edge.

- f\_offset is the separation between the sub block edge frequency and the centre of the measuring filter.

- f\_offsetmax is equal to the sub block gap bandwidth minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

6.7.4.6.4.1 OTA operating band unwanted emission limits (Category A)

The power of unwanted emission of IAB-DU shall not exceed the limits in table 6.7.4.6.4.1-1 or 6.7.4.6.4.1-2. The power of unwanted emission of IAB-MT shall not exceed the limits in table 6.7.4.6.4.1-3 or 6.7.4.6.4.1-4.

**Table 6.7.4.6.4.1-1: OBUE limits applicable for IAB-DU in the frequency range 24.25 – 33.4 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 32.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < Δfmax | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < f\_ offsetmax | Min(-13 dBm, Max(Prated,t,TRP – 43 dB, -20 dBm)) | 1 MHz |
| NOTE: For non-contiguous spectrum operation within any operating band the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. | | | |

**Table 6.7.4.6.4.1-2: OBUE limits applicable for IAB-DU in the frequency range 37 GHz – 52.6 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 30.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < Δfmax | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < f\_ offsetmax | Min(-13 dBm, Max(Prated,t,TRP – 41 dB, -20 dBm)) | 1 MHz |
| NOTE: For non-contiguous spectrum operation within any operating band the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. | | | |

**Table 6.7.4.6.4.1-3: OBUE limits applicable for IAB-MT in the frequency range 24.25 – 33.4 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.1 dBm, Max(Prated,t,TRP – 32.1 dB, -9.1 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < Δfmax | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < f\_ offsetmax | Min(-13 dBm, Max(Prated,t,TRP – 43 dB, -20 dBm)) | 1 MHz |
| NOTE: For non-contiguous spectrum operation within any operating band the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. | | | |

**Table 6.7.4.6.4.1-4: OBUE limits applicable for IAB-MT in the frequency range 37 GHz – 52.6 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.0 dBm, Max(Prated,t,TRP – 30.0 dB, -9.0 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < Δfmax | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < f\_ offsetmax | Min(-13 dBm, Max(Prated,t,TRP – 41 dB, -20 dBm)) | 1 MHz |
| NOTE: For non-contiguous spectrum operation within any operating band the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. | | | |

6.7.4.6.4.2 OTA operating band unwanted emission limits (Category B)

The power of unwanted emission of IAB-DU shall not exceed the limits in table 6.7.4.6.4.2-1 or 6.7.4.6.4.2-2. The power of unwanted emission of IAB-MT shall not exceed the limits in table 6.7.4.6.4.2-3 or 6.7.4.6.4.2-4.

**Table 6.7.4.6.4.2-1: OBUE limits applicable for IAB-DU in the frequency range 24.25 – 33.4 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 32.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 43 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 33 dB, -10 dBm)) | 10 MHz |
| NOTE 1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap.  NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. | | | |

**Table 6.7.4.6.4.2-2: OBUE limits applicable for IAB-DU in the frequency range 37 – 52.6 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 30.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 41 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 31 dB, -10 dBm)) | 10 MHz |
| NOTE 1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap.  NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. | | | |

**Table 6.7.4.6.4.2-3: OBUE limits applicable for IAB-DU in the frequency range 24.25 – 33.4 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.1 dBm, Max(Prated,t,TRP – 32.1 dB, -9.1 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 43 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 33 dB, -10 dBm)) | 10 MHz |
| NOTE 1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap.  NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. | | | |

**Table 6.7.4.6.4.2-4: OBUE limits applicable for IAB-DU in the frequency range 37 – 52.6 GHz**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency offset of measurement filter -3 dB point, Δf** | **Frequency offset of measurement filter centre frequency, f\_offset** | **Test limit** | **Measurement bandwidth** |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.0 dBm, Max(Prated,t,TRP – 30.0 dB, -9.0 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 41 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 31 dB, -10 dBm)) | 10 MHz |
| NOTE 1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap.  NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. | | | |

6.7.4.6.4.3 Additional OTA operating band unwanted emission limits

6.7.4.6.4.3.1 Protection of Earth Exploration Satellite Service

For IAB-Node operating in the frequency range 24.25 – 27.5 GHz, the power of unwanted emission shall not exceed the limits in table 6.7.4.6.4.3.1-1.

**Table 6.7.4.6.4.3.1-1: OBUE limits for protection of Earth Exploration Satellite Service**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency range** | **Measurement filter centre frequency range** | **Limit** | **Measurement Bandwidth** |
| 23.6 – 24 GHz | 23.7 – 23.9 GHz | -3 dBm (Note 1) | 200 MHz |
| 23.6 – 24 GHz | 23.7 – 23.9 GHz | -9 dBm (Note 2) | 200 MHz |
| NOTE 1: This limit applies to IAB-DU and IAB-MT brought into use on or before 1 September 2027.  NOTE 2: This limit applies to IAB-DU and IAB-MT brought into use after 1 September 2027. | | | |

6.7.5 OTA transmitter spurious emissions

6.7.5.1 General

For IAB-DU, the OTA transmitter spurious emission limits for FR1 shall apply from 30 MHz to 12.75 GHz, excluding the frequency range from ΔfOBUE below the lowest frequency of each supported downlink *operating band*, up to ΔfOBUE above the highest frequency of each supported downlink *operating band*, where the ΔfOBUE is defined in table 9.7.1-1. For some FR1 *operating bands*, the upper limit is higher than 12.75 GHz in order to comply with the 5th harmonic limit of the downlink *operating band*, as specified in Recommendation ITU-R SM.329 [10].

For IAB-MT, the OTA transmitter spurious emission limits for FR1 shall apply from 30 MHz to 12.75 GHz, excluding the frequency range from ΔfOBUE below the lowest frequency of each supported uplink *operating band*, up to ΔfOBUE above the highest frequency of each supported uplink *operating band*, where the ΔfOBUE is defined in table 9.7.1-2. For some FR1 *operating bands*, the upper limit is higher than 12.75 GHz in order to comply with the 5th harmonic limit of the uplink *operating band*, as specified in Recommendation ITU-R SM.329 [10].

For *multi-band RIB* each supported *operating band* and ΔfOBUE MHz around each band are excluded from the OTA transmitter spurious emissions requirements.

The requirements shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

*IAB-DU type 1-O* and *IAB-MT type 1-O* requirements consist of OTA transmitter spurious emission requirements based on TRP and co-location requirements not based on TRP.

6.7.5.2 General OTA transmitter spurious emissions requirements

6.7.5.2.1 Definition and applicability

The general OTA transmitter spurious emissions requirements are specified as TRP per RIB, per cell, unless otherwise specified.

6.7.5.2.2 Minimum requirement

The minimum requirement for *IAB type 1-O* is specified in TS 38.174 [2], clause 9.7.5.2.

The minimum requirement for *IAB type 2-O* is specified in TS 38.174 [2], clause 9.7.5.3.

6.7.5.2.3 Test purpose

The test purpose is to verify if the radiated spurious emissions from the IAB at the RIB are within the specified minimum requirements.

6.7.5.2.4 Method of test

6.7.5.2.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier, see clause 4.9.1:

- For FR1:

- B when testing from 30 MHz to FDL\_low - ΔfOBUE

- T when testing from FDL\_high + ΔfOBUE to 12.75 GHz (or to 5th harmonic)

- For FR2:

- B when testing from 30 MHz to FDL\_low - ΔfOBUE

- T when testing from FDL\_high + ΔfOBUE to 2nd harmonic (or to 60 GHz)

RF bandwidth positions to be tested in single-band multi-carrier operation, see clause 4.9.1:

- For FR1:

- BRFBW when testing from 30 MHz to FDL\_low - ΔfOBUE

- TRFBW when testing from FDL\_high + ΔfOBUE to 12.75 GHz (or 5th harmonic)

- For FR2:

- BRFBW when testing from 30 MHz to FDL\_low - ΔfOBUE

- TRFBW when testing from FDL\_high + ΔfOBUE to 2nd harmonic (or to 60 GHz)

RF bandwidth positions to be tested in multi-band multi-carrier operation, see clause 4.9.1:

- For FR1:

- BRFBW\_T'RFBW when testing from 30 MHz to FDL\_Blow\_low - ΔfOBUE

- B'RFBW\_TRFBW when testing from FDL\_Bhigh\_high + ΔfOBUE to 12.75 GHz (or to 5th harmonic)

- BRFBW\_T'RFBW and B'RFBW\_TRFBW when testing from FDL\_Blow\_high + ΔfOBUE to FDL\_Bhigh\_low - ΔfOBUE

Directions to be tested: As the requirement is TRP the beam pattern(s) may be set up to optimise the TRP measurement procedure (see annex I) as long as the required TRP level is achieved.

6.7.5.2.4.2 Procedure

The following procedure for measuring TRP is based on directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the IAB-Node at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 6.7.5.2.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

5) Set the IAB to transmit:

- For RIBdeclared to be capable of single carrier operation only, set the RIB to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model in clause 4.9.2 (i.e.IAB-DU-FR1-TM1.1 for *IAB-DU type 1-O,* IAB-MT-FR1-TM1.1 for *IAB-MT type 1-O,* IAB-DU-FR2-TM1.1 for *IAB-DU type 2-O* or IAB-MT-FR2-TM1.1 for *IAB-MT type 2-O*), at manufacturer's declared rated output power Prated,c,TRP.

- For a RIB declared to be capable of multi-carrier and/or CA operation, set the RIB to transmit according to the corresponding test model in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8.

6) Orient the positioner (and IAB) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth.

8) Repeat step 6-7 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order.

9) Calculate TRP at each specified frequency using the directional measurements.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

10) For *IAB type 1-O* and *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6.7.5.2.5 Test requirement

6.7.5.2.5.1 Test requirement for *IAB type 1-O*

For a IAB meeting category A the TRP of any spurious emission shall not exceed the limits in table 6.7.5.2.5.1-1.

**Table 6.7.5.2.5.1-1: General IAB-DU and IAB-MT transmitter spurious emission limits in FR1 (Category A)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Spurious frequency range** | **Test limit** | **Measurement bandwidth** | **Notes** |
| 30 MHz – 1 GHz | -13 + X dBm | 100 kHz | Note 1, Note 6 |
| 1 GHz – 12.75 GHz |  | 1 MHz | Note 1, Note 2, Note 6 |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the DL *operating band* in GHz |  | 1 MHz | Note 1, Note 2, Note 3, Note 6 |
| NOTE 1: Measurement bandwidths as in ITU-R SM.329 [10], s4.1.  NOTE 2: Upper frequency as in ITU-R SM.329 [10], s2.5 table 1.  NOTE 3: This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the DL *operating band* is reaching beyond 12.75 GHz.  NOTE 4: Void.  NOTE 5: Void.  NOTE 6: X = 9 dB, unless stated differently in regional regulation. | | | |

For a IAB meeting category B the TRP of any spurious emission shall not exceed the limits in table 6.7.5.2.5.1-2.

**Table 6.7.5.2.5.1-2: General IAB-DU and IAB-MT transmitter spurious emission limits in FR1 (Category B)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Spurious frequency range** | **Test limit** | **Measurement bandwidth** | **Notes** |
| 30 MHz – 1 GHz | -36 + X dBm | 100 kHz | Note 1, Note 5 |
| 1 GHz – 12.75 GHz | -30 + X dBm | 1 MHz | Note 1, Note 2, Note 5 |
| 12.75 GHz – 5th harmonic of the upper frequency edge of the DL *operating band* in GHz |  | 1 MHz | Note 1, Note 2, Note 3, Note 5 |
| NOTE 1: Measurement bandwidths as in ITU-R SM.329 [10], s4.1.  NOTE 2: Upper frequency as in ITU-R SM.329 [105], s2.5 table 1.  NOTE 3: This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the DL *operating band* is reaching beyond 12.75GHz.  NOTE 4: Void.  NOTE 5: X = 9 dB, unless stated differently in regional regulation. | | | |

6.7.5.2.5.2 Test requirement for *IAB type 2-O*

6.7.5.2.5.2.1 General

The requirements of either clause 6.7.5.2.5.2.2 (Category A limits) or clause 6.7.5.2.5.2.3 (Category B limits) shall apply. The application of either Category A or Category B limits shall be the same as for Operating band unwanted emissions in clause 6.7.1.

6.7.5.2.5.2.2 OTA transmitter spurious emissions (Category A)

The power of any spurious emission shall not exceed the limits in table 6.7.5.2.5.2.2-1.

**Table 6.7.5.2.5.2.2-1: General IAB-DU and IAB-MT transmitter spurious emission limits in FR2 (Category A)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Spurious frequency range** | **Test limit** | **Measurement bandwidth** | **Notes** |
| 30 MHz – 1 GHz | -13 dBm | 100 kHz | Note 1 |
| 1 GHz – min(2nd harmonic of the upper frequency edge of the DL operating band in GHz; 60 GHz) |  | 1 MHz | Note 1, Note 2 |
| NOTE 1: Measurement bandwidth as in ITU-R SM.329 [10], s4.1.  NOTE 2: Upper frequency as in ITU-R SM.329 [10], s2.5 table 1. | | | |

6.7.5.2.5.2.3 OTA transmitter spurious emissions (Category B)

The power of any spurious emission shall not exceed the limits in table 6.7.5.2.5.2.3-1.

**Table 6.7.5.2.5.2.3-1: IAB-DU and IAB-MT radiated Tx spurious emission limits in FR2 (Category B)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency range  (Note 4)** | **Test limit** | **Measurement Bandwidth** | **Note** |
| 30 MHz ↔ 1 GHz | -36 dBm | 100 kHz | Note 1 |
| 1 GHz ↔ 18 GHz | -30 dBm | 1 MHz | Note 1 |
| 18 GHz ↔ Fstep,1 | -20 dBm | 10 MHz | Note 2 |
| Fstep,1 ↔ Fstep,2 | -15 dBm | 10 MHz | Note 2 |
| Fstep,2 ↔ Fstep,3 | -10 dBm | 10 MHz | Note 2 |
| Fstep,4 ↔ Fstep,5 | -10 dBm | 10 MHz | Note 2 |
| Fstep,5 ↔ Fstep,6 | -15 dBm | 10 MHz | Note 2 |
| Fstep,6 ↔ min(2nd harmonic of the upper frequency edge of the DL operating band in GHz; 60 GHz) | -20 dBm | 10 MHz | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [10], s4.1  NOTE 2: Limit and bandwidth as in ERC Recommendation 74-01 [11], annex 2.  NOTE 3: Upper frequency as in ITU-R SM.329 [10], s2.5 table 1.  NOTE 4: The step frequencies Fstep,X are defined in table 6.7.5.2.5.2.3-2. | | | |

**Table 6.7.5.2.5.2.3-2: Step frequencies for defining the IAB-DU and IAB-MT radiated Tx spurious emission limits in FR2 (Category B)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Operating band** | **Fstep,1 (GHz)** | **Fstep,2 (GHz)** | **Fstep,3 (GHz) (Note 2)** | **Fstep,4 (GHz) (Note 2)** | **Fstep,5 (GHz)** | **Fstep,6 (GHz)** |
| n257 | 18 | 23.5 | 25 | 31 | 32.5 | 41.5 |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23.5 | 35.5 | 38 | 45 | 47.5 | 59.5 |
| NOTE 1: Fstep,X are based on ERC Recommendation 74-01 [11], annex 2.  NOTE 2: Fstep,3 and Fstep,4 are aligned with the values for ΔfOBUE in table 6.7.1-1. | | | | | | |

6.7.5.3 Void

6.7.5.4 Additional spurious emissions requirements

6.7.5.4.1 Definition and applicability

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

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

The requirement shall apply at each RIB supporting transmission in the *operating band*.

All additional spurious requirements are TRP unless otherwise stated.

6.7.5.4.2 Minimum Requirement

The minimum requirement for *IAB type 1-O* is specified in TS 38.174 [2], clause 9.7.5.2.3.

The minimum requirement for *IAB type 2-O* is specified in TS 38.174 [2], clause 9.7.5.3.3.

6.7.5.4.3 Test purpose

The test purpose is to verify the radiated spurious emissions from the IAB at the RIB are within the specified additional spurious emissions requirements.

6.7.5.4.4 Method of test

6.7.5.4.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier:

- For FR1:

- B when testing from 30 MHz to FDL\_low - ΔfOBUE

- T when testing from FDL\_high + ΔfOBUE to 12.75 GHz (or to 5th harmonic)

- For FR2:

- B when testing from 30 MHz to FDL\_low - ΔfOBUE

- T when testing from FDL\_high + ΔfOBUE to 60 GHz (or to 2nd harmonic)

RF bandwidth positions to be tested in single-band multi-carrier operation:

- For FR1:

- BRFBW when testing from 30 MHz to FDL\_low - ΔfOBUE

- TRFBW when testing from FDL\_high + ΔfOBUE to 12.75 GHz (or to 5th harmonic)

- For FR2:

- BRFBW when testing from 30 MHz to FDL\_low - ΔfOBUE

- TRFBW when testing from FDL\_high + ΔfOBUE to 60 GHz (or to 2nd harmonic)

RF bandwidth positions to be tested in multi-band multi-carrier operation:

- For FR1:

- BRFBW\_T'RFBW when testing from 30 MHz to FDL\_Blow\_low - ΔfOBUE

- B'RFBW\_TRFBW when testing from FDL\_Bhigh\_high + ΔfOBUE to 12.75 GHz (or to 5th harmonic)

- BRFBW\_T'RFBW and B'RFBW\_TRFBW when testing from FDL\_Blow\_high + ΔfOBUE to FDL\_Bhigh\_low - ΔfOBUE

Directions to be tested: As the requirements are TRP the beam pattern(s) may be set up to optimise the TRP measurement procedure (see annex I) as long as the required TRP level is achieved.

6.7.5.4.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the IAB-Node at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the IAB with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 6.7.5.4.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

5) Set the IAB-Node to transmit:

- For RIBdeclared to be capable of single carrier operation only, set the RIB to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model in clause 4.9.2 (IAB-DU-FR1-TM1.1 for *IAB-DU type 1-O,* IAB-MT-FR1-TM1.1 for *IAB-MT type 1-O, IAB-DU-FR2-TM1.1* for *IAB-DU type 2-O* or IAB-MT-FR2-TM1.1 for *IAB-MT type 2-O*), at manufacturer's declared rated output power Prated,c,TRP.

- For a RIB declared to be capable of multi-carrier and/or CA operation, set the RIB to transmit according to IAB-DU-FR1-TM1.1 for *IAB-DU type 1-O,* IAB-MT-FR1-TM1.1 for *IAB-MT type 1-O,* IAB-DU-FR2-TM1.1 for *IAB-DU type 2-O* or IAB-MT-FR2-TM1.1 for *IAB-MT type 2-O* in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8.

6) Orient the positioner (and IAB) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth.

8) Repeat step 6-7 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order.

9) Calculate TRP at each specified frequency using the directional measurements.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

10) For *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6.7.5.4.5 Test requirement

6.7.5.4.5.1 Test requirement for *IAB type 1-O*

The power of any spurious emission shall not exceed the test limits in table 6.7.5.4.5-1 for a IAB where requirements for co-existence with the system listed in the first column apply. For a *multi-band RIB*, the exclusions and conditions in the Note column of table 6.7.5.4.5-1 apply for each supported *operating band*.

