**3GPP TSG- Meeting # *R5-255377***

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

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.521-1** | **CR** | **3429** | **rev** | **1** | **Current version:** | **19.0.0** |  |
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| *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 |  | Core Network |  |

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| ***Title:***  | 3CC intraband non-contiguous updates |
|  |  |
| ***Source to WG:*** | Keysight Technologies UK Ltd |
| ***Source to TSG:*** | R5 |
|  |  |
| ***Work item code:*** | NR\_CADC\_NR\_LTE\_DC\_R17-UEConTest |  | ***Date:*** | 2025-08-12 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Intraband non-contiguous (IBNC) carrier aggregation (CA) for 3CC is already possible fo band n66 which has the frequencies defined in 38.508-1 and it is declared as completed for DL CA in PRD21. However, IBNC CA for 3CC is fully or particially uncovered in certain 3CC CA RX test cases.In addition, because of the assymetric nature of band n66 and the rules to define frequencies in that case in 38.508-1, when testing the maximum agreated BW, the general rule in the test configuration tables of using maximum BW in the PCC does not match with other general rules in 38.508-1 for the frequency definition and the PCC location. To minimize the impact in the specs, it is proposed to add exceptions to the rule in the test configuration tables.  |
|  |  |
| ***Summary of change:*** | In test configuration table 7.3A.2.4.1-1, added specific clarifications for n66(3A).Added IBNC CA support in 3CC DL test cases 7.6A.3.2, 7.6A.4.2 and 7.8A.2.2. Also added specific clarifications for n66(3A) case.  |
|  |  |
| ***Consequences if not approved:*** | Test specifcation will remain inconsistent and incomplete.  |
|  |  |
| ***Clauses affected:*** | 7.3A.2, 7.6A.3.2, 7.6A.4.2, 7.8A.2.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision 1:-Resolved overlap with R5-254382 (R&S) by removing changes in sections 7.6A.4.2.5.x and 7.8A.2.2.5.x in this CR, given same changes are also covered in the other CR. -Editorial corrections in Table 7.8A.2.2.4.1-1: removed unnecessary line break and unnecessary “)” in the added text. |

## <<< START OF CHANGES >>>

### 7.3A.2 Reference sensitivity power level for 3DL CA without exceptions

7.3A.2.1 Test purpose

To verify the ability of UE that support CA to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area.

7.3A.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 3DL CA.

7.3A.2.3 Minimum requirements

The minimum conformance requirements are defined in clause 7.3A.0.

7.3A.2.4 Test description

7.3A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on NR operating bands specified in Table 5.2-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.2A.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.2.4.1-1: Test Configuration Table for 3DL CA without exceptions

|  |
| --- |
| Initial conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal, TL/VL, TL/VH, TH/VL, TH/VH |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | For test frequencies refer to “Range” columns.For Inter-band CA:CA\_nXA-nYA-nZA: Mid range for PCC and SCC with exceptions (Note 11):CA\_nXC-nYA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA :Low range, High Range for nXC and nXB, mid range for nYA for PCC and SCC with exceptions :CA configurations containing the following band combinations:CA\_n1-n77: Mid in band n1 and Low in band n77CA\_n2-n77: UL and DL Mid in band n2 and band n77 at 3850MHzCA\_n3-n77: TBD in band 3 and TBD in band 77. CA\_n3-n78: Mid in band 3 and High in band 78.CA\_n8-nX: Low range for PCC in Band 8CA\_n70-n71: High range for PCC in band 71 |
| Test CC Combination setting (CBW) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE. | Refer to “NRB\_PCC”, “NRB\_SCC1” and “NRB\_SCC2” columns |
| Test SCS as specified in Table 5.3.5-1 | Lowest |
| Network signalling value | NS\_01Unless given by Table 7.3.2.3-4 for the band with active uplink carrier |
| Test Parameters for CA Configurations |
| ID | CA Configuration / channel BW | DL Allocation | UL allocation (NOTE2.0 to NOTE 5) |
| CA configuration | PCC NRB | SCC1 NRB | SCC2 NRB | CC Mod | PCC & SCC RB allocation | CC Mod | PCC & SCC RB allocation |
| PCC | Wgap1 | SCC1 | Wgap2 | SCC2 | PCC | SCC |
| Band | Range | Band | Range | Band | Range |
| Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous) |
| 1 | nX | Low CC1 | N/A | nX | Low CC2 | N/A | nX | Low CC3 | Highest NRB\_agg | Highest NRB\_agg | Highest NRB\_agg | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nX | High CC1 | N/A | nX | High CC2 | N/A | nX | High CC3 | Highest NRB\_agg | Highest NRB\_agg | Highest NRB\_agg | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |

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| --- |
| Test Parameters for CA Configurations |
| ID | CA Configuration / channel BW | DL Allocation | UL allocation (NOTE2.0 to NOTE 5) |
| CA configuration | PCC NRB | SCC1 NRB | SCC2 NRB | CC Mod | PCC & SCC RB allocation | CC Mod | PCC & SCC RB allocation |
| PCC | Wgap1 | SCC1 | Wgap2 | SCC2 | PCC | SCC |
| Band | Range | Band | Range | Band | Range |
| Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band) |
| 1 | nX | default | N/A | nY | default | N/A | nZ | default | Highest (NOTE 12) | Highest | Highest | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | N/A | nZ | default | N/A | nX | default | Highest (NOTE 12) | Highest | Highest | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 3 | nZ | default | N/A | nY | default | N/A | nX | default | Highest (NOTE 12) | Highest | Highest | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| Default Test Settings for a CA\_nXC-nYA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA Configurations (Intra-band contiguous + Inter-band) |
| 1 | nX | default | N/A | nX | default | N/A | nY | default | Highest NRB\_agg | Highest NRB\_agg | Highest  | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | N/A | nX | default | N/A | nX | default | Highest (NOTE 12) | Highest NRB\_agg | Highest NRB\_agg | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |

|  |
| --- |
| Test Parameters for CA Configurations |
| ID | CA Configuration / channel BW | DL Allocation | UL allocation (NOTE2.0 to NOTE 5) |
| CA configuration | PCC NRB | SCC1 NRB | SCC2 NRB | CC Mod | PCC & SCC RB allocation | CC Mod | PCC & SCC RB allocation |
| PCC | Wgap1 | SCC1 | Wgap2 | SCC2 | PCC | SCC |
| Band | Range | Band | Range | Band | Range |
| Default Test Settings for a CA\_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band) |
| 1 | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | nY | Mid | Highest N**RB\_agg** (NOTE 6) | Highest N**RB\_agg** (NOTE 6) | Highest  | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | Mid | NA | nX | CC1 | Max (NOTE 7) | nX | CC2 | Highest (NOTE 12) | Highest N**RB\_agg** | Highest N**RB\_agg** | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| **Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)** |
| 1 | nX | CC1 | Max (NOTE 7) | nX | CC2 | Max (NOTE 7, NOTE 13) | nX | CC3 | Highest NRB\_agg (NOTE 6, NOTE 13) | Highest NRB\_agg (NOTE 6, NOTE 13) | Highest NRB\_agg (NOTE 6, NOTE 13) | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| **Default Test Settings for a CA\_nX(A-C) and CA\_nX(A-B) Configuration (Intra-band contiguous + Intra-band non-contiguous)** |
| 1 | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | nX | CC3 | Highest NRB\_agg (NOTE 6) | Highest NRB\_agg (NOTE 6) | Highest NRB\_agg (NOTE 6) | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.Note 2.0: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.Note 2: Use CA Configuration – specific test points if present in the table, otherwise use test points from matching Group Test Settings, if present in the table. Otherwise use the Default Test Settings test points.Note 3: Inter-band: nX,nY,nZ correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n8A, nX=n1, nY=n3, nZ=n8.Note 4: Intra-band contiguous + Inter-band:nX, nY correspond to the different bands in the CA Configuration, e.g. for CA\_n1C-n3A, nX=n1, nY=n3 Note 5: Intra-band non-contiguous + Inter-band: nX and nY correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n1A-n8A, nX=n1, nY =n8.Note 6: If the UE supports multiple CC Combinations in the CA Configuration with the same N**RB\_agg**, only the combination with the highest N**RB\_PCC** is testedNote 7: The W**gap** is defined to be widest possible on band based on the PCC and SCC configuration for Intra-band non-contiguousNote 8: For band combinations including operating bands without uplink band (as noted in Table 5.2-1), only the CA configurations where PCC band has uplink band shall be testedNote 9: The fallback configuration CA\_nXA-nYA for 3CA configurations CA\_nXC-nYA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA does not need to be tested even if the test frequency differsNote 10: In a band where UE supports 4Rx but not supports 8Rx, the test needs to be performed only with 4Rx antennas connected. In a band where UE supports 8Rx, the test needs to be performed only with 8Rx antennas connected.Note 11: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.Note 12: Each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.2. DL channel bandwidth shall be selected first.Note 13: For the NR asymmetric band n66(3A) case, following the Note 7 and the rules to define the Test Frequencies as specified in TS 38.508-1 [5], the Highest NRB\_agg is only achievable setting a 20MHz PCC at Low frequency, a 20MHz SCC1 at Mid frequency and 40MHz SCC2 at high frequency with no UL. In this case, Note 6 above does not apply.  |