**Table 6.7.5.4.5.1-1: IAB-DU and IAB-MT spurious emissions basic limits for co-existence with systems operating in other frequency bands**

| **System type to co-exist with** | **Frequency range for co-existence requirement** | ***Test limits*** | ***Measurement bandwidth*** | **Note** |
| --- | --- | --- | --- | --- |
| GSM900 | 921 – 960 MHz | -45.4 dBm | 100 kHz |  |
|  | 876 – 915 MHz | -49.4 dBm | 100 kHz |  |
| DCS1800 | 1805 – 1880 MHz | -35.4 dBm | 100 kHz |  |
|  | 1710 – 1785 MHz | -49.4 dBm | 100 kHz |  |
| PCS1900 | 1930 – 1990 MHz | -35.4 dBm | 100 kHz |  |
|  | 1850 – 1910 MHz | -49.4 dBm | 100 kHz |  |
| GSM850 or | 869 – 894 MHz | -45.4 dBm | 100 kHz |  |
| CDMA850 | 824 – 849 MHz | -49.4 dBm | 100 kHz |  |
| UTRA FDD | 2110 – 2170 MHz | -40.4 dBm | 1 MHz |  |
| Band I or  E-UTRA Band 1 or NR Band n1 | 1920 – 1980 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD | 1930 – 1990 MHz | -40.4 dBm | 1 MHz |  |
| Band II or  E-UTRA Band 2 or NR Band n2 | 1850 – 1910 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD | 1805 – 1880 MHz | -40.4 dBm | 1 MHz |  |
| Band III or  E-UTRA Band 3 or NR Band n3 | 1710 – 1785 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band IV or  E-UTRA Band 4 | 2110 – 2155 MHz | -40.4 dBm | 1 MHz |  |
|  | 1710 – 1755 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band V or  E-UTRA Band 5 or NR Band n5 | 869 – 894 MHz | -40.4 dBm | 1 MHz |  |
|  | 824 – 849 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD | 860 – 890 MHz | -40.4 dBm | 1 MHz |  |
| Band VI, XIX or | 815 – 830 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 6, 18, 19 or NR Band n18 | 830 – 845 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band VII or  E-UTRA Band 7 or NR Band n7 | 2620 – 2690 MHz | -40.4 dBm | 1 MHz |  |
|  | 2500 – 2570 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band VIII or  E-UTRA Band 8 or NR Band n8 | 925 – 960 MHz | -40.4 dBm | 1 MHz |  |
|  | 880 – 915 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band IX or  E-UTRA Band 9 | 1844.9 – 1879.9 MHz | -40.4 dBm | 1 MHz |  |
|  | 1749.9 – 1784.9 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band X or  E-UTRA Band 10 | 2110 – 2170 MHz | -40.4 dBm | 1 MHz |  |
|  | 1710 – 1770 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XI or XXI or  E-UTRA Band 11 or 21 | 1475.9 – 1510.9 MHz | -40.4 dBm | 1 MHz |  |
|  | 1427.9 – 1447.9 MHz | -37.4 dBm | 1 MHz |  |
|  | 1447.9 – 1462.9 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XII or  E-UTRA Band 12 or NR Band n12 | 729 – 746 MHz | -40.4 dBm | 1 MHz |  |
|  | 699 – 716 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XIII or  E-UTRA Band 13 | 746 – 756 MHz | -40.4 dBm | 1 MHz |  |
|  | 777 – 787 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XIV or  E-UTRA Band 14 or NR band n14 | 758 – 768 MHz | -40.4 dBm | 1 MHz |  |
|  | 788 – 798 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 17 | 734 – 746 MHz | -40.4 dBm | 1 MHz |  |
|  | 704 – 716 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20 | 791 – 821 MHz | -40.4 dBm | 1 MHz |  |
|  | 832 – 862 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XXII or E-UTRA Band 22 | 3510 – 3590 MHz | -40 dBm | 1 MHz | This requirement does not apply to IAB-DU and IAB-MT operating in band n77 or n78. |
|  | 3410 – 3490 MHz | -37 dBm | 1 MHz | This requirement does not apply to IAB-DU and IAB-MT operating in band n77 or n78. |
| E-UTRA Band 24 | 1525 – 1559 MHz | -40.4 dBm | 1 MHz |  |
|  | 1626.5 – 1660.5 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XXV or  E-UTRA Band 25 or NR band n25 | 1930 – 1995 MHz | -40.4 dBm | 1 MHz |  |
|  | 1850 – 1915 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD Band XXVI or  E-UTRA Band 26 or NR Band n26 | 859 – 894 MHz | -40.4 dBm | 1 MHz |  |
|  | 814 – 849 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 27 | 852 – 869 MHz | -40.4 dBm | 1 MHz |  |
|  | 807 – 824 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 28 or NR Band n28 | 758 – 803 MHz | -40.4 dBm | 1 MHz |  |
|  | 703 – 748 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 29 or NR Band n29 | 717 – 728 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 30 or NR Band n30 | 2350 – 2360 MHz | -40.4 dBm | 1 MHz |  |
|  | 2305 – 2315 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 31 | 462.5 – 467.5 MHz | -40.4 dBm | 1 MHz |  |
|  | 452.5 – 457.5 MHz | -37.4 dBm | 1 MHz |  |
| UTRA FDD band XXXII or E-UTRA band 32 | 1452 – 1496 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band a) or E-UTRA Band 33 | 1900 – 1920 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band a) or E-UTRA Band 34 or NR band n34 | 2010 – 2025 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band b) or E-UTRA Band 35 | 1850 – 1910 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band b) or E-UTRA Band 36 | 1930 – 1990 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band c) or E-UTRA Band 37 | 1910 – 1930 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band f) or E-UTRA Band 39 or NR band n39 | 1880 – 1920MHz | -40.4 dBm | 1 MHz |  |
| UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300 – 2400MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 41 or NR Band n41, n90 | 2496 – 2690 MHz | -40.4 dBm | 1 MHz | This is not applicable IAB-DU and IAB-MT operating in Band n41. |
| E-UTRA Band 42 | 3400 – 3600 MHz | -40 dBm | 1 MHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78. |
| E-UTRA Band 43 | 3600 – 3800 MHz | -40 dBm | 1 MHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78. |
| E-UTRA Band 44 | 703 – 803 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 45 | 1447 – 1467 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 46 | 5150 – 5925 MHz | -39.5 dBm | 1 MHz |  |
| E-UTRA Band 47 | 5855 – 5925 MHz | -39.5 dBm | 1 MHz |  |
| E-UTRA Band 48 or NR Band n48 | 3550 – 3700 MHz | -40 dBm | 1 MHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78. |
| E-UTRA Band 50 or NR band n50 | 1432 – 1517 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 51 or NR Band n51 | 1427 – 1432 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 53 or NR Band n53 | 2483.5 - 2495 MHz | -40.4 dBm | 1 MHz | This is not applicable to IAB-DU and IAB-MT operating in Band n41. |
| E-UTRA Band 65 or NR Band n65 | 2110 – 2200 MHz | -40.4 dBm | 1 MHz |  |
|  | 1920 – 2010 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 66 or NR Band n66 | 2110 – 2200 MHz | -40.4 dBm | 1 MHz |  |
|  | 1710 – 1780 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 67 | 738 – 758 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 68 | 753 -783 MHz | -40.4 dBm | 1 MHz |  |
|  | 698-728 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 69 | 2570 – 2620 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 70 or NR Band n70 | 1995 – 2020 MHz | -40.4 dBm | 1 MHz |  |
|  | 1695 – 1710 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 71 or NR Band n71 | 617 – 652 MHz | -40.4 dBm | 1 MHz |  |
|  | 663 – 698 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 72 | 461 – 466 MHz | -40.4 dBm | 1 MHz |  |
|  | 451 – 456 MHz | -37.4 dBm | 1 MHz |  |
| E-UTRA Band 74 or NR Band n74 | 1475 – 1518 MHz | -40.4 dBm | 1 MHz |  |
|  | 1427 – 1470 MHz | -37.4 dBm | 1MHz |  |
| E-UTRA Band 75 or NR Band n75 | 1432 – 1517 MHz | -40.4 dBm | 1 MHz |  |
| E-UTRA Band 76 or NR Band n76 | 1427 – 1432 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n77 | 3.3 – 4.2 GHz | -40 dBm | 1 MHz | This requirement does not apply to IAB-DU and IAB-MT operating in Band n77 or n78 |
| NR Band n78 | 3.3 – 3.8 GHz | -40 dBm | 1 MHz | This requirement does not apply to IAB-DU and IAB-MT operating in Band n77 or n78 |
| NR Band n79 | 4.4 – 5.0 GHz | -39.5 dBm | 1 MHz | This requirement does not apply to IAB-DU and IAB-MT operating in Band n79 |
| NR Band n80 | 1710 – 1785 MHz | -37.4 dBm | 1 MHz |  |
| NR Band n81 | 880 – 915 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n82 | 832 – 862 MHz | -45.4 dBm | 1 MHz |  |
| NR Band n83 | 703 – 748 MHz | -49.4 dBm | 1 MHz |  |
| NR Band n84 | 1920 – 1980 MHz | -35.4 dBm | 1 MHz |  |
| E-UTRA Band 85 | 728 – 746 MHz | -49.4 dBm | 1 MHz |  |
|  | 698 – 716 MHz | -35.4 dBm | 1 MHz |  |
| NR Band n86 | 1710 – 1780 MHz | -49.4 dBm | 1 MHz |  |
| NR Band n89 | 824 – 849 MHz | -45.4 dBm | 1 MHz |  |
| NR Band n91 | 1427 – 1432 MHz | -49.4 dBm | 1 MHz |  |
|  | 832 – 862 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n92 | 1432 – 1517 MHz | -37.4 dBm | 1 MHz |  |
|  | 832 – 862 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n93 | 1427 – 1432 MHz | -37.4 dBm | 1 MHz |  |
|  | 880 – 915 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n94 | 1432 – 1517 MHz | -37.4 dBm | 1 MHz |  |
|  | 880 – 915 MHz | -40.4 dBm | 1 MHz |  |
| NR Band n95 | 2010 – 2025 MHz | -37.4 dBm | 1 MHz |  |

NOTE 1: As defined in the scope for spurious emissions in this clause the co-existence requirements in table 6.7.5.4.5.1-1do not apply for the ΔfOBUE frequency range immediately outside the downlink *operating band* (see table 5.2-1). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2: Table 6.7.5.4.5.1-1 assumes that two *operating bands*, where the frequency ranges in table 5.2-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.

6.7.5.5 Co-location requirements

6.7.5.5.1 Definition and applicability

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

The requirements assume a 30 dB coupling loss between transmitter and receiver and are based on co-location with same class.

6.7.5.5.2 Minimum requirements

The minimum requirement for *IAB type 1-O* is defined in TS 38.174 [2], clause 9.7.5.2.

6.7.5.5.3 Test purpose

For OTA co-locate spurious emission, the test purpose is to verify that the emission is within the specified requirement limits at the CLTA conducted output(s).

6.7.5.5.4 Method of test

6.7.5.5.4.1 Initial conditions

Test environment: normal; see clause B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

*IAB RF Bandwidth* positions to be tested for multi-carrier:

- MRFBW in *single-band RIB*, see clause 4.9.1;

- BRFBW\_T'RFBW and B'RFBW\_TRFBW in *multi-band RIB*, see clause 4.9.1.

In addition, for *multi-band RIB*:

- For BRFBW\_T'RFBW, emission testing above the highest operating band may be omitted.

- For B'RFBW\_TRFBW, emission testing below the lowest operating band may be omitted.

Directions to be tested: The FR1 requirement is specified as co-location requirement. For general description of co-location requirements, refer to clause 4.12.

The co-location spurious emission is measured at the CLTA conducted output(s).

6.7.5.5.4.2 Procedure

1) Select and place the IAB-Node and CLTA as described in clause 4.12, with parameters as specified in table 4.12.2.2-1 and table 4.12.2.3-1.

2) Several CLTAs might be required to cover the whole co-location spurious emission frequency ranges.

3) Place test antenna in reference direction at far-field distance, aligned in all supported polarizations (single or dual) with the IAB-Node as depicted in annex E.1.3.

4) The test antenna shall be dual (or single) polarized with the same frequency range as the IAB-Node for co-location spurious emission test case.

5) Connect test antenna and CLTA to the measurement equipment as depicted in annex E.1.3.

6) OTA co-location spurious emission is measured as the power sum over all supported polarizations at the CLTA conducted output(s).

7) The measurement device (signal analyser) characteristics shall be:

- Detection mode: True RMS.

8) Set the *IAB type 1-O* to transmit:

- Set the IAB-Nodeto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the IAB-Node declared to be capable of multi-carrier and/or CA operation, set the IAB-Node to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

9) Measure the emission at the specified frequencies with specified measurement bandwidth.

In addition, for *multi-band RIB*, the following steps shall apply:

10) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6.7.5.5.5 Test requirements

6.7.5.5.5.1 Test requirement for *IAB type 1-O*

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

The requirements assume co-location with base stations of the same class.

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

This requirement is a co-location requirement as defined in clause 4.9, in TS 38.174 [2], the power levels are specified at the CLTAoutput.

The output of the CLTA of any spurious emission shall not exceed the test limit in table 6.7.5.5.5.1-1.

For a *multi-band RIB*, the exclusions and conditions in the notes column of table 6.7.5.5.5.1-1 apply for each supported operating band.

**Table 6.7.5.5.5.1-1: *IAB-DU and IAB-MT spurious emissions basic limits for co-location with BS or IAB-Node***

| **Co-located system** | **Frequency range for** | ***Test limits*** | | | **Measurement** | **Note** |
| --- | --- | --- | --- | --- | --- | --- |
|  | **co-location requirement** | **WA IAB-DU and WA IAB-MT** | **MR IAB-DU** | **LA IAB-DU and LA IAB-MT** | **bandwidth** |  |
| GSM900 | 876 – 915 MHz | -115.9 dBm | -108.9 dBm | -87.9 dBm | 100 kHz |  |
| DCS1800 | 1710 – 1785 MHz | -115.9 dBm | -108.9 dBm | --97.9 dBm | 100 kHz |  |
| PCS1900 | 1850 – 1910 MHz | -115.9 dBm | -108.9 dBm | --97.9 dBm | 100 kHz |  |
| GSM850 or CDMA850 | 824 – 849 MHz | -115.9 dBm | -108.9 dBm | -87.9 dBm | 100 kHz |  |
| UTRA FDD Band I or E-UTRA Band 1 or NR Band n1 | 1920 – 1980 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band II or E-UTRA Band 2 or NR Band n2 | 1850 – 1910 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band III or E-UTRA Band 3 or NR Band n3 | 1710 – 1785 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band IV or E-UTRA Band 4 | 1710 – 1755 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band V or E-UTRA Band 5 or NR Band n5 | 824 – 849 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band VI, XIX or E-UTRA Band 6, 19 | 830 – 845 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7 | 2500 – 2570 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band VIII or E-UTRA Band 8 or NR Band n8 | 880 – 915 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band IX or E-UTRA Band 9 | 1749.9 – 1784.9 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band X or E-UTRA Band 10 | 1710 – 1770 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XI or E-UTRA Band 11 | 1427.9 –1447.9 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XII or  E-UTRA Band 12 or NR Band n12 | 699 – 716 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XIII or  E-UTRA Band 13 | 777 – 787 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XIV or  E-UTRA Band 14 or NR Band n14 | 788 – 798 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 17 | 704 – 716 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 18 or NR Band n18 | 815 – 830 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20 | 832 – 862 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XXI or E-UTRA Band 21 | 1447.9 – 1462.9 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XXII or E-UTRA Band 22 | 3410 – 3490 MHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| E-UTRA Band 23 | 2000 – 2020 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 24 | 1626.5 – 1660.5 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XXV or  E-UTRA Band 25 or NR Band n25 | 1850 – 1915 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA FDD Band XXVI or  E-UTRA Band 26 or NR Band n26 | 814 – 849 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 27 | 807 – 824 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 28 or NR Band n28 | 703 – 748 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 30 or NR Band n30 | 2305 – 2315 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 31 | 452.5 – 457.5 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band a) or E-UTRA Band 33 | 1900 – 1920 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band a) or E-UTRA Band 34 or NR band n34 | 2010 – 2025 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band b) or E-UTRA Band 35 | 1850 – 1910 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band b) or E-UTRA Band 36 | 1930 – 1990 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band c) or E-UTRA Band 37 | 1910 – 1930 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band f) or E-UTRA Band 39 or NR band n39 | 1880 – 1920MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300 – 2400MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 41 or NR Band n41, n90 | 2496 – 2690 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n41 |
| E-UTRA Band 42 | 3400 – 3600 MHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| E-UTRA Band 43 | 3600 – 3800 MHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| E-UTRA Band 44 | 703 – 803 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 45 | 1447 – 1467 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 46 | 5150 – 5925 MHz | N/A | -108.6 dBm | -105.6 dBm | 100 kHz |  |
| E-UTRA Band 48 or NR Band n48 | 3550 – 3700 MHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| E-UTRA Band 50 or NR Band n50 | 1432 – 1517 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 51 or NR Band n51 | 1427 – 1432 MHz | N/A | N/A | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 53 or NR Band n53 | 2483.5 – 2495 MHz | N/A | -108.9 dBm | -105.9 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n41 |
| E-UTRA Band 65 or NR Band n65 | 1920 – 2010 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 66 or NR Band n66 | 1710 – 1780 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 68 | 698 – 728 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 70 or NR Band n70 | 1695 – 1710 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 71 or NR Band n71 | 663 – 698 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 72 | 451 – 456 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 74 or NR Band n74 | 1427 – 1470 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n77 | 3.3 – 4.2 GHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| NR Band n78 | 3.3 – 3.8 GHz | -113.7 dBm | -108.7 dBm | -105.7 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n77 or n78 |
| NR Band n79 | 4.4 – 5.0 GHz | -113.6 dBm | -108.6 dBm | -105.6 dBm | 100 kHz | This is not applicable to IAB-DU and IAB-MT operating in Band n79 |
| NR Band n80 | 1710 – 1785 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n81 | 880 – 915 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n82 | 832 – 862 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n83 | 703 – 748 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n84 | 1920 – 1980 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| E-UTRA Band 85 | 698 – 716 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n86 | 1710 – 1780 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n89 | 824 – 849 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n91 | 832 – 862 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n92 | 832 – 862 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n93 | 880 – 915 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n94 | 880 – 915 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |
| NR Band n95 | 2010 – 2025 MHz | -113.9 dBm | -108.9 dBm | -105.9 dBm | 100 kHz |  |

NOTE 1: As defined in the scope for spurious emissions in this clause, the co-location requirements in table 6.6.5.2.3-1 do not apply for the frequency range extending ΔfOBUE immediately outside the transmit frequency range of a IAB-MT and IAB-DU. The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30dB antenna to antenna minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [15].

NOTE 2: Table 6.6.5.2.3-1 assumes that two operating bands, where the corresponding transmit and receive frequency ranges in table 5.2-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-location requirements may apply that are not covered by the 3GPP specifications.

6.8 OTA transmitter intermodulation

## **<End of changes from R4-2115700>**

## **<Start of changes from R4-2115699>**

6.8.4.2 Procedure

1) Select a CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.2-1.

2) Place the CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.3-1.

3) The test antenna(s) shall be dual (or single) polarized covering the same frequency range as the IAB and the emission frequencies.

4) Several test antennas are required to cover both the IABand the whole emission frequency range.

5) Connect test antenna and CLTA to the measurement equipment as shown in annex E.1.5.

6) During the OTA emission measurements at the test antenna conducted output(s), both IAB and CLTA are rotated around same axis.

7) The OTA emission measurement method shall be TRP, according to the procedure described in annex I.

8) The measurement device (signal analyser) characteristics shall be:

- Detection mode: True RMS.

9) Set the IAB node to transmit:

For IAB-DU:

- Set the IAB-DUto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the IAB-DU declared to be capable of multi-carrier and/or CA operation, set the IAB-DU to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

For IAB-MT:

- Set the IAB-MTto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the IAB-MT declared to be capable of multi-carrier and/or CA operation, set the IAB-MT to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

10) Generate the interfering signal for *IAB node* via the CLTA. The CLTA is fed with a power level equal to declared Prated,t,TRP, divided over all the supported polarizations, from the same signal generator source:

For IAB-DU:

- using test model as defined in clause 4.9.2.2 for IAB-DU, at a centre frequency offset according to the conditions in table 9.8.2-1 in TS 38.174 [2], but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the Inter RF Bandwidth gap.

For IAB-MT:

- using test model as defined in clause 4.9.2.3 for IAB-MT, at a centre frequency offset according to the conditions in table 9.8.2-1 in TS 38.174 [2], but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the Inter RF Bandwidth gap.

11) Adjust the interfering signal level at the CLTA conducted input(s) as defined in:

- transmitter intermodulation table 9.8.2-1 in TS 38.174 [2].

12) If the interferer signal is applicable according to clause 4.7, perform the unwanted emission tests specified in clauses 6.7.3 (OTA ACLR) and 6.7.4 (OTA OBUE) for all third and fifth order intermodulation products which appear in the frequency ranges defined in clauses 6.7.3 and 6.7.4 (Note 2). The width of the intermodulation products shall be taken into account.

13) If the interferer signal is applicable according to clause 4.7, perform the Transmitter spurious emissions test as specified in clause 6.7.5 (OTA spurious emission), except OTA co-location spurious emission, for all third and fifth order intermodulation products which appear in the frequency ranges defined in clause 6.7.5 (Note 2). The width of the intermodulation products shall be taken into account.

14) Verify that the emission level does not exceed the required level in clause 6.8.5 (Test requirements) with the exception of interfering signal frequencies.

15) Repeat the test for the remaining interfering signal centre frequency offsets according to the conditions of:

- transmitter intermodulation table 9.8.2-1 in TS 38.174 [2].

16) Repeat the test for the remaining interfering signals defined in clause 4.7 for requirements 6.7.3 (OTA ACLR), 6.7.4 (OTA OBUE) and 6.7.5 (OTA spurious emission), except OTA co-location spurious emission.

In addition, for *multi-band RIB,* the following steps shall apply:

17) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

NOTE 1: The third order intermodulation products are centred at 2F1±F2 and 2F2±F1. The fifth order intermodulation products are centred at 3F1±2F2, 3F2±2F1, 4F1±F2, and 4F2±F1 where F1 represents the test signal centre frequency or centre frequency of each sub-block and F2 represents the interfering signal centre frequency. The widths of intermodulation products are:

- (n\*BWF1 + m\* BWF2) for the nF1±mF2 products;

- (n\* BWF2 + m\* BWF1) for the nF2±mF1 products;

where BWF1 represents the test wanted signal RF bandwidth or channel bandwidth in case of single carrier, or sub-block bandwidth and BWF2 represents the interfering signal channel bandwidth.

NOTE 2: During the conformance test the interferer signal can be applied on one side of the wanted signal, while the transmitter intermodulation emission is measured only on the opposite side of the wanted signal. This applies for intermodulation products which are within the operating band or OBUE region.

## **<End of changes from R4-2115699>**

## **<Start of changes from R4-2114322>**

7.1 General

General test conditions for receiver tests are given in clause 4, including interpretation of measurement results and configurations for testing. IAB configurations for the tests are defined in clause 4.5.

Unless otherwise stated, the following arrangements apply for radiated receiver characteristics requirements in clause 7:

- Requirements apply during the IAB receive period.

- Requirements shall be met for any transmitter setting.

- Throughput requirements defined for the radiated receiver characteristics do not assume HARQ retransmissions.

- When IAB is configured to receive multiple carriers, all the throughput requirements are applicable for each received carrier.

- For ACS, blocking and intermodulation characteristics, the negative offsets of the interfering signal apply relative to the lower *IAB RF Bandwidth* edge or *sub-block* edge inside a *sub-block gap*, and the positive offsets of the interfering signal apply relative to the upper *IAB RF Bandwidth* edge or *sub-block* edge inside a *sub-block gap*.

NOTE 1: In normal operating condition the IAB in TDD operation is configured to TX OFF power during *receive period*.

Each requirement, except OTA receiver spurious emissions, shall be met over the RoAoA specified.

For FR1 requirements which are to be met over the *OTA REFSENS RoAoA* absolute requirement values are offset by the following term:

ΔOTAREFSENS = 44.1 - 10\*log10(BeWθ,REFSENS\*BeWφ,REFSENS) (dB) for the reference direction.

And

ΔOTAREFSENS = 41.1 - 10\*log10(BeWθ,REFSENS\*BeWφ,REFSENS) (dB) for all other directions.

For requirements which are to be met over the *minSENS RoAoA* absolute requirement values are offset by the following term:

ΔminSENS = PREFSENS – EISminSENS (dB)

For FR2 requirements which are to be met over the *OTA REFSENS RoAoA* absolute requirement values are offset by the following term:

ΔFR2\_REFSENS = -3 dB for the reference direction

and

ΔFR2\_REFSENS = 0 dB for all other directions

## **<End of changes from R4-2114322>**

## **<Start of changes from R4-2115699>**

7.2.1 Definition and applicability

The OTA sensitivity requirement is based upon the declaration of one or more *OTA sensitivity direction declarations* (OSDD), related to a IAB *type 1-H* and IAB *type 1-O* receiver.

The *IAB type 1-H* and IAB *type 1-O* receiver may optionally be capable of redirecting/changing the *receiver target* by means of adjusting BS settings resulting in multiple *sensitivity RoAoA*. The *sensitivity RoAoA* resulting from the current BS settings is the active *sensitivity RoAoA*.

If the IAB is capable of redirecting the *receiver target* related to the OSDD then the OSDD shall include:

- IAB *channel bandwidth* and declared minimum EISlevel applicable to any active *sensitivity RoAoA* inside the *receiver target redirection range* in the OSDD.

- A declared *receiver target redirection range*, describing all the angles of arrival that can be addressed for the OSDD through alternative settings in the BS.

- Five declared *sensitivity RoAoA* comprising the conformance testing directions as detailed in TR 37. 941 [29].

- The *receiver target reference direction*.

NOTE 1: Some of the declared *sensitivity RoAoA* may coincide depending on the redirection capability.

NOTE 2: In addition to the declared *sensitivity RoAoA*, several *sensitivity RoAoA* may be implicitly defined by the *receiver target redirection range* without being explicitly declared in the OSDD.

If the *IAB* is not capable of redirecting the *receiver target* related to the OSDD, then the OSDD includes only:

- IAB *channel bandwidth* and declared minimum EISlevel applicable to the *sensitivity RoAoA* in the OSDD.

- One declared active *sensitivity RoAoA*.

- The receiver target reference direction.

NOTE 3: For *BS* without target redirection capability, the declared (fixed) *sensitivity RoAoA* is always the active *sensitivity RoAoA*.

The OTA sensitivity EIS level declaration shall apply to each supported polarization, under the assumption of *polarization match*.

<Next modified section from R4-2115699>

7.4.1 Definition and applicability

The OTA dynamic range is a measure of the capability of the receiver unit to receive a wanted signal in the presence of an interfering signal inside the received *IAB-DU channel bandwidth*.

The requirement shall apply at the RIB when the AoA of the incident wave of a received signal and the interfering signal are from the same direction and are within the *OTA REFSENS RoAoA.*

The wanted and interfering signals apply to each supported polarization, under the assumption of *polarization match*.

<Next modified section from R4-2115699>

7.5.2.4.2 Procedure

1) Place the IAB with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.2.3.

2) Align the manufacturer declared coordinate system orientation of the IAB with the test system.

3) Align the IAB with the test antenna in the declared direction to be tested.

4) Align the IAB to that the wanted signal and interferer signal is *polarization matched* with the test antenna(s).

5) Configure the beam peak direction for the transmitter according to the declared reference beam direction pair for the appropriate beam identifier.

6) Set the test signal mean power so that the calibrated radiated power at the IAB Antenna Array coordinate system reference point is as follows:

For general OTA blocking:

*a)* For *IAB-DU type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.2-1.

For *IAB-DU type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.3-1.

For *IAB-MT type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.4-1.

For *IAB-MT type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.5-1.

b) For *IAB-DU type 1-O,* set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in table 7.5.2.5.2-1. The interfering signal shall be swept with a step size of 1 MHz starting from the minimum offset to the channel edges of the wanted signals.

For *IAB-DU type 2-O,* set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in table 7.5.2.5.3-1. The interfering signal shall be swept with a step size indicated in Table 7.5.2.4.2-1 starting from the minimum offset to the channel edges of the wanted signals.

For *IAB-MT type 1-O,* set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in table 7.5.2.5.4-1. The interfering signal shall be swept with a step size of 1 MHz starting from the minimum offset to the channel edges of the wanted signals.

For *IAB-MT type 2-O,* set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in table 7.5.2.5.5-1. The interfering signal shall be swept with a step size indicated in Table 7.5.2.4.2-1 starting from the minimum offset to the channel edges of the wanted signals.

**Table 7.5.2.4.2-1: FR2 Interferer signal step size**

|  |  |
| --- | --- |
| **Minimum supported *IAB channel bandwidth* (MHz)** | **Measurement**  **step size**  **(MHz)** |
| 50 | 15 |
| 100 | 30 |
| 200 | 60 |
| 400 | 60 |

For OTA narrowband blocking:

*a)* For *IAB-DU type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.2-2.

For *IAB-DU type 2-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.3-2.

For *IAB-MT type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.4-2.

For *IAB-MT type 1-O*, set the signal generator for the wanted signal to transmit as specified in table 7.5.2.5.5-2.

*b)* For *IAB-DU type 1-O*, set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in tables 7.5.2.5.2-2 and 7.5.2.5.2-3. Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to table 7.5.2.5.2-3.

For *IAB-DU type 2-O*, set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in tables 7.5.2.5.3-2 and 7.5.2.5.3-3. Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to table 7.5.2.5.3-3.

For *IAB-MT type 1-O*, set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in tables 7.5.2.5.4-2 and 7.5.2.5.4-3. Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to table 7.5.2.5.4-3.

For *IAB-MT type 1-O*, set the signal generator for the interfering signal at the specified frequency offset from the wanted signal to transmit as specified in tables 7.5.2.5.5-2 and 7.5.2.5.5-3. Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to table 7.5.2.5.5-3.

7) Measure throughput according to annex A.1 for each supported polarization, for multi-carrier and/or CA operation the throughput shall be measured for relevant carriers specified by the test configuration specified in clauses 4.7.2 and 4.8.

8) Repeat steps 3 to 8 for all the specified measurement directions.

For *multi-band RIB(s)* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carriers activated in the other band.

<Next modified section from R4-2115699>

7.6.5.1.2 Co-location requirement

This additional OTA out-of-band blocking requirement may be applied for the protection of IAB receivers when NR, E‑UTRA BS, UTRA BS, CDMA BS , GSM/EDGE BS or IAB-DU and/or IAB-MT operating in a different frequency band are co-located with an IAB-Node.

The requirement is a co-location requirement. The interferer power levels are specified at the *co-location reference antenna* conducted input. The interfering signal power is specified per supported polarization.

The requirement is valid over the *minSENS RoAoA*.

For OTA wanted and OTA interfering signal provided at the RIB using the parameters in table 7.6.5.1.2-1, the following requirements shall be met:

- The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel. The reference measurement channel for the OTA wanted signal is identified in TS 38.174 [2] clause 10.3 for each *IAB channel bandwidth* and further specified in annex A.1. The characteristics of the interfering signal is further specified in annex H.

For *IAB type 1-O* the OTA blocking requirement for co-location with BS or IAB-Node in other frequency bands is applied for all *operating bands* for which co-location protection is provided.

**Table 7.6.5.1.2-1: OTA blocking requirement for co-location with BS or IAB-Node in other frequency bands**

| **Frequency range of interfering signal** | **Wanted signal mean power (dBm)** | **Interfering signal mean power for WA IAB-Node (dBm)** | **Interfering signal mean power for MR IAB-Node (dBm)** | **Interfering signal mean power for LA IAB-Node (dBm)** | **Type of interfering signal** |
| --- | --- | --- | --- | --- | --- |
| Frequency range of co-located downlink *operating band* | EISminSENS + 6 dB  (Note 1) | +46 | +38 | +24 | CW carrier |
| NOTE 1: EISminSENS depends on the IAB class and on the *IAB channel bandwidth*, see TS 38.174 [2] clause 10.3.  NOTE 2: The requirement does not apply when the interfering signal falls within any of the supported downlink *operating band(s)* or in ΔfOOB immediately outside any of the supported downlink *operating band(s)*. | | | | | |

<Next modified section from R4-2115699>

7.7.5.2 Test requirement for *IAB type 2-O*

The power of any receiver spurious emission shall not exceed the limits in table 7.7.5.2-1.

**Table 7.7.5.2-1: Radiated Rx spurious emission limits for *IAB type 2-O***

|  |  |  |  |
| --- | --- | --- | --- |
| **Spurious  frequency range  (Note 4)** | **Limit (Note 5)** | **Measurement Bandwidth** | **Note** |
| 30 MHz ↔ 1 GHz | -36 dBm | 100 kHz | Note 1 |
| 1 GHz ↔ 18 GHz | -30 dBm | 1 MHz | Note 1 |
| 18 GHz ↔ Fstep,1 | -20 dBm | 10 MHz | Note 2 |
| Fstep,1 ↔ Fstep,2 | -15 dBm | 10 MHz | Note 2 |
| Fstep,2 ↔ Fstep,3 | -10 dBm | 10 MHz | Note 2 |
| Fstep,4 ↔ Fstep,5 | -10 dBm | 10 MHz | Note 2 |
| Fstep,5 ↔ Fstep,6 | -15 dBm | 10 MHz | Note 2 |
| Fstep,6 ↔ min(2nd harmonic of the upper frequency edge of the UL operating band in GHz; 60 GHz) | -20 dBm | 10 MHz | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [10], s4.1.  NOTE 2: Limit and bandwidth as in ERC Recommendation 74-01 [11], Annex 2.  NOTE 3: Upper frequency as in ITU-R SM.329 [10], s2.5 table 1.  NOTE 4: The step frequencies Fstep,X are defined in table 7.7.5.2-2.  NOTE 5: Additional limits may apply regionally. | | | |

**Table 7.7.5.2-2: Step frequencies for defining the radiated Rx spurious emission limits   
for *IAB-DU type 2-O***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Operating band** | **Fstep,1 (GHz)** | **Fstep,2 (GHz)** | **Fstep,3 (GHz)** | **Fstep,4 (GHz)** | **Fstep,5 (GHz)** | **Fstep,6 (GHz)** |
| n257 | 18 | 23.5 | 25 | 31 | 32.5 | 41.5 |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23.5 | 35.5 | 38 | 45 | 47.5 | 59.5 |
| n260 | 25 | 34 | 35.5 | 41.5 | 43 | 52 |
| n261 | 18 | 25.5 | 26.0 | 29.85 | 30.35 | 38.35 |

In addition, the following requirement may be applied for protection of EESS for IAB operating in frequency range 24.25 – 27.5 GHz.

The power of any receiver spurious emission shall not exceed the limits in Table 7.7.5.2-3.

**Table 7.7.5.2-3: Limits for protection of Earth Exploration Satellite Service**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency range** | **Limit** | **Measurement Bandwidth** | **Note** |
| 23.6 – 24 GHz | -3 dBm | 200 MHz | Note 1 |
| 23.6 – 24 GHz | -9 dBm | 200 MHz | Note 2 |
| NOTE 1: This limit applies to IAB brought into use on or before 1 September 2027 and enters into force from [January 1], 2021.  NOTE 2: This limit applies to IAB brought into use after 1 September 2027. | | | |

<Next modified section from R4-2115699>

7.8.5.3 IAB-MT type 1-O

The requirement shall apply at the RIB when the AoA of the incident wave of a received signal and the interfering signal are from the same direction, and:

- when the wanted signal is based on EISREFSENS: the AoA of the incident wave of a received signal and the interfering signal are within the *FR1 OTA REFSENS RoAoA.*

- when the wanted signal is based on EISminSENS: the AoA of the incident wave of a received signal and the interfering signal are within the *minSENS RoAoA*.

The throughputshall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted signal at the assigned channel frequency and two interfering signals at the RIB with the conditions specified in tables 7.8.5.3-1 and 7.8.5.3-2 for intermodulation performance and in tables 7.8.5.3-3 and 7.8.5.3-4 for narrowband intermodulation performance.

The reference measurement channel for the wanted signal is identified in table 7.3.5.2-1, table 7.3.5.2-2 and table 7.3.5.2-3 for each *IAB-MT channel bandwidth* and further specified in annex A.1.

The subcarrier spacing for the modulated interfering signal shall be the same as the subcarrier spacing for the wanted signal, except for the case of wanted signal subcarrier spacing 60 kHz and *IAB-MT channel bandwidth* ≤ 20 MHz, for which the subcarrier spacing of the interfering signal should be 30 kHz.

The receiver intermodulation requirement is applicable outside the IAB-MT RF Bandwidth or Radio Bandwidth edges. The interfering signal offset is defined relative to the IAB-MT RF Bandwidth edges or Radio Bandwidth edges.

For a RIBs supporting operation in non-contiguous spectrum within any *operating band*, the narrowband intermodulation requirement shall apply in addition inside any sub-block gap in case the sub-block gap is at least as wide as the *IAB-MT channel bandwidth* of the NR interfering signal in tables 7.8.5.3-1 and 7.8.5.3-2. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For *multi-band RIBs*, the intermodulation requirement shall apply in addition inside any Inter RF Bandwidth gap, in case the gap size is at least twice as wide as the NR interfering signal centre frequency offset from the IAB-MT RF Bandwidth edge.

For *multi-band RIBs*, the narrowband intermodulation requirement shall apply in addition inside any Inter RF Bandwidth gap in case the gap size is at least as wide as the NR interfering signal in tables 7.8.5.3-3 and 7.8.5.3-4. The interfering signal offset is defined relative to the IAB-MT RF Bandwidth edges inside the Inter RF Bandwidth gap.

**Table 7.8.5.3-1: General intermodulation requirement**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB-MT class** | **Wanted Signal mean power (dBm)** | **Mean power of interfering signals (dBm)** | **Type of interfering signal** |
| Wide Area | EISREFSENS + 6 dB | -52 - ΔOTAREFSENS | See table 7.8.5.3-2 |
|  | EISminSENS + 6 dB | -52 - ΔminSENS |  |
| Local Area | EISREFSENS + 6 dB | -44 - ΔOTAREFSENS |  |
|  | EISminSENS + 6 dB | -44 - ΔminSENS |  |
| NOTE: EISREFSENS and EISminSENS depend on the IAB-MT class and on the *IAB-MT* *channel bandwidth* as specified in TS 38.174 [2], clause 10.2.2.1.2 and 10.3.3.2. | | | |

**Table 7.8.5.3-2: Interfering signals for intermodulation requirement**

|  |  |  |
| --- | --- | --- |
| ***IAB-DU channel bandwidth* of the lowest/highest carrier received (MHz)** | **Interfering signal centre frequency offset from the lower/upper IAB-DU RF Bandwidth edge (MHz)** | **Type of interfering signal (Note 3)** |
| 10 | ±7.465 | CW |
|  | ±17.5 | 5MHz CP-OFDM NR signal (Note 1) |
| 15 | ±7.43 | CW |
|  | ±17.5 | 5MHz CP-OFDM NR signal (Note 1) |
| 20 | ±7.395 | CW |
|  | ±17.5 | 5MHz CP-OFDM NR signal (Note 1) |
| 25 | ±7.465 | CW |
|  | ±25 | 20 MHz CP-OFDM NR signal (Note 2) |
| 30 | ±7.43 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| 40 | ±7.45 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| 50 | ±7.35 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| 60 | ±7.49 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| 70 | ±7.42 | CW |
|  | ±25 | 20 MHz CP-OFDM NR signal (Note 2) |
| 80 | ±7.44 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| 90 | ±7.46 | CW |
|  | ±25 | 20 MHz CP-OFDM NR signal (Note 2) |
| 100 | ±7.48 | CW |
|  | ±25 | 20MHz CP-OFDM NR signal (Note 2) |
| NOTE 1: For the 15 kHz subcarrier spacing, the number of RB is 25. For the 30 kHz subcarrier spacing, the number of RB is 10.  NOTE 2: For the 15 kHz subcarrier spacing, the number of RB is 100. For the 30 kHz subcarrier spacing, the number of RB is 50. For the 60 kHz subcarrier spacing, the number of RB is 24.  NOTE 3: The RBs shall be placed adjacent to the transmission bandwidth configuration edge which is closer to the *IAB-MT RF Bandwidth* edge. | | |

**Table 7.8.5.3-3: Narrowband intermodulation performance requirement in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB-MT class** | **Wanted signal mean power (dBm)** | **Interfering signal mean power (dBm)** | **Type of interfering signal** |
| Wide Area | EISREFSENS + 6 dB  (Note 1) | -52 - ΔOTAREFSENS | See table 7.8.5.3-4 |
|  | EISminSENS + 6 dB  (Note 1) | -52 - ΔminSENS |  |
| Local Area | EISREFSENS + 6 dB  (Note 1) | -44 - ΔOTAREFSENS |  |
|  | EISminSENS + 6 dB  (Note 1) | -44 - ΔminSENS |  |
| NOTE: EISREFSENS and EISminSENS depends on the *IAB-MT channel bandwidth* as specified in TS 38.174 [2], clause 10.2.2.1.2 and 10.3.3.2. | | | |

**Table 7.8.5.3-4: Interfering signals for narrowband intermodulation requirement in FR1**

|  |  |  |
| --- | --- | --- |
| ***IAB-MT channel bandwidth* of the lowest/highest carrier received (MHz)** | **Interfering RB centre frequency offset from the lower/upper IAB-MT RF Bandwidth edge or sub-block edge inside a sub-block gap (kHz) (Note 3)** | **Type of interfering signal** |
| 10 | ±370 | CW |
|  | ±1960 | 5MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 15 (NOTE 2) | ±380 | CW |
|  | ±1960 | 5MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 20 (NOTE 2) | ±390 | CW |
|  | ±2320 | 5MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 25 (NOTE 2) | ±325 | CW |
|  | ±2350 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 30 (NOTE 2) | ±335 | CW |
|  | ±2350 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 40 (NOTE 2) | ±355 | CW |
|  | ±2710 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 50 (NOTE 2) | ±375 | CW |
|  | ±2710 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 60 (NOTE 2) | ±395 | CW |
|  | ±2710 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 70 (NOTE 2) | ±415 | CW |
|  | ±2710 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 80 (NOTE 2) | ±435 | CW |
|  | ±2710 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 90 (NOTE 2) | ±365 | CW |
|  | ±2530 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| 100 (NOTE 2) | ±385 | CW |
|  | ±2530 | 20MHz CP-OFDM NR signal, 1 RB (Note 1) |
| NOTE 1: Interfering signal consisting of one resource block positioned at the stated offset, the *IAB-MTchannel bandwidth* of the interfering signal is located adjacently to the lower/upper IAB-MT RF Bandwidth edge.  NOTE 2: This requirement shall apply only for a G-FRC mapped to the frequency range at the channel edge adjacent to the interfering signals.  NOTE 3: The centre of the interfering RB refers to the frequency location between the two central subcarriers. | | |

<Next modified section from R4-2115699>

7.9.5.2 *IAB-DU type 2-O*

For *IAB-DU type 2-O*, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in annex A.1 with parameters specified in table 7.9.5.2-1.

The wanted and interfering signals applies to each supported polarization, under the assumption of *polarization match.*

**Table 7.9.5.2-1: OTA in-channel selectivity requirement for *IAB-DU type 2-O***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **NR channel bandwidth (MHz)** | **Subcarrier spacing (kHz)** | **Reference measurement channel**  **(annex A.1)** | **Wanted signal mean power (dBm)**  **(Note 2)** | **Interfering signal mean power (dBm)**  **(Note 2)** | **Type of interfering signal** |
| 50 | 60 | G-FR2-A1-4 | EISREFSENS\_50M + 3.4 + ΔFR2\_REFSENS | EISREFSENS\_50M + 10 + ΔFR2\_REFSENS | DFT-s-OFDM NR signal, 60 kHz SCS, 32 RBs |
| 100, 200 | 60 | G-FR2-A1-1 | EISREFSENS\_50M + 6.4 + ΔFR2\_REFSENS | EISREFSENS\_50M + 13 + ΔFR2\_REFSENS | DFT-s-OFDM NR signal, 60 kHz SCS, 64 RBs |
| 50 | 120 | G-FR2-A1-5 | EISREFSENS\_50M + 3.4 + ΔFR2\_REFSENS | EISREFSENS\_50M + 10 + ΔFR2\_REFSENS | DFT-s-OFDM NR signal, 120 kHz SCS, 16 RBs |
| 100, 200, 400 | 120 | G-FR2-A1-2 | EISREFSENS\_50M+ 6.4 + ΔFR2\_REFSENS | EISREFSENS\_50M + 13 + ΔFR2\_REFSENS | DFT-s-OFDM NR signal, 120 kHz SCS, 32 RBs |
| NOTE 1: Wanted and interfering signal are placed adjacently around Fc, where the Fc is defined for *IAB-DU channel bandwidth* of the wanted signal according to the table 5.4.2.2-1 in TS 38.104 [4]. The aggregated wanted and interferer signal shall be centred in the IAB-DU channel bandwidth of the wanted signal.  NOTE 2: EISREFSENS\_50M is defined in TS 38.174 [2], clause 10.2.1.2. | | | | | |

**<Next modified section>**

**<< Start OF 1st CHANGE from R4-2115769>>**

#### 8.1.1.3 Applicability rule

##### 8.1.1.3.1 General

Unless otherwise stated, for a IAB-DU declared to support more than 2 demodulation branches (for *IAB type 1-O* and *IAB type 2-O*), the performance requirement tests for 2 demodulation branches shall apply, and the mapping between connectors and demodulation branches is up to BS implementation.

The tests requiring more than [20] dB SNR level are set to N/A in the test requirements.

##### 8.1.1.3.2 Applicability of PUSCH performance requirements

8.1.1.3.2.1 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, PUSCH requirement tests shall apply only for each subcarrier spacing declared to be supported (see D.7 in table 4.6-1).

Unless otherwise stated, if IAB-DU supports more than one SCS then PUSCH requirement tests with highest modulation order shall apply only with lowest supported SCS and PUSCH requirement tests with other modulation orders shall apply only with highest supported SCS. Otherwise all modulation orders are tested on supported SCS.

8.1.1.3.2.2 Applicability of requirements for different channel bandwidths

For each subcarrier spacing declared to be supported, the test requirements for a specific channel bandwidth shall apply only if the IAB-DU supports it (see D.7 in table 4.6-1).

Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement for the closest channel bandwidth lower than this widest supported bandwidth; the tested PRBs shall then be centered in this widest supported channel bandwidth.

8.1.1.3.2.3 Applicability of requirements for different configurations

Unless otherwise stated, for *IAB type 1-O*, PUSCH requirement tests shall apply only for the mapping type declared to be supported (see D.100 in table 4.6-1). If both mapping type A and type B are declared to be supported, the tests shall be done for either type A or type B; the same chosen mapping type shall then be used for all tests.

Unless otherwise stated, for *IAB type 2-O*, PUSCH requirement tests shall apply only for the additional DM-RS position declared to be supported (see D.101 in table 4.6-1). If both options (i.e., pos0 and pos1) are declared to be supported, the tests shall be done for pos1.

Unless otherwise stated, for *IAB type 2-O*, PUSCH requirement tests with transform precoding disabled shall apply for the PT-RS option declared to be supported (see D.106 in table 4.6-1). If both PT-RS options (without and with PT-RS) are declared to be supported, the tests shall be done for either without or with PT-RS only; the same chosen option shall then be used for all tests.

Unless otherwise stated, for *IAB type 2-O*, PUSCH requirement tests with transform precoding enabled shall be done for without PT-RS.

8.1.1.3.2.4 Applicability of requirements for uplink carrier aggregation

The tests for uplink carrier aggregation shall be carried out according to the declaration (see D.108 in table 4.6-1).

Unless otherwise stated, the tests for uplink carrier aggregation shall apply only for PUSCH with transform precoding disabled, and shall be conducted on per component carrier basis.

8.1.1.3.2.5 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if IAB-DU supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

8.1.1.3.2.6 Applicability of requirements for transform precoding

Unless otherwise stated, the tests with transform precoding enabled shall apply only, if the IAB-DU supports it (see D.110 in table 4.6-1).

##### 8.1.1.3.3 Applicability of PUCCH performance requirements

8.1.1.3.3.1 Applicability of requirements for different formats

Unless otherwise stated, PUCCH requirement tests shall apply only for each PUCCH format declared to be supported (see D.102 in table 4.6-1).

8.1.1.3.3.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, PUCCH requirement tests shall apply only for each subcarrier spacing declared to be supported (see D.7 in table 4.6-1). If multiple subcarrier spacings are declared to be supported, each supported PUCCH format can be tested on one subcarrier spacing.

8.1.1.3.3.3 Applicability of requirements for different channel bandwidths

For each subcarrier spacing declared to be supported by the IAB-DU, the test requirements for a specific channel bandwidth shall apply only if the IAB-DU supports it (see D.7 in table 4.6-1).

Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement for the closest channel bandwidth lower than this widest supported bandwidth; the tested PRBs shall then be centered in this widest supported channel bandwidth.

8.1.1.3.3.4 Applicability of requirements for different configurations

Unless otherwise stated, PUCCH format 3 requirement tests shall apply only for the additional DM-RS configuration declared to be supported (see D.104 in table 4.6-1). If both options (without and with additional DM-RS) are declared to be supported, the tests shall be done for either without or with additional DM-RS; the same chosen option shall then be used for all tests.

Unless otherwise stated, PUCCH format 4 requirement tests shall apply only for the additional DM-RS configuration declared to be supported (see D.105 in table 4.6-1). If both options (without and with additional DM-RS) are declared to be supported, the tests shall be done for either without or with additional DM-RS; the same chosen option shall then be used for all tests.

8.1.1.3.3.5 Applicability of requirements for multi-slot PUCCH

Unless otherwise stated, multi-slot PUCCH requirement tests shall apply only if the IAB-DU supports it (see D.107 in table 4.6-1).

##### 8.1.1.3.4 Applicability of PRACH performance requirements

8.1.1.3.4.1 Applicability of requirements for different formats

Unless otherwise stated, PRACH requirement tests shall apply only for PRACH formats declared to be supported (see D.103 in table 4.6-1).

For IAB-DU declares to support more than one PRACH formats, limit the number of tests to any two cases chosen by the manufacturer. If IAB-DU declares to support more than one PRACH formats where formats for both long and short PRACH sequences are presented, require choosing formats with different sequences (see D.103 in table 4.6-1).

8.1.1.3.4.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, for each PRACH format with short sequence declared to be supported, for each FR, the tests shall apply only for the smallest supported subcarrier spacing in the FR (see D.103 in table 4.6-1).

8.1.1.3.4.3 Applicability of requirements for different channel bandwidths

Unless otherwise stated, for the subcarrier spacing to be tested, the test requirements shall apply only for anyone channel bandwidth declared to be supported (see D.7 in table 4.6-1).

**<< End OF 1st CHANGE from R4-2115769>>**

**<<start of change FROM R4-2115709>>**

8.1.2 Performance requirements for PUSCH

8.1.2.1 Performance requirements for PUSCH with transform precoding disabled

8.1.2.1.1 Definition and applicability

The performance requirement of PUSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ re-transmissions.

Which specific test(s) are applicable to IAB-DU is based on the test applicability rules defined in clause 8.1.1.3.2.

8.1.2.1.2 Minimum Requirement

For *BS type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.2.1.1.

For *BS type 2-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.2.2.1

8.1.2.1.3 Test purpose

The test shall verify the receiver's ability to achieve throughput under multipath fading propagation conditions for a given SNR.

8.1.2.1.4 Method of test

8.1.2.1.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M, see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.2.1.4.2 Procedure

1) Place the IAB-DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-DU with the test system.

3) Set the IAB-DU in the declared direction to be tested.

4) Connect the IAB-DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.1.2.1.4.2-1.

**Table 8.1.2.1.4.2-1: Test parameters for testing PUSCH**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | ***IAB type 1-O*** | ***IAB type 2-O*** |
| Transform precoding | | Disabled | |
| Cyclic prefix | | Normal | |
| Default TDD UL-DL pattern (Note) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U | 60 kHz and 120kHz SCS:  3D1S1U, S=10D:2G:2U |
| HARQ | Maximum number of HARQ transmissions | 4 | |
|  | RV sequence | 0, 2, 3, 1 | |
| DM-RS | DM-RS configuration type | 1 | |
|  | DM-RS duration | single-symbol DM-RS | |
|  | Additional DM-RS position | pos1 | {pos0, pos1} |
|  | Number of DM-RS CDM group(s) without data | 2 | |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | |
|  | DM-RS port(s) | {0}, {0,1} | |
|  | DM-RS sequence generation | NID0=0, nSCID=0 | |
| Time | PUSCH mapping type | A, B | B |
| domain | Start symbol | 0 | 0 |
| resource assignment | Allocation length | 14 | 10 |
| Frequency | RB assignment | Full applicable test bandwidth | |
| domain resource assignment | Frequency hopping | Disabled | |
| TPMI index for 2Tx two layer spatial multiplexing transmission | | 0 | |
| Code block group based PUSCH transmission | | Disabled | |
| PTRS | Frequency density (*KPT-RS*) | N.A. | *2*, Disabled |
| configuration | Time density (*LPT-RS*) | N.A. | 1, Disabled |
| Note: The same requirements are applicable with different UL-DL patterns for *IAB type 1-O* and *IAB type 2-O*. | | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.2.1.5.1 and 8.1.2.1.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB-DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.2.1.4.2-2.

**Table 8.1.2.1.4.2-2: AWGN power level at the IAB-DU input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 |  |  |
|  |  |  |  |
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|  |  |  |  |
|  | | | |

8) For reference channels applicable to the IAB-DU, measure the throughput.

8.1.2.1.5 Test Requirement

8.1.2.1.5.1 Test requirement for *IAB type 1-O*

The throughput measured according to clause 8.1.2.1.4.2 shall not be below the limits for the SNR levels specified in table 8.1.2.1.5.1-1 to table 8.1.2.1.5.1-14 for 1Tx and for 2Tx two layer spatial multiplexing transmission.

**Table 8.1.2.1.5.1-1: Void**



**Table 8.1.2.1.5.1-2: Test requirements for PUSCH with 70% of maximum throughput, Type A, 10 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-2 | pos1 | -1.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-2 | pos1 | 10.8 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-2 | pos1 | 12.8 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-9 | pos1 | 2.5 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-9 | pos1 | 19.1 |

**Table 8.1.2.1.5.1-3: Test requirements for PUSCH with 70% of maximum throughput, Type A, 20 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-3 | pos1 | -1.5 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-3 | pos1 | 10.6 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-3 | pos1 | 13.0 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A2.1-10 | pos1 | 2.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-10 | pos1 | 19.1 |

**Table 8.1.2.1.5.1-4: Test requirements for PUSCH with 70% of maximum throughput, Type A, 10 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-4 | pos1 | -1.7 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-4 | pos1 | 10.8 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-4 | pos1 | 13.4 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-11 | pos1 | 2.1 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-11 | pos1 | 19.2 |

**Table 8.1.2.1.5.1-5: Test requirements for PUSCH with 70% of maximum throughput, Type A, 20 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-5 | pos1 | -2.3 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-5 | pos1 | 10.8 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-5 | pos1 | 13.1 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-12 | pos1 | 2.1 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-12 | pos1 | 18.9 |

**Table 8.1.2.1.5.1-6: Test requirements for PUSCH with 70% of maximum throughput, Type A, 40 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-6 | pos1 | -1.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-6 | pos1 | 10.6 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-6 | pos1 | 13.0 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-13 | pos1 | 2.1 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-13 | pos1 | 20.3 |

**Table 8.1.2.1.5.1-7: Test requirements for PUSCH with 70% of maximum throughput, Type A, 100 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-7 | pos1 | -2.2 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-7 | pos1 | 10.8 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-7 | pos1 | 13.6 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-14 | pos1 | 2.2 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-14 | pos1 | 20.0 |

**Table 8.1.2.1.5.1-8: Void**



**Table 8.1.2.1.5.1-9: Test requirements for PUSCH with 70% of maximum throughput, Type B, 10 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-2 | pos1 | -1.7 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-2 | pos1 | 11.1 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-2 | pos1 | 13.2 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-9 | pos1 | 2.8 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-9 | pos1 | 19.5 |

**Table 8.1.2.1.5.1-10: Test requirements for PUSCH with 70% of maximum throughput, Type B, 20 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-3 | pos1 | -1.5 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-3 | pos1 | 11.0 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-3 | pos1 | 12.9 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A2.1-10 | pos1 | 2.4 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-10 | pos1 | 18.9 |

**Table 8.1.2.1.5.1-11: Test requirements for PUSCH with 70% of maximum throughput, Type B, 10 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-4 | pos1 | -1.8 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-4 | pos1 | 10.7 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-4 | pos1 | 13.1 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-11 | pos1 | 1.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-11 | pos1 | 19.3 |

**Table 8.1.2.1.5.1-12: Test requirements for PUSCH with 70% of maximum throughput, Type B, 20 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-5 | pos1 | -2.3 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-5 | pos1 | 10.7 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-5 | pos1 | 13.1 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-12 | pos1 | 2.1 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-12 | pos1 | 19.0 |

**Table 8.1.2.1.5.1-13: Test requirements for PUSCH with 70% of maximum throughput, Type B, 40 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-6 | pos1 | -1.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-6 | pos1 | 10.6 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-6 | pos1 | 13.1 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-13 | pos1 | 2.5 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-13 | pos1 | 19.5 |

**Table 8.1.2.1.5.1-14: Test requirements for PUSCH with 70% of maximum throughput, Type B, 100 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-7 | pos1 | -1.9 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-7 | pos1 | 10.7 |
|  |  | TDLA30-10 Low | D-FR1-A.2.4-7 | pos1 | 13.7 |
| 2 | 2 | TDLB100-400 Low | D-FR1-A.2.1-14 | pos1 | 2.4 |
|  |  | TDLC300-100 Low | D-FR1-A.2.3-14 | pos1 | 20.1 |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

8.1.2.1.5.2 Test requirement for *IAB type 2-O*

The throughput measured according to clause 8.1.2.1.4.2 shall not be below the limits for the SNR levels specified in table 8.1.2.1.5.2-1 to 8.1.2.1.5.2-7.

**Table 8.1.2.1.5.2-1: Test requirements for PUSCH with 70% of maximum throughput, 50 MHz Channel Bandwidth, 60 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **PT-RS** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-1 | pos0 | No | -1.4 |
|  |  |  | D-FR2-A.2.1-13 | pos1 | No | -1.6 |
|  |  | TDLA30-300 Low | D-FR2-A.2.3-1 | pos0 | Yes | 12.6 |
|  |  |  |  |  | No | 12.1 |
|  |  |  | D-FR2-A.2.3-11 | pos1 | Yes | 11.3 |
|  |  |  |  |  | No | 11.3 |
|  |  | TDLA30-75 Low | D-FR2-A.2.4-1 | pos0 | Yes | 14.3 |
|  |  |  |  |  | No | 13.7 |
|  |  |  | D-FR2-A.2.4-6 | pos1 | Yes | 14.0 |
|  |  |  |  |  | No | 13.5 |
| 2 |  | TDLA30-300 Low | D-FR2-A.2.1-6 | pos0 | No | 2.3 |
|  |  |  | D-FR2-A.2.1-18 | pos1 | No | 2.0 |
|  |  | TDLA30-300 Low | D-FR2-A.2.2-1 | pos0 | Yes | 16.0 |
|  |  |  |  |  | No | 15.1 |
|  |  |  | D-FR2-A.2.2-6 | pos1 | Yes | 14.6 |
|  |  |  |  |  | No | 13.8 |

**Table 8.1.2.1.5.2-2: Test requirements for PUSCH with 70% of maximum throughput, 100 MHz Channel Bandwidth, 60 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **PT-RS** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-2 | pos0 | No | -1.5 |
|  |  |  | D-FR2-A.2.1-14 | pos1 | No | -1.8 |
|  |  | TDLA30-300 Low | D-FR2-A.2.3-2 | pos0 | Yes | 12.8 |
|  |  |  |  |  | No | 11.8 |
|  |  |  | D-FR2-A.2.3-12 | pos1 | Yes | 11.8 |
|  |  |  |  |  | No | 11.2 |
|  |  | TDLA30-75 Low | D-FR2-A.2.4-2 | pos0 | Yes | 14.8 |
|  |  |  |  |  | No | 13.9 |
|  |  |  | D-FR2-A.2.4-7 | pos1 | Yes | 14.3 |
|  |  |  |  |  | No | 13.7 |
| 2 |  | TDLA30-300 Low | D-FR2-A.2.1-7 | pos0 | No | 2.3 |
|  |  |  | D-FR2-A.2.1-19 | pos1 | No | 2.0 |
|  |  | TDLA30-300 Low | D-FR2-A.2.2-2 | pos0 | Yes | 16.8 |
|  |  |  |  |  | No | 15.7 |
|  |  |  | D-FR2-A.2.2-7 | pos1 | Yes | 14.6 |
|  |  |  |  |  | No | 13.9 |

**Table 8.1.2.1.5.2-3: Test requirements for PUSCH with 70% of maximum throughput, 50 MHz Channel Bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **PT-RS** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-3 | pos0 | No | -1.2 |
|  |  |  | D-FR2-A.2.1-15 | pos1 | No | -1.5 |
|  |  | TDLA30-300 Low | D-FR2-A.2.3-3 | pos0 | Yes | 12.2 |
|  |  |  |  |  | No | 11.5 |
|  |  |  | D-FR2-A.2.3-13 | pos1 | Yes | 11.5 |
|  |  |  |  |  | No | 11.1 |
|  |  | TDLA30-75 Low | D-FR2-A.2.4-3 | pos0 | Yes | 14.3 |
|  |  |  |  |  | No | 13.7 |
|  |  |  | D-FR2-A.2.4-8 | pos1 | Yes | 13.8 |
|  |  |  |  |  | No | 13.6 |
| 2 |  | TDLA30-300 Low | D-FR2-A.2.1-8 | pos0 | No | 2.2 |
|  |  |  | D-FR2-A.2.1-20 | pos1 | No | 2.1 |
|  |  | TDLA30-300 Low | D-FR2-A.2.2-3 | pos0 | Yes | 15.0 |
|  |  |  |  |  | No | 14.4 |
|  |  |  | D-FR2-A.2.2-8 | Pos1 | Yes | 14.7 |
|  |  |  |  |  | No | 13.9 |

**Table 8.1.2.1.5.2-4: Test requirements for PUSCH with 70% of maximum throughput, 100 MHz Channel Bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **PT-RS** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-4 | pos0 | No | -1.8 |
|  |  |  | D-FR2-A.2.1-16 | pos1 | No | -1.9 |
|  |  | TDLA30-300 Low | D-FR2-A.2.3-4 | pos0 | Yes | 12.5 |
|  |  |  |  |  | No | 11.1 |
|  |  |  | D-FR2-A.2.3-14 | pos1 | Yes | 11.7 |
|  |  |  |  |  | No | 11.1 |
|  |  | TDLA30-75 Low | D-FR2-A.2.4-4 | pos0 | Yes | 14.1 |
|  |  |  |  |  | No | 13.5 |
|  |  |  | D-FR2-A.2.4-9 | pos1 | Yes | 14.0 |
|  |  |  |  |  | No | 13.4 |
| 2 |  | TDLA30-300 Low | D-FR2-A.2.1-9 | pos0 | No | 2.2 |
|  |  |  | D-FR2-A.2.1-21 | pos1 | No | 2.0 |
|  |  | TDLA30-300 Low | D-FR2-A.2.2-4 | pos0 | Yes | 14.7 |
|  |  |  |  |  | No | 14.0 |
|  |  |  | D-FR2-A.2.2-9 | pos1 | Yes | 14.3 |
|  |  |  |  |  | No | 13.7 |

**Table 8.1.2.1.5.2-5: Test requirements for PUSCH with 70% of maximum throughput, 200 MHz Channel Bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **PT-RS** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-5 | pos0 | No | -1.5 |
|  |  |  | D-FR2-A.2.1-17 | pos1 | No | -1.8 |
|  |  | TDLA30-300 Low | D-FR2-A.2.3-5 | pos0 | Yes | 11.9 |
|  |  |  |  |  | No | 11.5 |
|  |  |  | D-FR2-A.2.3-15 | pos1 | Yes | 11.8 |
|  |  |  |  |  | No | 11.3 |
|  |  | TDLA30-75 Low | D-FR2-A.2.4-5 | pos0 | Yes | 14.7 |
|  |  |  |  |  | No | 14.0 |
|  |  |  | D-FR2-A.2.4-10 | pos1 | Yes | 14.3 |
|  |  |  |  |  | No | 13.9 |
| 2 |  | TDLA30-300 Low | D-FR2-A.2.1-10 | pos0 | No | 2.2 |
|  |  |  | D-FR2-A.2.1-22 | pos1 | No | 1.9 |
|  |  | TDLA30-300 Low | D-FR2-A.2.2-5 | pos0 | Yes | 14.8 |
|  |  |  |  |  | No | 14.1 |
|  |  |  | D-FR2-A.2.2-10 | pos1 | Yes | 14.4 |
|  |  |  |  |  | No | 13.8 |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

8.1.2.2 Performance requirements for PUSCH with transform precoding enabled

8.1.2.2.1 Definition and applicability

The performance requirement of PUSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ re-transmissions.

Which specific test(s) are applicable to IAB-DU is based on the test applicability rules defined in clause 8.1.1.3.2.

8.1.2.2.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.2.1.2.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.2.2.2.

8.1.2.2.3 Test Purpose

The test shall verify the receiver's ability to achieve throughput under multipath fading propagation conditions for a given SNR.

8.1.2.2.4 Method of test

8.1.2.2.4.1 Initial Conditions

Test environment: Normal, see clause B.2.

RF channels to be tested for single carrier: M, see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.2.2.4.2 Procedure

1) Place the IAB-DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-DU with the test system.

3) Set the IAB-DU in the declared direction to be tested.

4) Connect the IAB-DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.1.2.2.4.2-1.

**Table 8.1.2.2.4.2-1: Test parameters for testing PUSCH**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | ***IAB type 1-O*** | ***IAB type 2-O*** |
| Transform precoding | | Enabled | |
| Cyclic prefix | | Normal | |
| Default TDD UL-DL pattern (Note) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U | 60 kHz and 120kHz SCS:  3D1S1U, S=10D:2G:2U |
| HARQ | Maximum number of HARQ transmissions | 4 | |
|  | RV sequence | 0, 2, 3, 1 | |
| DM-RS | DM-RS configuration type | 1 | |
|  | DM-RS duration | single-symbol DM-RS | |
|  | Additional DM-RS position | pos1 | pos0, pos1 |
|  | Number of DM-RS CDM group(s) without data | 2 | |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | |
|  | DM-RS port(s) | 0 | |
|  | DM-RS sequence generation | *NID*0=0, group hopping and sequence hopping are disabled | |
| Time | PUSCH mapping type | A, B | B |
| domain | Start symbol | 0 | 0 |
| resource assignment | Allocation length | 14 | 10 |
| Frequency domain resource assignment | RB assignment | 15 kHz SCS: 25 PRBs in the middle of the test bandwidth  30 kHz SCS: 24 PRBs in the middle of the test bandwidth | 30 PRBs in the middle of the test bandwidth |
|  | Frequency hopping | Disabled | |
| Code block group based PUSCH transmission | | Disabled | |
| PT-RS | | Not configured | |
| NOTE: The same requirements are applicable to TDD with different UL-DL patterns for *IAB type 1-O*, and *IAB type 2-O*. | | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.2.2.5.1 and 8.1.2.2.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB-DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.2.2.4.2-2.

**Table 8.1.2.2.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB-DU type** | **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| *IAB type 1-O* | 15 | 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz |
|  | 30 | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz |
| *IAB type 2-O* | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52MHz |
|  | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

8) For reference channels applicable to the IAB-DU, measure the throughput.

8.1.2.2.5 Test Requirement

8.1.2.2.5.1 Test requirement for *IAB type 1-O*

The throughput measured according to clause 8.1.2.2.4.2 shall not be below the limits for the SNR levels specified in table 8.1.2.2.5.1-1 to table 8.1.2.2.5.1-4.

**Table 8.1.2.2.5.1-1: Test requirements for PUSCH with 70% of maximum throughput, Type A, 5 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-15 | pos1 | -1.8 |

**Table 8.1.2.2.5.1-2: Test requirements for PUSCH with 70% of maximum throughput, Type A, 10 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-16 | pos1 | -1.9 |

**Table 8.1.2.2.5.1-3: Test requirements for PUSCH with 70% of maximum throughput, Type B, 5 MHz channel bandwidth, 15 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-15 | pos1 | -1.7 |

**Table 8.1.2.2.5.1-4: Test requirements for PUSCH with 70% of maximum throughput, Type B, 10 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLB100-400 Low | D-FR1-A.2.1-16 | pos1 | -2.1 |

8.1.2.2.5.2 Test requirement for *IAB type 2-O*

The throughput measured according to clause 8.1.2.2.4.2 shall not be below the limits for the SNR levels specified in table 8.1.2.2.5.2-1 to table 8.1.2.2.5.2-2.

**Table 8.1.2.2.5.2-1: Test requirements for PUSCH with 70% of maximum throughput, Type B, 50 MHz channel bandwidth, 60 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix**  **(annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-11 | Pos0 | -1.2 |
|  |  |  | D-FR2-A.2.1-23 | pos1 | -1.3 |

**Table 8.1.2.2.5.2-2: Test requirements for PUSCH with 70% of maximum throughput, Type B, 50 MHz channel bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix**  **(annex J)** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | TDLA30-300 Low | D-FR2-A.2.1-12 | Pos0 | -1.2 |
|  |  |  | D-FR2-A.2.1-24 | pos1 | -1.3 |

8.1.2.3 Performance requirements for UCI multiplexed on PUSCH

8.1.2.3.1 Definition and applicability

The performance requirement of UCI multiplexed on PUSCH is determined by two parameters: block error probability (BLER) of CSI part 1 and block error probability of CSI part 2. The performance is measured by the required SNR at block error probability of CSI part 1 not exceeding 0.1 %, and the required SNR at block error probability of CSI part 2 not exceeding 1 %.

The CSI part 1 BLER is defined as the probability of incorrectly decoding the CSI part 1 information when the CSI part 1 information is sent.

The CSI part 2 BLER is defined as the probability of incorrectly decoding the CSI part 2 information when the CSI part2 information is sent.

In the test of UCI multiplexed on PUSCH, the UCI information only contains CSI part 1 and CSI part 2 information, there is no HACK/ACK information transmitted.

The number of UCI information bit payload per slot is defined for two cases as follows:

- 7 bits: 5 bits in CSI part 1, 2 bits in CSI part 2

- 40 bits: 20 bits in CSI part 1, 20 bits in CSI part 2

The 7 bits UCI information case is further defined with the bitmap [c0 c1 c2 c3 c4] = [0 1 0 1 0] for CSI part 1 information, where c0 is mapping to the RI information, and with the bitmap [c0 c1] = [1 0] for CSI part 2 information.

The 40 bits UCI information case is assumed random information bit selection.

In both tests, PUSCH data, CSI part 1 and CSI part 2 are transmitted simultaneously.

Which specific test(s) is applicable to IAB-DU is based on the test applicability rule defined in clause 8.1.1.3.2.

8.1.2.3.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.2.1.3.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.2.2.3.

8.1.2.3.3 Test Purpose

The test shall verify the receiver's ability to detect UCI with CSI part 1 and CSI part 2 bits multiplexed on PUSCH under multipath fading propagation conditions for a given SNR.

8.1.2.3.4 Method of test

8.1.2.3.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.2.3.4.2 Procedure

1) Place the IAB-DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-DU with the test system.

3) Set the IAB-DU in the declared direction to be tested.

4) Connect the IAB-DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured to the corresponding UL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.1.2.3.4.2-1. The UCI information bit payload per slot is equal to 7bits with CSI part 1 5bits, CSI part 2 2bits, and the UCI information bit payload per slot is equal to 40 bits with CSI part 1 20bits, CSI part 2 20 bits.

**Table: 8.1.2.3.4.2-1 Test parameters for testing UCI multiplexed on PUSCH**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | ***IAB type 1-O*** | ***IAB type 2-O*** | |
| Transform precoding | | Disabled | | |
| Cyclic prefix | | Normal | | |
| Default TDD UL-DL pattern (Note) | | 30 kHz SCS:  7D1S2U, S=6D:4G:4U | 120 kHz SCS:  3D1S1U, S=10D:2G:2U | |
| HARQ | Maximum number of HARQ transmissions | 1 | | |
|  | RV sequence | 0 | | |
| DM-RS | DM-RS configuration type | 1 | | |
|  | DM-RS duration | Single-symbol DM-RS | | |
|  | Additional DM-RS position | pos1 | pos0,pos1 | |
|  | Number of DM-RS CDM group(s) without data | 2 | | |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | | |
|  | DM-RS port(s) | {0} | {0} | |
|  | DM-RS sequence generation | NID0=0, nSCID =0 | | |
| Time domain | PUSCH mapping type | A,B | B | |
| resource | Start symbol | 0 | | |
| assignment | Allocation length | 14 | 10 | |
| Frequency | RB assignment | Full applicable test bandwidth | | |
| domain resource assignment | Frequency hopping | Disabled | | |
| Code block group based PUSCH transmission | | Disabled | | |
| PT-RS | PT-RS | Disabled | | Enabled |
| configuration | Frequency density (*KPT-RS*) | N.A. | | 2 |
|  | Time density (*LPT-RS*) | N.A. | | 1 |
| UCI | Number of CSI part1 and CSI part2 information bit payload | {5, 2}, {20,20} | | |
|  | scaling | 1 | | |
|  | betaOffsetACK-Index1 | 11 | | |
|  | betaOffsetCSI-Part1-Index1 and betaOffsetCSI-Part1-Index2 | 13 | | |
|  | betaOffsetCSI-Part2-Index1 and betaOffsetCSI-Part2-Index2 | 13 | | |
|  | UCI partition for frequency hopping | Disabled | | |
| NOTE: The same requirements are applicable to TDD with different UL-DL patterns for *IAB type 1-O* and IAB *type 2-O.* | | | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.2.3.5.1 and 8.1.2.3.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the BS receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.2.3.4.2-2.

**Table 8.1.2.3.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB-DU type** | **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| *IAB type 1-O* | 30 | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz |
| *IAB type 2-O* | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as declared in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

8) The signal generator sends a test pattern where UCI with CSI part 1 and CSI part 2 information can be multiplexed on PUSCH. The following statistics are kept: the number of incorrectly decoded CSI part 1 information transmitted, the number of incorrectly decoded CSI part 2 information transmitted during UCI multiplexed on PUSCH transmission.

8.1.2.3.5 Test Requirement

8.1.2.3.5.1 Test requirement for *IAB type 1-O*

The fraction of incorrectly decoded UCI with CSI part 1 according to clause 8.1.2.3.4.2 shall be less than 0.1 % for the SNR listed in table 8.1.2.3.5.1-1 and table 8.1.2.3.5.1-2. The fraction of incorrectly decoded UCI with CSI part 2 according to clause 8.1.2.3.4.2 shall be less than 1 % for the SNR listed in table 8.1.2.3.5.1-3 and table 8.1.2.3.5.1-4.

**Table 8.1.2.3.5.1-1: Test requirements for UCI multiplexed on PUSCH, Type A, CSI part 1, 10 MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLC300-100 Low | 7 (5, 2) | pos1 | D-FR1-A.2.3-4 | 6.0 |
|  | 2 | TDLC300-100 Low | 40 (20,20) | pos1 | D-FR1-A.2.3-4 | 4.9 |

**Table 8.1.2.3.5.1-2: Test requirements for UCI multiplexed on PUSCH, Type B, CSI part 1, 10MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLC300-100 Low | 7 (5, 2) | pos1 | D-FR1-A.2.3-4 | 6.4 |
|  | 2 | TDLC300-100 Low | 40 (20,20) | pos1 | D-FR1-A.2.3-4 | 4.7 |

**Table 8.1.2.3.5.1-3: Test requirements for UCI multiplexed on PUSCH, Type A, CSI part 2, 10MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLC300-100 Low | 7 (5, 2) | pos1 | D-FR1-A.2.3-4 | 0.4 |
|  | 2 | TDLC300-100 Low | 40 (20,20) | pos1 | D-FR1-A.2.3-4 | 3.0 |

**Table 8.1.2.3.5.1-4: Test requirements for UCI multiplexed on PUSCH, Type B, CSI part 2, 10MHz channel bandwidth, 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLC300-100 Low | 7 (5, 2) | pos1 | D-FR1-A.2.3-4 | 0.9 |
|  | 2 | TDLC300-100 Low | 40 (20,20) | pos1 | D-FR1-A.2.3-4 | 3.2 |

8.1.2.3.5.2 Test requirement for *IAB type 2-O*

The fraction of incorrectly decoded UCI with CSI part 1 measured according to clause 8.1.2.3.4.2 shall be less than 0.1 % for the SNR listed in table 8.1.2.3.5.2-1 and table 8.1.2.3.5.2-2. The fraction of incorrectly decoded UCI with CSI part 2 measured according to clause 8.1.2.3.4.2 shall be less than 1 % for the SNR listed in table 8.1.2.3.5.2-3 and table 8.1.2.3.5.2-4.

**Table 8.1.2.3.5.2-1: Test requirements for UCI multiplexed on PUSCH, Type B, with PT-RS, CSI part 1, 50 MHz channel bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLA30-300 Low | 7 (5, 2) | pos0 | D-FR2-A.2.3-3 | 7.8 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos0 | D-FR2-A.2.3-3 | 6.4 |
|  | 2 | TDLA30-300 Low | 7 (5, 2) | pos1 | D-FR2-A.2.3-13 | 8.4 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos1 | D-FR2-A.2.3-13 | 6.5 |

**Table 8.1.2.3.5.2-2: Test requirements for UCI multiplexed on PUSCH, Type B, without PT-RS, CSI part 1, 50MHz channel bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLA30-300 Low | 7 (5, 2) | pos0 | D-FR2-A.2.3-3 | 7.7 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos0 | D-FR2-A.2.3-3 | 6.4 |
|  | 2 | TDLA30-300 Low | 7 (5, 2) | pos1 | D-FR2-A.2.3-13 | 7.9 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos1 | D-FR2-A.2.3-13 | 6.1 |

**Table 8.1.2.3.5.2-3: Test requirements for UCI multiplexed on PUSCH, Type B, with PT-RS, CSI part 2, 50 MHz channel bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLA30-300 Low | 7 (5, 2) | pos0 | D-FR2-A.2.3-3 | 1.7 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos0 | D-FR2-A.2.3-3 | 4.6 |
|  | 2 | TDLA30-300 Low | 7 (5, 2) | pos1 | D-FR2-A.2.3-13 | 1.9 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos1 | D-FR2-A.2.3-13 | 4.6 |

**Table 8.1.2.3.5.2-4: Test requirements for UCI multiplexed on PUSCH, Type B, Without PT-RS, CSI part 2, 50MHz channel bandwidth, 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Propagation conditions and correlation matrix (Annex J)** | **UCI bits**  **(CSI part 1, CSI part 2)** | **Additional DM-RS position** | **FRC**  **(Annex A)** | **SNR (dB)** |
| 1 | 2 | TDLA30-300 Low | 7 (5, 2) | pos0 | D-FR2-A.2.3-3 | 1.7 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos0 | D-FR2-A.2.3-3 | 4.5 |
|  | 2 | TDLA30-300 Low | 7 (5, 2) | pos1 | D-FR2-A.2.3-13 | 1.8 |
|  | 2 | TDLA30-300 Low | 40 (20,20) | pos1 | D-FR2-A.2.3-13 | 4.3 |

8.1.3 Performance requirements for PUСCH

8.1.3.1 Performance requirements for PUCCH format 0

8.1.3.1.1 Definition and applicability

The performance requirement of single user PUCCH format 0 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as conditional probability of detection of the ACK when the signal is present.

The transient period as specified in TS 38.101-1 [16] clause 6.3.3.1 and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

Which specific test(s) are applicable to IAB-DU is based on the test applicability rules defined in clause 8.1.1.3.3.

8.1.3.1.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirements are in TS 38.174 [2] clause 11.3.1.1 and 11.1.3.1.2.

For *IAB type 2-O*, the minimum requirements are in TS 38.174 [2] clause 11.3.2.1 and 11.1.3.2.2.

8.1.3.1.3 Test Purpose

The test shall verify the receiver's ability to detect ACK under multipath fading propagation conditions for a given SNR.

8.1.3.1.4 Method of test

8.1.3.1.4.1 Initial Conditions

Test environment: Normal, see annex B.2.

RF channels to be tested: single carrier M; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.3.1.4.2 Procedure

1) Place the IAB-DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-DU with the test system.

3) Set the IAB-DU in the declared direction to be tested.

4) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7] and according to additional test parameters listed in table 8.1.3.1.4.2-1.

**Table 8.1.3.1.4.2-1: Test parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | ***IAB type 1-O*** | ***IAB type 2-O*** |
| number of UCI information bits | 1 | 1 |
| Number of PRBs | 1 | 1 |
| First PRB prior to frequency hopping | 0 | 0 |
| Intra-slot frequency hopping | N/A for 1 symbol  Enabled for 2 symbols | N/A for 1 symbol  Enabled for 2 symbols |
| First PRB after frequency hopping | The largest PRB index – (number of PRBs – 1) | The largest PRB index – (number of PRBs – 1) |
| Group and sequence hopping | neither | neither |
| Hopping ID | 0 | 0 |
| Initial cyclic shift | 0 | 0 |
| First symbol | 13 for 1 symbol  12 for 2 symbols | 13 for 1 symbol  12 for 2 symbols |
| Cyclic prefix | normal | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.2.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.3.1.5.1 and 8.1.3.1.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB-DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level quoted in table 8.1.3.1.4.2-2.

**Table 8.1.3.1.4.2-2: AWGN power level at the IAB-DU input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The signal generator sends a test pattern with the pattern outlined in figure 8.1.3.1.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.

****

**Figure 8.1.3.1.4.2-1: Test signal pattern for single user PUCCH format 0 demodulation tests**

8.1.3.1.5 Test Requirement

8.1.3.1.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.1.3.1.5.1-1 and in table 8.1.3.1.5.1-2.

**Table 8.1.3.1.5.1-1: Test requirements for PUCCH format 0 and 15 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation conditions and** | **Number of** | **Channel bandwidth / SNR (dB)** | | | |
| **of TX antennas** | **demodulation branches** | **correlation matrix (annex J)** | **OFDM symbols** | **10 MHz** | | **20 MHz** | |
| 1 | 2 | TDLC300-100 Low | 1 | 9.4 | | 9.9 | |
|  |  |  | 2 | 4.3 | | 3.9 | |

**Table 8.1.3.1.5.1-2: Test requirements for PUCCH format 0 and 30 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation conditions** | **Number** | **Channel bandwidth / SNR (dB)** | | | |
| **of TX antennas** | **demodulation branches** | **and correlation matrix (annex J)** | **of OFDM symbols** | **10 MHz** | **20 MHz** | **40 MHz** | **100 MHz** |
| 1 | 2 | TDLC300-100 Low | 1 | 10.4 | 10.4 | 10.1 | 9.8 |
|  |  |  | 2 | 4.8 | 4.2 | 4.4 | 4.1 |

8.1.3.1.5.2 Test requirement for *IAB type 2-O*

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.1.3.1.5.2-1 and in table 8.1.3.1.5.2-2.

**Table 8.1.3.1.5.2-1: Test requirements for PUCCH format 0 and 60 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of demodulation** | **Propagation conditions and correlation matrix (annex J)** | **Number of OFDM** | **Channel bandwidth / SNR (dB)** | |
| **antennas** | **branches** |  | **symbols** | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | 1 | 9.9 | 9.6 |
|  |  |  | 2 | 4.8 | 4.6 |

**Table 8.1.3.1.5.2-2: Test requirements for PUCCH format 0 and 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of demodulation** | **Propagation conditions and correlation matrix (annex J)** | **Number of OFDM** | **Channel bandwidth / SNR (dB)** | | |
| **antennas** | **branches** |  | **symbols** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 2 | TDLA30-300 Low | 1 | 10.1 | 9.8 | 10.3 |
|  |  |  | 2 | 4.7 | 4.4 | 4.6 |

8.1.3.2 Performance requirements for PUCCH format 1

8.1.3.2.1 NACK to ACK detection

8.1.3.2.1.1 Definition and applicability

The performance requirement of PUCCH format 1 for NACK to ACK detection is determined by the two parameters: probability of false detection of the ACK and the NACK to ACK detection probability. The performance is measured by the required SNR at probability of the NACK to ACK detection equal to 0.1% or less. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK at particular bit position when input is only noise. Each false bit detection is counted as one error.

The NACK to ACK detection probability is the probability of detecting an ACK bit when an NACK bit was sent on particular bit position. Each NACK bit erroneously detected as ACK bit is counted as one error. Erroneously detected NACK bits in the definition do not contain the NACK bits which are mapped from DTX, i.e. NACK bits received when DTX is sent should not be considered.

The transient period as specified in TS 38.101-1 [16] and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

Which specific test(s) are applicable to IAB-DU is based on the test applicability rules defined in clause 8.1.1.3.3.

8.1.3.2.1.2 Minimum Requirement

For BS type 1-O, the minimum requirement is in TS 38.174 [2], clause 11.1.3.1.3.

For BS type 2-O, the minimum requirement is in TS 38.174 [2], clause 11.1.3.2.3.

8.1.3.2.1.3 Test Purpose

The test shall verify the receiver's ability not to falsely detect NACK bits as ACK bits under multipath fading propagation conditions for a given SNR.

8.1.3.2.1.4 Method of test

8.1.3.2.1.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested: OTA REFSENS receiver target reference direction (see D.54 in table 4.6-1).

8.1.3.2.1.4.2 Procedure

1) Place the IAB-DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-DU with the test system.

3) Set the IAB-DU in the declared direction to be tested.

4) Connect the IAB-DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.2.1.4.2-1.

**Table 8.1.3.2.1.4.2-1: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs - 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.3.2.1.5.1 and 8.1.3.2.1.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB-DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.2.1.4.2-2.

**Table 8.1.3.2.1.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB type** | **Subcarrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| *IAB type 1-O* | 15 kHz | 10 | -80.3 – ΔOTAREFSENS dBm / 9.36 MHz |
|  |  | 20 | -77.2 – ΔOTAREFSENS dBm / 19.08 MHz |
|  | 30 kHz | 10 | -80.6 – ΔOTAREFSENS dBm / 8.64 MHz |
|  |  | 20 | -77.4 – ΔOTAREFSENS dBm / 18.36 MHz |
|  |  | 40 | -74.2 – ΔOTAREFSENS dBm / 38.16 MHz |
|  |  | 100 | -70.1 – ΔOTAREFSENS dBm / 98.28 MHz |
| *IAB type 2-O* | 60 kHz | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz |
|  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
|  |  | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
|  |  | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
|  |  | 200 | EISREFSENS\_50M + ΔFR2\_REFSENS + 21 dBm / 190.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

8) The signal generator sends random codeword from applicable codebook, in regular time periods. The following statistics are kept: the number of ACK bits detected in the idle periods and the number of NACK bits detected as ACK.

8.1.3.2.1.5 Test Requirement

8.1.3.2.1.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACK bits shall be less than 1 % and the fraction of NACK bits falsely detected as ACK shall be less than 0.1 % for the SNR listed in tables 8.1.3.2.1.5.1-1 and table 8.1.3.2.1.5.1-2.

**Table 8.1.3.2.1.5.1-1: Required SNR for PUCCH format 1 with 15 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | | | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **10 MHz** | | **20 MHz** | |
| 1 | 2 | TDLC300-100 Low | -3.0 | | -3.0 | |

**Table 8.1.3.2.1.5.1-2: Required SNR for PUCCH format 1 with 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | | | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **10 MHz** | **20 MHz** | **40 MHz** | **100 MHz** |
| 1 | 2 | TDLC300-100 Low | -2.2 | -2.7 | -3.3 | -2.9 |

8.1.3.2.1.5.2 Test requirement for *IAB type 2-O*

The fraction of falsely detected ACK bits shall be less than 1 % and the fraction of NACK bits falsely detected as ACK shall be less than 0.1 % for the SNR listed in tables 8.1.3.2.1.5.2-1 and table 8.1.3.2.1.5.2-2.

**Table 8.1.3.2.1.5.2-1: Required SNR for PUCCH format 1 with 60 kHz SCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | -0.6 | -3.6 |

**Table 8.1.3.2.1.5.2-2: Required SNR for PUCCH format 1 with 120 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 2 | TDLA30-300 Low | -3.3 | -3.3 | -2.4 |

8.1.3.2.2 ACK missed detection

8.1.3.2.2.1 Definition and applicability

The performance requirement of PUCCH format 1 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as conditional probability of detection of the ACK when the signal is present.

The transient period as specified in TS 38.101-1 [16] and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

Which specific test(s) are applicable to IAB DU is based on the test applicability rules defined in clause 8.1.1.3.3.

8.1.3.2.2.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [7], clause 11.1.3.1.3.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [7], clause 11.1.3.2.3.

8.1.3.2.2.3 Test Purpose

The test shall verify the receiver's ability to detect ACK bits under multipath fading propagation conditions for a given SNR.

8.1.3.2.2.4 Method of test

8.1.3.2.2.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1.

Direction to be tested: OTA REFSENS receiver target reference direction (see D.54 in table 4.6-1).

8.1.3.2.2.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.2.2.4.2-1.

**Table 8.1.3.2.2.4.2-1: Test Parameters**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index – (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.2.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.2.2.5.1 and 8.1.3.2.2.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.2.2.4.2-2.

**Table 8.1.3.2.2.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 kHz |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The tester sends random codewords from applicable codebook, in regular time periods. The following statistics are kept: the number of ACK bits falsely detected in the idle periods and the number of missed ACK bits. Each falsely detected ACK bit in the idle periods is accounted as one error for the statistics of false ACK detection, and each missed ACK bit is accounted as one error for the statistics of missed ACK detection.

Note that the procedure described in this clause for ACK missed detection has the same condition as that described in clause 8.1.3.2.1.4.2 for NACK to ACK detection. Both statistics are measured in the same testing.

8.1.3.2.2.5 Test Requirement

8.1.3.2.2.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of correctly detected ACK bits shall be larger than 99% for the SNR listed in tables 8.1.3.2.2.5-1 and table 8.1.3.2.2.5-2.

**Table 8.1.3.2.2.5.1-1: Required SNR for PUCCH format 1 with 15 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | | | |
|  |  |  |  | |  | |
|  |  |  |  | |  | |

**Table 8.1.3.2.2.5.1-2: Required SNR for PUCCH format 1 with 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | | | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **10 MHz** | **20 MHz** | **40 MHz** | **100 MHz** |
| 1 | 2 | TDLC300-100 Low | -3.3 | -3.8 | -3.8 | -3.6 |

8.1.3.2.2.5.2 Test requirement for *IAB type 2-O*

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of correctly detected ACK bits shall be larger than 99% for the SNR listed in tables 8.1.3.2.2.5.2-1 and table 8.1.3.2.2.5.2-2.

**Table 8.1.3.2.2.5.2-1: Required SNR for PUCCH format 1 with 60 kHz SCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | -3.3 | -3.6 |

**Table 8.1.3.2.2.5.2-2: Required SNR for PUCCH format 1 with 120 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of Demodulation** | **Propagation conditions and** | **Channel bandwidth / SNR (dB)** | | |
| **antennas** | **Branches** | **correlation matrix (annex J)** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 2 | TDLA30-300 Low | -4.1 | -4.0 | -4.0 |

8.1.3.3 Performance requirements for PUCCH format 2

8.1.3.3.1 ACK missed detection performance requirements

8.1.3.3.1.1 Definition and applicability

The performance requirement of PUCCH format 2 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK on the wanted signal. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as probability of detection of the ACK when the signal is present.

Which specific test(s) are applicable to IAB DU is based on the test applicability rules defined in clause 8.1.1.3.

The transient period as specified in TS 38.101-1 [16] and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

8.1.3.3.1.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.3.1.4.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.3.2.4.

8.1.3.3.1.3 Test Purpose

The test shall verify the receiver's ability to detect ACK bits under multipath fading propagation conditions for a given SNR.

8.1.3.3.1.4 Method of test

8.1.3.3.1.4.1 Initial Conditions

Test environment: Normal, see clause B.2.

RF channels to be tested for single carrier; M; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table.4.6-1).

8.1.3.3.1.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.3.1.4.2-1.

**Table 8.1.3.3.1.4.2-1: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Modulation order | QPSK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | N/A |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs-1) |
| Number of PRBs | 4 |
| Number of symbols | 1 |
| The number of UCI information bits | 4 |
| First symbol | 13 |
| DM-RS sequence generation | *NID*0=0 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.3.1.5.1 and 8.1.3.3.1.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.3.1.4.2-2.

**Table 8.1.3.3.1.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 kHz |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The tester sends a test pattern with pattern outlined in figure 8.1.3.3.1.4.2-1. The following statistics are kept: the number of ACK bits detected in the idle periods and the number of missed ACKs.

****

**Figure 8.1.3.3.1.4.2-1: Test signal pattern for PUCCH format 2 demodulation tests**

8.1.3.3.1.5 Test Requirement

8.1.3.3.1.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.1.3.3.1.5.1-1 and table 8.1.3.3.1.5.1-2.

**Table 8.1.3.3.1.5.1-1: Required SNR for PUCCH format 2 with 15 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | | | |
|  |  |  |  | |  | |
|  |  |  |  | |  | |

**Table 8.1.3.3.1.5.1-2: Required SNR for PUCCH format 2 with 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth/ SNR (dB)** | | | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **10MHz** | **20MHz** | **40MHz** | **100MHz** |
| 1 | 2 | TDLC300-100 Low | 6.1 | 6.2 | 6.1 | 6.3 |

8.1.3.3.1.5.2 Test requirement for *IAB type 2-O*

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.1.3.3.1.5.2-1 and table 8.1.3.3.1.5.2.-2.

**Table 8.1.3.3.1.5.2-1: Required SNR for PUCCH format 2 with 60 kHz SCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth / SNR (dB)** | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | 7.3 | 7.8 |

**Table 8.1.3.3.1.5.2-2: Required SNR for PUCCH format 2 with 120 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth / SNR (dB)** | | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 2 | TDLA30-300 Low | 7.2 | 6.9 | 7.2 |

8.1.3.3.2 UCI BLER performance requirements

8.1.3.3.2.1 Definition and applicability

The UCI block error probability is defined as the probability of incorrectly decoding the UCI information when the UCI information is sent. The UCI information does not contain CSI part 2.

Which specific test(s) are applicable to IAB DU is based on the test applicability rules defined in clause 8.1.2.

The transient period as specified in TS 38.101-1 [16] and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

8.1.3.3.2.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.3.1.4.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.3.2.4.

8.1.3.3.2.3 Test Purpose

The test shall verify the receiver's ability to detect UCI under multipath fading propagation conditions for a given SNR.

8.1.3.3.2.4 Method of test

8.1.3.3.2.4.1 Initial Conditions

Test environment: Normal, see clause B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.3.3.2.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branches signals should be transmitted on each polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.3.2.4.2-1.

**Table 8.1.3.3.2.4.2-1: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Modulation order | QPSK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs-1) |
| Number of PRBs | 9 |
| Number of symbols | 2 |
| The number of UCI information bits | 22 |
| First symbol | 12 |
| DM-RS sequence generation | *NID*0=0 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.3.2.5.1 and 8.1.3.3.2.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.3.3.2.4.2-2.

**Table 8.1.3.3.2.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 kHz |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The tester sends a test pattern with the pattern outlined in figure 8.1.3.3.2.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.

****

**Figure 8.1.3.3.2.4.2-1: Test signal pattern for PUCCH format 2 demodulation tests**

8.1.3.3.2.5 Test Requirement

8.1.3.3.2.5.1 Test requirement for *IAB type 1-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.3.2.5.1-1 and table 8.1.3.3.2.5.1-2.

**Table 8.1.3.3.2.5.1-1: Required SNR for PUCCH format 2 with 15 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | | | |
|  |  |  |  | |  | |
|  |  |  |  | |  | |

**Table 8.1.3.3.2.5.1-2: Required SNR for PUCCH format 2 with 30 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth/ SNR (dB)** | | | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **10MHz** | **20MHz** | **40MHz** | **100MHz** |
| 1 | 2 | TDLC300-100 Low | 1.1 | 1.7 | 1.0 | 0.9 |

8.1.3.3.2.5.2 Test requirement for *IAB type 2-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.3.2.5.2-1 and table 8.1.3.3.2.5.2-2.

**Table 8.1.3.3.2.5.2-1: Required SNR for PUCCH format 2 with 60 kHz SCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth / SNR (dB)** | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | 3.2 | 1.7 |

**Table 8.1.3.3.2.5.2-2: Required SNR for PUCCH format 2 with 120 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Channel bandwidth / SNR (dB)** | | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 2 | TDLA30-300 Low | 1.8 | 1.8 | 1.7 |

8.1.3.4 Performance requirements for PUCCH format 3

8.1.3.4.1 Definition and applicability

The performance is measured by the required SNR at UCI block error probability not exceeding 1%.

The UCI block error probability is defined as the conditional probability of incorrectly decoding the UCI information when the UCI information is sent. The UCI information does not contain CSI part 2.

The transient period as specified in TS 38.101-1 [16] clause 6.3.3.1 and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

Which specific test(s) are applicable to IAB DU is based on the test applicability rules defined in clause 8.1.1.3.

8.1.3.4.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [7], clause 11.1.3.1.5.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [7], clause 11.1.3.2.5.

8.1.3.4.3 Test Purpose

The test shall verify the receiver's ability to detect UCI under multipath fading propagation conditions for a given SNR.

8.1.3.4.4 Method of test

8.1.3.4.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested:

- OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.3.4.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.4.4.2-1.

**Table 8.1.3.4.4.2-1: Test parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Test 1** | **Test 2** |
| Modulation order | QPSK | |
| Cyclic prefix | normal | |
| First PRB prior to frequency hopping | 0 | |
| Intra-slot frequency hopping | enabled | |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs -1) | |
| Group and sequence hopping | neither | |
| Hopping ID | 0 | |
| Number of PRBs | 1 | 3 |
| Number of symbols | 14 | 4 |
| The number of UCI information bits | 16 | 16 |
| First symbol | 0 | 0 |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-DU receiver is as specified in clause 8.1.3.4.5.1 and 8.1.3.4.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and the SNR at the IAB-DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.4.4.2-2.

**Table 8.1.3.4.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8.1.3.4.5 Test Requirement

8.1.3.4.5.1 Test requirement for *IAB type 1-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.4.5.1-1 and table 8.1.3.4.5.1-2.

**Table 8.1.3.4.5.1-1: Required SNR for PUCCH format 3 with 15 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | | |
|  |  |  |  |  |  | |  |
|  |  |  |  |  |  | |  |
|  |  |  |  |  |  | |  |
|  |  |  |  |  |  | |  |

**Table 8.1.3.4.5.1-2: Required SNR for PUCCH format 3 with 30 kHz SCS**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Number** | **Number of TX** | **Number of** | **Propagation conditions** | **Additional DM-RS** | **Channel bandwidth / SNR (dB)** | | | |
|  | **antennas** | **demodulation branches** | **and correlation matrix (annex J)** | **configuration** | **10 MHz** | **20 MHz** | **40 MHz** | **100 MHz** |
| 1 | 1 | 2 | TDLC300-100 Low | No additional DM-RS | 1.5 | 1.2 | 1.2 | 1.5 |
|  |  |  |  | Additional DM-RS | 1.1 | 0.9 | 0.6 | 0.7 |
| 2 | 1 | 2 | TDLC300-100 Low | No additional DM-RS | 2.4 | 2.6 | 2.6 | 2.1 |

8.1.3.4.5.2 Test requirement for *IAB type 2-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.4.5.2-1 and table 8.1.3.4.5.2-2.

**Table 8.1.3.4.5.2-1: Required SNR for PUCCH format 3 with 60 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test Number** | **Number of TX** | **Number of** | **Propagation conditions** | **Additional DM-RS** | **Channel bandwidth / SNR (dB)** | |
|  | **antennas** | **demodulation branches** | **and correlation matrix (annex J)** | **configuration** | **50 MHz** | **100 MHz** |
| 1 | 1 | 2 | TDLA30-300 Low | No additional DM-RS | 2.2 | 1.3 |
|  |  |  |  | Additional DM-RS | 1.9 | 1.5 |
| 2 | 1 | 2 | TDLA30-300 Low | No additional DM-RS | 3.6 | 3.0 |

**Table 8.1.3.4.5.2-2: Required SNR for PUCCH format 3 with 120 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Test** | **Number** | **Number of** | **Propagation** | **Additional** | **Channel bandwidth / SNR (dB)** | | |
| **Number** | **of TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **DM-RS configuration** | **50 MHz** | **100 MHz** | **200 MHz** |
| 1 | 1 | 2 | TDLA30-300 Low | No additional DM-RS | 2.0 | 1.3 | 1.3 |
|  |  |  |  | Additional DM-RS | 1.9 | 2.0 | 1.5 |
| 2 | 1 | 2 | TDLA30-300 Low | No additional DM-RS | 1.7 | 3.5 | 2.0 |

8.1.3.5 Performance requirements for PUCCH format 4

8.1.3.5.1 Definition and applicability

The performance is measured by the required SNR at UCI block error probability not exceeding 1%.

The UCI block error probability is defined as the conditional probability of incorrectly decoding the UCI information when the UCI information is sent. The UCI information does not contain CSI part 2.

The transient period as specified in TS 38.101-1 [16] and TS 38.101-2 [17] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.1.3.3.

8.1.3.5.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.3.1.6.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.3.2.6.

8.1.3.5.3 Test Purpose

The test shall verify the receiver's ability to detect UCI under multipath fading propagation conditions for a given SNR.

8.1.3.5.4 Method of test

8.1.3.5.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested:

- OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.3.5.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.4.4.2-1.

**Table 8.1.3.5.4.2-1: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Modulation order | QPSK |
| Cyclic prefix | normal |
| First PRB prior to frequency hopping | 0 |
| Number of PRBs | 1 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs - 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Number of symbols | 14 |
| The number of UCI information bits | 22 |
| First symbol | 0 |
| Length of the orthogonal cover code | n2 |
| Index of the orthogonal cover code | n0 |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.5.5.1 and 8.1.3.5.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.5.4.2-2.

**Table 8.1.3.5.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8.1.3.5.5 Test Requirement

8.1.3.5.5.1 Test requirement for *IAB type 1-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.5.5.1-1 and table 8.1.3.5.5.1-2.

**Table 8.1.3.5.5.1-1: Required SNR for PUCCH format 4 with 15 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | | | |
|  |  |  |  |  | |  | |
|  |  |  |  |  | |  | |
|  |  |  |  |  | |  | |

**Table 8.1.3.5.5.1-2: Required SNR for PUCCH format 4 with 30 kHz SCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of** | **Number of** | **Propagation** | **Additional** | **Channel bandwidth / SNR (dB)** | | | |
| **TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **DM‑RS configuration** | **10**  **MHz** | **20 MHz** | **40 MHz** | **100 MHz** |
| 1 | 2 | TDLC300-100 Low | No additional DM-RS | 3.7 | 3.4 | 3.7 | 3.4 |
|  |  |  | Additional DM‑RS | 3.4 | 2.9 | 3.7 | 2.8 |

8.1.3.5.5.2 Test requirement for *IAB type 2-O*

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.1.3.5.5.2-1 and table 8.1.3.5.5.2-2.

**Table 8.1.3.5.5.2-1: Required SNR for PUCCH format 4 with 60 kHz SCS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation** | **Propagation conditions and** | **Additional DM‑RS configuration** | **Channel bandwidth / SNR (dB)** | |
|  | **branches** | **correlation matrix (annex J)** |  | **50 MHz** | **100 MHz** |
| 1 | 2 | TDLA30-300 Low | No additional DM-RS | 3.6 | 3.3 |
|  |  |  | Additional DM-RS | 3.7 | 4.1 |

**Table 8.1.3.5.5.2-2: Required SNR for PUCCH format 4 with 120 kHz SCS**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Number of TX** | **Number of demodulation** | **Propagation conditions and** | **Additional DM‑RS configuration** | **Channel bandwidth / SNR (dB)** | | |
| **antennas** | **branches** | **correlation matrix (annex J)** |  | **50 MHz** | **100 MHz** | **200MHz** |
| 1 | 2 | TDLA30-300 Low | No additional DM-RS | 3.4 | 3.4 | 4.1 |
|  |  |  | Additional DM-RS | 4.2 | 4.4 | 3.8 |

8.1.3.6 Performance requirements for multi-slot PUCCH

8.1.3.6.1 Performance requirements for multi-slot PUCCH format 1

8.1.3.6.1.1 NACK to ACK detection

8.1.3.6.1.1.1 Definition and applicability

The performance requirement of PUCCH format 1 for NACK to ACK detection is determined by the two parameters: probability of false detection of the ACK and the NACK to ACK detection probability. The performance is measured by the required SNR at probability of the NACK to ACK detection equal to 0.1% or less. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK at particular bit position when input is only noise. Each false bit detection is counted as one error.

The NACK to ACK detection probability is the probability of detecting an ACK bit when an NACK bit was sent on particular bit position. Each NACK bit erroneously detected as ACK bit is counted as one error. Erroneously detected NACK bits in the definition do not contain the NACK bits which are mapped from DTX, i.e. NACK bits received when DTX is sent should not be considered.

Which specific test(s) are applicable to IAB DU is based on the test applicability rules defined in clause 8.1.1.3.3.

8.1.3.6.1.1.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.3.1.7.

8.1.3.6.1.1.3 Test Purpose

8.1.3.6.1.1.4 Method of test

The test shall verify the receiver's ability not to falsely detect NACK bits as ACK bits under multipath fading propagation conditions for a given SNR.

8.1.3.6.1.1.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested: OTA REFSENS *receiver target reference direction* (D.54).

8.1.3.6.1.1.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.6.1.1.4.2-1.

**Table 8.1.3.6.1.1.4.2-1: Test Parameters for multi-slot PUCCH format 1**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | disabled |
| Inter-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Number of slots for PUCCH repetition | 2 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.6.1.1.5.1 for *IAB type 1-O*, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.6.1.1.4.2-2.

**Table 8.1.3.6.1.1.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 kHz |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The tester sends random codeword from applicable codebook, in regular time periods. The following statistics are kept: the number of ACK bits detected in the idle periods and the number of NACK bits detected as ACK.

8.1.3.6.1.1.5 Test Requirement

8.1.3.6.1.1.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of NACK bits falsely detected as ACK shall be less than 0.1% for the SNR listed in table 8.1.3.6.1.1.5.1-1.

**Table 8.1.3.6.1.1.5.1-1: Required SNR for multi-slot PUCCH format 1 with 30 kHz SCS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of TX** | **Number of RX** | **Propagation conditions and correlation matrix** | **Channel bandwidth (MHz) / SNR (dB)** |
| **antennas** | **antennas** | **(Annex J)** | **40 MHz** |
| 1 | 2 | TDLC-300-100 Low | -5.7 |

8.1.3.6.1.2 ACK missed detection

8.1.3.6.1.2.1 Definition and applicability

The performance requirement of PUCCH format 1 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as conditional probability of detection of the ACK when the signal is present.

8.1.3.6.1.2.2 Minimum Requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.1.3.1.7.

8.1.3.6.1.2.3 Test Purpose

The test shall verify the receiver's ability to detect ACK bits under multipath fading propagation conditions for a given SNR.

8.1.3.6.1.2.4 Method of test

8.1.3.6.1.2.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier (SC): M; see clause 4.9.1

Direction to be tested: OTA REFSENS *receiver target reference direction* (D.54).

8.1.3.6.1.2.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [7], and according to additional test parameters listed in table 8.1.3.6.1.2.4.2-1.

**Table 8.1.3.6.1.2.4.2-1: Test Parameters for multi-slot PUCCH format 1**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | disabled |
| Inter-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Number of slots for PUCCH repetition | 2 |
| Cyclic prefix | normal |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB DU receiver is as specified in clause 8.1.3.6.1.2.5.1 for *IAB type 1-O*, and that the SNR at the IAB DU receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.3.6.1.2.4.2-2.

**Table 8.1.3.6.1.2.4.2-2: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 kHz |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) The tester sends a test pattern with the pattern outlined in figure 8.1.3.6.1.2.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.

****

**Figure 8.1.3.6.1.2.4.2-1: Test signal pattern for PUCCH format 1 demodulation tests**

8.1.3.6.1.2.5 Test Requirement

8.1.3.6.1.2.5.1 Test requirement for *IAB type 1-O*

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of correctly detected ACK bits shall be larger than 99% for the SNR listed in table 8.1.3.6.1.2.5.1-1.

**Table 8.1.3.6.1.2.5.1-1: Required SNR for multi-slot PUCCH format 1 with 30 kHz SCS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Number of TX** | **Number of RX** | **Propagation conditions and correlation matrix** | **Channel bandwidth (MHz) / SNR (dB)** |
| **antennas** | **antennas** | **(Annex G)** | **40 MHz** |
| 1 | 2 | TDLC-300-100 Low | -7.0 |

8.1.4 Performance requirements for PRACH

8.1.4.1 PRACH false alarm probability and missed detection

8.1.4.1.1 Definition and applicability

The performance requirement of PRACH for preamble detection is determined by the two parameters: total probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required SNR at probability of detection, Pd of 99%. Pfa shall be 0.1% or less.

Pfa is defined as a conditional total probability of erroneous detection of the preamble (i.e. erroneous detection from any detector) when input is only noise.

Pd is defined as conditional probability of detection of the preamble when the signal is present. The erroneous detection consists of several error cases – detecting only different preamble(s) than the one that was sent, not detecting any preamble at all, or detecting the correct preamble but with the out-of-bounds timing estimation value. For AWGN, TDLC300-100 and TDLA30-300, a timing estimation error occurs if the estimation error of the timing of the strongest path is larger than the time error tolerance values given in table 8.1.4.1.1-1.

**Table 8.1.4.1.1-1: Time error tolerance for AWGN, TDLC300-100 and TDLA30-300**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **PRACH** | **PRACH SCS** | **Time error tolerance** | | |
| **preamble** | **(kHz)** | **AWGN** | **TDLC300-100** | **TDLA30-300** |
| 0 | 1.25 | 1.04 us | 2.55 us | N/A |
| A1, A2, A3, B4, C0, C2 | 15 | 0.52 us | 2.03 us | N/A |
|  | 30 | 0.26 us | 1.77 us | N/A |
|  | 60 (FR2) | 0.13 us | N/A | 0.28 us |
|  | 120 | 0.07 us | N/A | 0.22 us |

The test preambles for normal mode are listed in table A.2.5-1 and A.2.5-2.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.1.3.4.

8.1.4.1.2 Minimum requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.4.1.1 and 11.1.4.1.2.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2] clause 11.1.4.2.1 and 11.1.4.2.2.

8.1.4.1.3 Test purpose

The test shall verify the receiver's ability to detect PRACH preamble under static conditions and multipath fading propagation conditions for a given SNR.

8.1.4.1.4 Method of test

8.1.4.1.4.1 Initial conditions

Test environment: Normal, see clause B.2.

RF channels to be tested: for single carrier: M; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.1.4.1.4.2 Procedure

1) Place the IAB DU with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB DU with the test system.

3) Set the IAB DU in the declared direction to be tested.

4) Connect the IAB DU tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameter *msg1-FrequencyStart* is set to 0.

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the AWGN generator, according to the SCS and channel bandwidth. The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.1.4.1.4.2-1.

**Table 8.1.4.1.4.2-1: AWGN power level at the BS input**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *IAB type 1-O* | 15 |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | | | |

8) Adjust the frequency offset of the test signal according to table 8.1.4.1.5.1-1 or 8.1.4.1.5.1-2 or 8.1.4.1.5.1-3 or 8.1.4.1.6.1-1 or 8.1.4.1.6.1-2 or 8.1.4.1.6.1-3 or 8.1.4.1.6.1-4 or 8.1.4.1.5.2-1 or 8.1.4.1.5.2-2.

9) Adjust the equipment so that the SNR specified in table 8.1.4.1.5.1-1 or 8.1.4.1.5.1-2 or 8.1.4.1.5.1-3 or 8.1.4.1.6.1-1 or 8.1.4.1.6.1-2 or 8.1.4.1.6.1-3 or 8.1.4.1.6.1-4 or 8.1.4.1.5.2-1 or 8.1.4.1.5.2-2 is achieved at the BS input during the PRACH preambles.

10) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated as illustrated in figure 8.1.4.1.4.2-1. The preambles are sent with certain timing offsets as described below. The following statistics are kept: the number of preambles detected in the idle period and the number of missed preambles.

****

**Figure 8.1.4.1.4.2-1: PRACH preamble test pattern**

The timing offset base value for PRACH preamble format 0 is set to 50% of Ncs. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.9us. Then the loop is being reset and the timing offset is set again to 50% of Ncs. The timing offset scheme for PRACH preamble format 0 is presented in Figure 8.1.4.1.4.2-2.

****

**Figure 8.1.4.1.4.2-2: Timing offset scheme for PRACH preamble format 0**

The timing offset base value for PRACH preamble format A1, A2, A3, B4, C0 and C2 is set to 0. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.8us. Then the loop is being reset and the timing offset is set again to 0. The timing offset scheme for PRACH preamble format A1, A2, A3, B4, C0 and C2 is presented in Figure 8.1.4.1.4.2-3.

****

**Figure 8.1.4.1.4.2-3: Timing offset scheme for PRACH preamble format A1, A2, A3, B4, C0 and C2**

8.1.4.1.5 Test requirement for Normal Mode

8.1.4.1.5.1 Test requirement for *IAB type 1-O*

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.1.4.1.5.1-1 to 8.1.4.1.5.1-3.

**Table 8.1.4.1.5.1-1: PRACH missed detection test requirements for Normal Mode, 1.25 kHz SCS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of TX** | **Number of demodulation** | **Propagation conditions and** | **Frequency offset** | **SNR (dB)** |
| **antennas** | **branches** | **correlation matrix (annex J)** |  | **Burst format 0** |
| 1 | 2 | AWGN | 0 | -14.2 |
|  |  | TDLC300-100 Low | 400 Hz | -6.0 |

**Table 8.1.4.1.5.1-2: PRACH missed detection test requirements for Normal Mode, 15 kHz SCS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation** | **Frequency** | **SNR (dB)** | | | | | |
| **of TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **offset** | **Burst format A1** | **Burst format A2** | **Burst format A3** | **Burst format B4** | **Burst format C0** | **Burst format C2** |
| 1 | 2 | AWGN | 0 | -9.0 | -12.3 | -13.9 | -16.5 | -6.0 | -12.2 |
|  |  | TDLC300-100 Low | 400 Hz | -1.5 | -4.2 | -6.0 | -8.2 | 1.4 | -4.3 |

**Table 8.1.4.1.5.1-3: PRACH missed detection test requirements for Normal Mode, 30 kHz SCS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation** | **Frequency** | **SNR (dB)** | | | | | |
| **of TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **offset** | **Burst format A1** | **Burst format A2** | **Burst format A3** | **Burst format B4** | **Burst format C0** | **Burst format C2** |
| 1 | 2 | AWGN | 0 | -8.8 | -11.7 | -13.5 | -16.2 | -5.8 | -11.6 |
|  |  | TDLC300-100 Low | 400 Hz | -2.2 | -5.1 | -6.8 | -9.3 | 0.7 | -5.0 |

8.1.4.1.5.2 Test requirement for *IAB type 2-O*

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.1.4.1.5.2-1 to 8.1.4.1.5.2-2.

**Table 8.1.4.1.5.2-1: PRACH missed detection test requirements for Normal Mode, 60 kHz SCS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation** | **Frequency** | **SNR (dB)** | | | | | |
| **of TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **offset** | **Burst format A1** | **Burst format A2** | **Burst format A3** | **Burst format B4** | **Burst format C0** | **Burst format C2** |
| 1 | 2 | AWGN | 0 | -8.6 | -11.6 | -13.2 | -15.5 | -5.7 | -11.5 |
|  |  | TDLA30-300 Low | 4000 Hz | -1.0 | -3.2 | -4.2 | -6.3 | 1.7 | -3.3 |

**Table 8.1.4.1.5.2-2: PRACH missed detection test requirements for Normal Mode, 120 kHz SCS**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number** | **Number of** | **Propagation** | **Frequency** | **SNR (dB)** | | | | | |
| **of TX antennas** | **demodulation branches** | **conditions and correlation matrix (annex J)** | **offset** | **Burst format A1** | **Burst format A2** | **Burst format A3** | **Burst format B4** | **Burst format C0** | **Burst format C2** |
| 1 | 2 | AWGN | 0 | -8.4 | -11.2 | -13.0 | -15.5 | -5.5 | -11.1 |
|  |  | TDLA30-300 Low | 4000 Hz | -1.1 | -3.8 | -5.2 | -6.9 | 1.8 | -3.6 |

**<<End of change from R4-2115709>>**

**<<START OF CHANGE FROM R4-2115716>**

8.2 IAB-MT performance requirements

8.2.1 General

8.2.1.1 Scope and definitions

Radiated performance requirements specify the ability of the *IAB-MT type 1-O* and *IAB-MT type 2-O* to correctly demodulate signals in various conditions and configurations. Radiated performance requirements are specified at the RIB.

Radiated performance requirements for the IAB-MT are specified for the fixed reference channels defined in annex A and the propagation conditions in annex J. The requirements only apply to those FRCs that are supported by the IAB-MT.

The radiated performance requirements for *IAB-MT type 1-O* and for *IAB-MT type 2-O* are limited to two OTA *demodulations branches* as described in clause 8.1.1.2. Conformance requirements can only be tested for 1 or 2 *demodulation branches* depending on the number of polarizations supported by the IAB-MT, with the required SNR applied separately per polarization.

NOTE: IAB-MT can support more than 2 *demodulation branches*, however OTA conformance testing can only be performed for 1 or 2 *demodulation branches*.

The SNR used in this clause is specified based on a single carrier and defined as:

SNR = S / N

Where:

S is the total signal energy in the slot on a single *TAB connector* (for *IAB-MT type 1-H*).

N is the noise energy in a bandwidth corresponding to the transmission bandwidth over the duration of a slot on a single TAB connector (for *IAB-MT type 1-H*).

8.2.2 Demodulation performance requirements

8.2.2.1 General

8.2.2.1.1 Applicability rule for IAB-MT

8.2.2.1.1.1 General

Unless otherwise stated, for an IAB-MT declared to support more than 2 demodulation branches (for *IAB-MT type 1-O* and *IAB-MT type 2-O*), the performance requirement tests for 2 demodulation branches shall apply, and the mapping between connectors and demodulation branches is up to IAB-MT implementation.

The tests requiring more than [20] dB SNR level are set to N/A in the test requirements.

8.2.2.1.1.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, the tests shall apply only for each subcarrier spacing declared to be supported (see D.7 in table 4.6-1).

8.2.2.1.1.3 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if IAB-MT supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

8.2.2.1.1.4 Applicability of requirements for IAB-MT features

Unless otherwise stated, for *IAB type 1-O*, the PDSCH 256QAM tests (Test 1-1 of Clause 8.2.2.2.5.1) shall apply only for the 256QAM for PDSCH for FR1 declared to be supported (see D.200 in table 4.6-1, *pdsch-256QAM-FR1*).

Unless otherwise stated, for both *IAB type 1-O* and *IAB type 2-O*, the PDSCH tests shall apply only in case the PDSCH MIMO rank in the test case does not exceed the maximum number of PDSCH MIMO layers declared to be supported (see D.202 in table 4.6-1, *maxNumberMIMO-LayersPDSCH*).

Unless otherwise stated, for *IAB type 2-O*, the PDSCH tests shall apply only for the PT-RS option declared to be supported (see D.203 in table 4.6-1, *onePortsPTRS* (MSB)).

Note: Applicability information may be obtained based on vendor declaration (Section 4.6) or alternatively from reading capability signaling.

8.2.2.2 Performance requirements for PDSCH

8.2.2.2.1 Definition and applicability

The performance requirement of PDSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ re-transmissions.

Which specific test(s) are applicable to IAB-MT is based on the test applicability rules defined in clause 8.2.2.1.1.

8.2.2.2.2 Minimum requirements

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.2.2.1.1.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2], clause 11.2.2.2.1.

8.2.2.2.3 Test purpose

The test shall verify the receiver's ability to achieve throughput under multipath fading propagation conditions for a given SNR.

8.2.2.2.4 Method of test

8.2.2.2.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M, see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.2.2.2.4.2 Test procedure

1) Place the IAB-MT with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-MT with the test system.

3) Set the IAB-MT in the declared direction to be tested.

4) Connect the IAB-MT tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.2.2.2.4.2-1.

**Table: 8.2.2.2.4.2-1 Test parameters for testing PDSCH**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **IAB type 1-O** | **IAB type 2-O** |
| Cyclic prefix | | Normal | Normal |
| Default TDD UL-DL pattern (Note) | | 7D1S2U, S=6D:4G:4U | 3D1S1U, S=10D:2G:2U |
| HARQ | Maximum number of HARQ transmissions | 4 | 4 |
| RV sequence | 0, 2, 3, 1 | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 | 1 |
| DM-RS duration | single-symbol DM-RS | single-symbol DM-RS |
| DM-RS position (*l0*) | 2 | 2 |
| Additional DM-RS position | pos1 | pos1 |
| Number of DM-RS CDM group(s) without data | 1 for Rank 1 and Rank 2 tests 2 for Rank 3 and Rank 4 tests | 1 |
| DM-RS port(s) | {1000} for Rank 1 tests {1000-1001} for Rank 2 tests {1000-1002} for Rank 3 tests {1000-1003} for Rank 4 tests | {1000} for Rank 1 tests {1000-1001} for Rank 2 tests |
| DM-RS sequence generation | NID0=0 | NID0=0 |
| Time domain resource assignment | PDSCH mapping type | A | A |
| Start symbol | 2 | 1 |
| Allocation length | 12 | 13 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth | Full applicable test bandwidth |
| PT-RS configuration | Frequency density (*KPT-RS*) | Not configured | 2 |
| Time density (*LPT-RS*) | 1 |
| PRB bundling size | | 2 | 2 |
| VRB-to-PRB mapping type | | Not interleaved | Not interleaved |
| PDSCH & PDSCH DMRS Precoding configuration | | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with PRB bundling granularity | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination, and with PRB bundling granularity |
| Note: The same requirements are applicable to TDD with different UL-DL patterns. | | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-MT receiver is as specified in clause 8.2.2.2.5.1 and 8.2.2.2.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.2.2.2.4.2-2.

**Table 8.2.2.2.4.2-2: AWGN power level at the IAB-MT input**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB type** | **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| IAB type 1-O | 30 | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| IAB type 2-O | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz |
| 120 | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

8) For reference channels applicable to the IAB, measure the throughput.

8.2.2.2.5 Test requirements

8.2.2.2.5.1 Test requirement for *IAB type 1-O*

The throughput shall be equal to or larger than the fraction of maximum throughput for the FRCs stated in Tables 8.2.2.2.5.1-1 and 8.2.2.2.5.1-2 at the given SNR with the test parameters stated in Table 8.2.2.2.4.2-1.

**Table 8.2.2.2.5.1-1: Minimum requirements for PDSCH Type A with Rank 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **FRC (Annex A)** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Fraction of maximum throughput (%)** | **SNR**  **(dB)** |
| 1-1 | M-FR1-A.3.3-1 | 40/30 | TDLA30-10 | 2x2, ULA Low | 70 | 26.3 |
| 1-2 | M-FR1-A.3.1-1 | 40/30 | TDLA30-10 | 2x2, ULA Low | 30 | 3.2 |

**Table 8.2.2.2.5.1-2: Minimum requirements for PDSCH Type A with Rank 2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **FRC (Annex A)** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Fraction of maximum throughput (%)** | **SNR**  **(dB)** |
| 2-1 | M-FR1-A.3.2-1 | 40/30 | TDLA30-10 | 2x2, ULA Low | 70 | 20.8 |

8.2.2.2.5.2 Test requirement for *IAB type 2-O*

The throughput shall be equal to or larger than the fraction of maximum throughput for the FRCs stated in Tables 8.2.2.2.5.2-1 and 8.2.2.2.5.2-2 at the given SNR with the test parameters stated in Table 8.2.2.2.4.2-1.

**Table 8.2.2.2.5.2-1: Minimum requirements for PDSCH Type A with Rank 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **FRC (Annex A)** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Fraction of maximum throughput (%)** | **SNR**  **(dB)** |
| 1-1 | M-FR2-A.3.1-1 | 100/120 | TDLA30-75 | 2x2, ULA Low | 30 | 4.1 |
| 1-2 | M-FR2-A.3.2-1 | 100/120 | TDLA30-75 | 2x2, ULA Low | 70 | 13.5 |

**Table 8.2.2.2.5.2-2: Minimum requirements for PDSCH Type A with Rank 2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **FRC (Annex A)** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Fraction of maximum throughput (%)** | **SNR**  **(dB)** |
| 2-1 | M-FR2-A.3.1-2 | 100/120 | TDLA30-75 | 2x2, ULA Low | 70 | 15.9 |
| 2-2 | M-FR2-A.3.1-3 | 50/60 | TDLA30-75 | 2x2, ULA Low | 70 | 16.0 |
| 2-3 | M-FR2-A.3.2-2 | 100/120 | TDLA30-75 | 2x2, ULA Low | 70 | 20.3 |

8.2.2.3 Demodulation performance requirements for PDCCH

8.2.2.3.1 Definition and applicability

The receiver characteristics of the PDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg).

Which specific test(s) are applicable to IAB-MT is based on the test applicability rules defined in clause 8.2.2.1.1.

8.2.2.3.2 Minimum requirement

For *IAB type 1-O*, the minimum requirement is in TS 38.174 [2], clause 11.2.2.1.2.

For *IAB type 2-O*, the minimum requirement is in TS 38.174 [2], clause 11.2.2.2.2.

8.2.2.3.3 Test purpose

The test shall verify the receiver's ability to detect the Downlink Scheduling Grant (Pm-dsg) under multipath fading propagation conditions for a given SNR.

8.2.2.3.4 Method of test

8.2.2.3.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M, see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

8.2.2.3.4.2 Test procedure

1) Place the IAB-MT with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the IAB-MT with the test system.

3) Set the IAB-MT in the declared direction to be tested.

4) Connect the IAB-MT tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding DL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.2.2.3.4.2-1.

**Table: 8.2.2.3.4.2-1 Test parameters for testing PDSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **IAB type 1-O** | **IAB-type 2-O** |
| Cyclic prefix | Normal | Normal |
| Default TDD UL-DL pattern (Note) | 7D1S2U, S=6D:4G:4U | 3D1S1U, S=10D:2G:2U |
| DM-RS sequence generation | NID=0 | NID=0 |
| Frequency domain resource allocation for CORESET | Start from RB = 0 with contiguous RB allocation | Start from RB = 0 with contiguous RB allocation |
| CCE to REG mapping type | Interleaved | Interleaved |
| Interleaver size | 3 | 3 for test with aggregation level 2, 8 2 for test with aggregation level 4 |
| REG bundle size | 2 for test with aggregation level 2, 4  6 for test with aggregation level 8 | 2 for test with aggregation level 2, 8 6 for test with aggregation level 4 |
| Shift Index | 0 | 0 |
| Slots for PDCCH monitoring | Each slot | Each slot |
| Number of PDCCH candidates for the tested aggregation level | 1 | 1 |
| PDCCH Precoding configuration | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination with REG bundling granularity for number of Tx larger than 1 | Single Panel Type I, Random precoder selection updated per slot, with equal probability of each applicable i1, i2 combination with REG bundling granularity for number of Tx larger than 1 |
| Note: The same requirements are applicable to TDD with different UL-DL patterns. | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the IAB-MT receiver is as specified in clause 8.2.2.3.5.1 and 8.2.2.3.5.2 for *IAB type 1-O* and *IAB type 2-O* respectively, and that the SNR at the IAB receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.2.2.3.4.2-2.

**Table 8.2.2.3.4.2-2: AWGN power level at the IAB-MT input**

|  |  |  |  |
| --- | --- | --- | --- |
| **IAB type** | **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| IAB type 1-O | 30 | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| IAB type 2-O | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz |
| 120 | 100 | EISREFSENS\_50M + ΔFR2\_REFSENS + 18 dBm / 95.04 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

8) For reference channels applicable to the IAB, measure the miss-detection of the Downlink Scheduling Grant (Pm-dsg).

8.2.2.3.5 Test requirements

8.2.2.3.5.1 Test requirement for *IAB type 1-O*

The Pm-dsg shall be equal to or smaller than 1%, for the cases stated in Table 8.2.2.3.5.1-1 at the given SNR with the test parameters stated in Table 8.2.2.3.4.2-1.

**Table 8.2.2.3.5.1-1: Minimum requirements for PDCCH**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **CORESET RB** | **CORESET duration** | **Aggregation level** | **FRC (Annex A)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Pm-dsg (%)** | **SNR**  **(dB)** |
| 1 | 40/30 | 102 | 1 | 2 | M-FR1-A.3.4-1 | TDLA30-10 | 1x2, ULA Low | 1 | 7.9 |
| 2 | 40/30 | 102 | 1 | 4 | M-FR1-A.3.4-1 | TDLA30-10 | 1x2, ULA Low | 1 | 5.8 |
| 3 | 40/30 | 90 | 1 | 8 | M-FR1-A.3.4-1 | TDLA30-10 | 2x2, ULA Low | 1 | 0.3 |

8.2.2.3.5.2 Test requirement for IAB type 2-O

The Pm-dsg shall be equal to or smaller than 1%, for the cases stated in Table 8.2.2.3.5.2-1 at the given SNR with the test parameters stated in Table 8.2.2.3.4.2-1.

**Table 8.2.2.3.5.2-1: Minimum requirements for PDCCH**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test number** | **Bandwidth (MHz) / Subcarrier spacing (kHz)** | **CORESET RB** | **CORESET duration** | **Aggregation level** | **FRC (Annex A)** | **Propagation conditions (Annex J)** | **Antenna configuration** | **Pm-dsg (%)** | **SNR**  **(dB)** |
| 1 | 100/120 | 60 | 1 | 2 | M-FR2-A.3.4-1 | TDLA30-75 | 1x2, ULA Low | 1 | 8.1 |
| 2 | 100/120 | 60 | 1 | 4 | M-FR2-A.3.4-2 | TDLA30-75 | 1x2, ULA Low | 1 | 4.6 |
| 3 | 100/120 | 60 | 1 | 8 | M-FR2-A.3.4-3 | TDLA30-75 | 2x2, ULA Low | 1 | 1.9 |

**<<END OF CHANGE FROM R4-2115716>**

**<<Start of change from R4-2115714>**

8.2.3.1 General

8.2.3.1.1 Applicability of requirements

8.2.3.1.1.1 General

Unless otherwise stated, for a IAB-MT declared to support more than 2 demodulation branches (for *IAB-MT type 1-O* and *IAB-MT type 2-O*), the performance requirement tests for 2 demodulation branches shall apply, and the mapping between connectors and demodulation branches is up to IAB-MT implementation.

The tests requiring more than [20] dB SNR level are set to N/A in the test requirements.

8.2.3.1.1.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, the tests shall apply only for each subcarrier spacing declared to be supported (see D.7 in table 4.6-1).

8.2.3.1.1.3 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if IAB-MT supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

8.2.3.1.1.4 Applicability of PMI/RI requirements

Testing of performance requirements for RI and PMI reporting is optional.

8.2.3.1.1.5 Applicability of requirements for IAB-MT features

Unless otherwise stated, for IAB type 1-O, the CSI reporting tests (clauses 8.2.3.3, 8.2.3.4) shall apply only in case the number of NZP-CSI-RS ports in the test case satisfies maximum number of ports across all configured NZP-CSI-RS resources per CC declared to be supported (see D.201 in table 4.6-1, *maxConfigNumberPortsAcrossNZP-CSI-RS-PerCC*).

Unless otherwise stated, for IAB type 1-O, the CSI reporting tests (clauses 8.2.3.2, 8.2.3.3, 8.2.3.4) shall apply only in case the PDSCH MIMO rank in the test case does not exceed the maximum number of PDSCH MIMO layers declared to be supported (see D.202 in table 4.6-1, *maxNumberMIMO-LayersPDSCH*).

Unless otherwise stated, for IAB type 2-O, the CSI reporting tests (clauses 8.2.3.2, 8.2.3.3, 8.2.3.4) shall apply only for the PT-RS option declared to be supported (see D.203 in table 4.6-1, onePortPTRS).

NOTE: Applicability information may be obtained based on vendor declaration (Section 4.6) or alternatively from reading capability signaling.

**< End of change from R4-2115714>**

**< START OF 2nd CHANGE from R4-2115769 >**

**Table 8.2.3.3.4.2-1: Test parameters for testing PMI reporting requirements**

| **Parameter** | | **Unit** | **FR1** | **FR2** |
| --- | --- | --- | --- | --- |
| Bandwidth | | MHz | 40 | 100 |
| Subcarrier spacing | | kHz | 30 | 120 |
| Duplex Mode | |  | TDD | TDD |
| TDD DL-UL configuration | |  | 7D1S2U, S=6D:4G:4U | 3D1S1U, S=10D:2G:2U |
| Propagation channel | |  | TDLA30-5 | TDLA30-35 |
| Antenna configuration | |  | High XP 4 x 2  (N1,N2) = (2,1)  High XP 8 x 2  (N1,N2) = (4,1) | 2 x 2 ULA Low |
| Beamforming Model | |  | As specified in Annex J.3.1 | As specified in Annex J.3.1 |
| NZP CSI-RS for CSI acquisition | CSI-RS resource Type |  | Periodic |  |
| Number of CSI-RS ports (*X*) |  | Test for 4 TX ports: 4  Test for 8 TX ports: 8 | 2 |
| CDM Type |  | Test for 4 TX ports: FD-CDM2  Test for 8 TX ports: CDM4 (FD2, TD2) | FD-CDM2 |
| Density (ρ) |  | 1 | 1 |
| First subcarrier index in the PRB used for CSI-RS (k0, k1) |  | Test for 4 TX ports: Row 4 (0,-)  Test for 8 TX ports: Row 8, (4,6) | Row 3, (6,-) |
| First OFDM symbol in the PRB used for CSI-RS (l0, l1) |  | Test for 4 TX ports, 2RX: (13,-)  Test for 8 TX ports: (5,-) | (13,-) |
| CSI-RS  interval and offset | Slot | 10/1 | 8/1 |
| ReportConfigType | |  | Periodic | Periodic |
| Sub-band Size | | RB | 16 | 8 |
| csi-ReportingBand | |  | 1111111 | 111111111 |
| CSI-Report periodicity and offset | | slot | 10/9 | 8/3 |
| pmi-FormatIndicator | |  | Wideband | Wideband |
| Codebook configuration | Codebook Type |  | typeI-SinglePanel | typeI-SinglePanel |
| Codebook Mode |  | 1 | 1 |
| (CodebookConfig-N1,CodebookConfig-N2) |  | Test for 4 TX ports: (2,1)  Test for 8 TX ports: (4,1) | NA |
| (CodebookConfig-O1,CodebookConfig-O2) |  | Test for 4 TX ports: (4,1)  Test for 8 TX ports: (4,1) | NA |
| CodebookSubsetRestriction |  | Test for 4 TX ports: 11111111  Test for 8 TX ports: 0x FFFF | 001111 |
| RI Restriction |  | Test for 4 TX ports: 00000001  Test for 8 TX ports: 00000010 | NA |
| Maximum number of HARQ transmission | |  | 4 | 4 |
| CQI/RI/PMI delay | | ms | 5.5 | 1.375 |
| Measurement channel | |  | Test for 4 TX ports: M-FR1-A.3.5-1  Test for 8 TX ports: M-FR1-A.3.5-2 | M-FR2-A.3.5-3 |
| Note 1: The same requirements are applicable for TDD with different UL-DL pattern.  Note 2: When Throughput is measured using random precoder selection, the precoder shall be updated in each slot (0.5 ms FR1 / 0.125 ms FR2 granularity) with equal probability of each applicable i1, i2 combination.  Note 3: If the IAB-MT reports in an available uplink reporting instance at slot #n based on PMI estimation at a downlink slot not later than slot#(n-4), this reported PMI cannot be applied at the gNB downlink before slot#(n+4).  Note 4: Randomization of the principle beam direction shall be used as specified in Annex J.2.3.2.3.  Note 5: SSB, TRS, CSI-RS and/or other unspecified test parameters with respect to TS 38.101-4 [18] are left up to test implementation, if transmitted or needed. | | | | |

**< END OF 2nd CHANGE from R4-2115769 >**

**<<start of change R4-2115709>>**

Annex C (informative):   
Test tolerances and derivation of test requirements

The test requirements explicitly defined in the present document have been calculated by relaxing the minimum requirements of the core specification TS 38.174 [2] using the test tolerances (TT) defined here. When the TT value is zero, the test requirement will be the same as the minimum requirement. When the TT value is non-zero, the test requirements will differ from the minimum requirements, and the formula used for this relaxation is given in the following tables.

The TTOTA values are derived from OTA Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the TTOTA values may sometimes be set to zero.

The TTOTA values should not be modified for any reason e.g. to take account of commonly known OTA Test System errors (such as mismatch, cable loss, etc.).

Note that a formula for applying TTOTA values is provided for all OTA tests, even those with a test tolerance of zero. This is necessary in the case where the OTA Test System uncertainty is greater than that allowed in clause 4.1.2. In this event, the excess error shall be subtracted from the defined TTOTA value in order to generate the correct tightened test requirements as defined in this annex.

C.3 Measurement of performance requirements

C.3.1 IAB-DU Test Tolerances

**Table C.3.1-1: Derivation of test requirements (FR1 and FR2 performance tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum Requirement in TS 38.174 [2]** | **Test Tolerance (TTOTA)** | **Test requirement in the present document** |
| Performance requirements for PUSCH with transform precoding disabled | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| Performance requirements for PUSCH with transform precoding enabled | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| Performance requirements for UCI multiplexed on PUSCH | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  BLER limit unchanged |
| Performance requirements for PUCCH format 0 | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged |
| Performance requirements for PUCCH format 1 | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  False NACK limit unchanged  Correct ACK limit unchanged |
| Performance requirements for PUCCH format 2 | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged  UCI BLER limit unchanged |
| Performance requirements for PUCCH format 3 | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| Performance requirements for PUCCH format 4 | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| Performance requirements for multi-slot PUCCH | SNRs as specified | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  False NACK limit unchanged  Correct ACK limit unchanged |
| PRACH false alarm probability and missed detection | SNRs as specified | 0.3 dB | Formula: SNR + TTOTA  PRACH False detection limit unchanged  PRACH detection limit unchanged |
| NOTE: TT values are applicable for normal condition unless otherwise stated. | | | |

C.3.2 IAB-MT Test Tolerances

C.3.2.1 Demodulation Performance

**Table C.3.2.1-1: Derivation of Test Requirements (FR1 demodulation performance tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum Requirement in TS 38.174 [2]** | **Test Tolerance (TT)** | **Test requirement in the present document** |
| Performance requirements for PDSCH | SNRs as specified | 0.9 dB for > 10 Hz doppler  1.0 dB for 10Hz doppler | Formula: SNR + TT  T-put limit unchanged |
| Performance requirements for PDCCH with 1 Tx antenna performance | SNRs as specified | 1.0 dB | Formula: SNR + TT  T-put limit unchanged |
| Performance requirements for PDCCH with 2 Tx antenna performance | SNRs as specified | 0.9 dB | Formula: SNR + TT  T-put limit unchanged |

**Table C.3.2.1-2: Derivation of Test Requirements (FR2 demodulation performance tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum Requirement in TS 38.174 [2]** | **Test Tolerance (TT)** | **Test requirement in the present document** |
| Performance requirements for PDSCH | SNRs as specified | 2Tx, Rank 1:  1.8 dB  2Tx, Rank 2:  1.7 dB for doppler < 100Hz  1.6 dB otherwise | Formula: SNR + TT  T-put limit unchanged |
| Performance requirements for PDCCH with 1 Tx antenna | SNRs as specified | 1Tx, rank1:  1.7 dB | Formula: SNR + TT  T-put limit unchanged |
| Performance requirements for PDCCH with 2 Tx antenna | SNRs as specified | 2Tx, rank1:  1.8 dB | Formula: SNR + TT  T-put limit unchanged |

C.3.2.2 Channel State Information Reporting

**Table C.3.2.2-1: Derivation of Test Requirements (FR1 and FR2 CSI reporting tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum Requirement in TS 38.174 [2]** | **Test Tolerance (TT)** | **Test requirement in the present document** |
| CQI reporting | SNRs as specified  Limits as in the Test Procedure | No test tolerances applied | SNR unchanged |
| PMI reporting | SNRs as specified  ** as specified | SNR 0 dB  *0.01* | SNR unchanged  ** -TT |
| RI reporting | SNRs as specified  ** or ** as specified | SNR 0 dB  *0.01*  *0.01* | SNR unchanged  ** -TT or ** -TT |

**<<end of change from R4-2115709>>**

**<<start of change from R4-2115699>>**

E.1.1 Radiated transmit power, OTA output power dynamics, OTA transmitted signal quality, OTA occupied bandwidth, and OTA transmit ON/OFF power (*IAB type 2-O*)

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**Figure E.1.1-1: Measurement set up for radiated transmit power, OTA output power dynamics, OTA transmitted signal quality, OTA occupied bandwidth, and OTA transmit ON/OFF power (*IAB type 2-O*)**

The OTA chamber shown in figure E.1.1-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, Near field chamber, etc.)

<Next modified section from R4-2115699>

E.1.4 OTA co-location emissions, OTA transmit ON/OFF power (*IAB type 1-O*)

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**Figure E.1.4-1: Measurement set up for OTA co-location emissions, OTA transmit ON/OFF power (*IAB type 1-O*)**

The OTA chamber shown in figure E.1.4-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, Near field chamber, etc.)

**<<Start of change from R4-2115709>>**

E.3 Measurement set-up IAB-MT and IAB-DU performance requirements

E.3.1 PUSCH and PUCCH single antenna port in multipath fading

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**Figure E.3.1-1: Functional set-up for PUSCH and PUCCH single antenna port performance requirements in multipath fading**

The OTA chamber shown in Figure E.3.1-1 is intended to be generic and can be replaced with any suitable OTA chamber (e.g. far field anechoic chamber, CATR, etc.).

NOTE 1: The feedback could be done as an RF feedback, either using NR channels or using other means, or as a digital feedback. The HARQ Feedback should be error free.

NOTE 2: In tests performed with signal generators, a synchronization signal may be provided between the IAB node and the signal generator, or a common (e.g., GNSS) source may be provided to both IAB node and the signal generator, to enable correct timing of the wanted signal. The method of synchronization with the TE is left to test implementation.

NOTE 3: It is left up to implementation how L1/L2 is configured for testing.

E.3.2 2 antenna port PUSCH, PDCCH, PDSCH in multi-path fading

****

****

**Figure E.3.2-1: Functional set-up for PUSCH, PDCCH, PDSCH performance requirements with Rx diversity (2 Rx case shown)**

The OTA chamber shown in Figure E.3.2-1 is intended to be generic and can be replaced with any suitable OTA chamber (e.g. far field anechoic chamber, CATR, etc.).

NOTE 1: The feedback could be done as an RF feedback, either using NR channels or using other means, or as a digital feedback. The HARQ Feedback should be error free.

NOTE 2: In tests performed with signal generators, a synchronization signal may be provided between the IAB node and the signal generator, or a common (e.g., GNSS) source may be provided to both IAB node and the signal generator, to enable correct timing of the wanted signal. The method of synchronization with the TE is left to test implementation.

NOTE 3: It is left up to implementation how L1/L2 is configured for testing.

E.3.3 PUSCH, PRACH, CSI in static AWGN

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**Figure E.3.3-1: Functional set-up for PUSCH, PRACH, CSI reporting performance requirements in static AWGN channel with Rx diversity (2 Rx case shown)**

The OTA chamber shown in Figure E.3.3-1 is intended to be generic and can be replaced with any suitable OTA chamber (e.g. far field anechoic chamber, CATR, etc.).

NOTE 1: The feedback could be done as an RF feedback, either using NR channels or using other means, or as a digital feedback. The HARQ Feedback should be error free.

NOTE 2: In tests performed with signal generators, a synchronization signal may be provided between the IAB node and the signal generator, or a common (e.g., GNSS) source may be provided to both IAB node and the signal generator, to enable correct timing of the wanted signal. The method of synchronization with the TE is left to test implementation.

NOTE 3: It is left up to implementation how L1/L2 is configured for testing.

**<<End of change>>**

**<<start of change from R4-2115709>>**

J.3 Physical signals, channels mapping and precoding

J.3.1 General

Unless otherwise stated, the transmission on antenna port(s) is defined by using a precoder matrix  of size , where is the number of physical transmit antenna elements configured per test , is the number of ports for a reference signal or physical channel configured per test, and is the first port for that reference signal or physical channel as defined in clauses 7.3 and 7.4 in TS 38.211 [9]. This precoder takes as an input a block of signals for antenna port(s) , , , with  being the number of modulation symbols per antenna port including the reference signal symbols, and generates a block of signals the elements of which are to be mapped onto the frequency-time index pair as per the test configuration but transmitted on different physical antenna elements:



For Clause 6 and 8, the transmission of PDCCH and PDCCH DMRS on antenna port is defined by using a precoder matrix  of size 2x1. This precoder takes as an input a block of signals for antenna port(s) , and generates a block of signals the elements of which are to be mapped onto the frequency-time index pair as per the test configuration but transmitted on different physical antenna elements:



The precoder matrix is specific to the test case configuration  is defined in Clause 5.2.2.2 of TS 38.214 [24].

The transmission on PT-RS antenna port is associated (using same precoder) with the lowest indexed DM-RS antenna port among the DM-RS antenna ports assigned for the PDSCH.

The physical antenna elements are identified by indices, where  is the number of physical antenna elements configured per test.

Modulation symbols with (i.e. PSS, SSS, PBCH and DM-RS for PBCH) are directly mapped to first physical antenna element.



Modulation symbols  for CSI-RS resources which configured for tracking with one port are directly mapped to first physical antenna element.

Modulation symbols  for CSI-RS resources which configured for beam refinement with one port are directly mapped to first physical antenna element.

Modulation symbols  for NZP CSI-RS which configured for CSI acquisition with  are mapped to the physical antenna index  where is the number of NZP CSI-RS ports configured per test.

**<<end of change>>**

**<<end of change from R4-2115709>>**