## <<< Skip unchanged sections >>>

#### 7.6A.3.2 Out-of-band blocking for CA (3DL CA)

7.6A.3.2.1 Test purpose

Out-of-band band blocking for CA is defined for an unwanted CW interfering signal falling more than 15 MHz or 3\*BWChannel\_CA below or above the UE receive band, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz or 3\*BWChannel\_CA below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5A and sub-clause 7.6A.2 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.3.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.6A.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.3.0.

7.6A.3.2.4 Test description

7.6A.3.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.3.2.4.1-1: Test configuration table for Intra-band contiguous CA

|  |
| --- |
| Default Conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | Mid range |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.1.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest NRB\_aggNOTE 3 |
| Test SCS as specified in Table 5.3.5-1  | Lowest |
| Test Parameters |
|  | Downlink Configuration | Uplink Configuration |
| Test ID | CCMod'n | PCC RB allocation  | SCCs RB allocation | CCMod'n | PCC RB allocation  |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested. NOTE 4: In a band where UE supports 4Rx but not supports 8Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2a and Table 7.3.2.5-2b) is used in the test requirements. In a band where UE supports 8Rx, the test shall be performed only with 8Rx antennas ports connected and 8Rx REFSENS requirement (Table 7.3.2.5-2e and Table 7.3.2.5-2f) is used in the test requirements. Otherwise, the UE shall be verified with two Rx antenna ports. |

Table 7.6A.3.2.4.1-2: Test configuration table for Inter-band CA

|  |
| --- |
| Default Conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | Inter-band : NOTE 5Intra-band contiguous + Inter-band: NOTE 5Intra-band non-contiguous + Inter-band: Max WGap for Intra-band non-contiguous NOTE 5 |
| Test CC Combination setting (NRB\_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE. | Highest NRB\_aggNOTE 3NOTE 6 |
| Test SCS as specified in Table 5.3.5-1  | Lowest |
| Test Parameters |
|  | Downlink Configuration | Uplink Configuration |
| Test ID | CCMod'n | PCC RB allocation  | SCCs RB allocation | CCMod'n | PCC RB allocation  |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2.NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested. NOTE 4: In a band where UE supports 4Rx but not supports 8Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2a and Table 7.3.2.5-2b) is used in the test requirements. In a band where UE supports 8Rx, the test shall be performed only with 8Rx antennas ports connected and 8Rx REFSENS requirement (Table 7.3.2.5-2e and Table 7.3.2.5-2f) is used in the test requirements. Otherwise, the UE shall be verified with two Rx antenna ports.NOTE 5: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.NOTE 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.2. DL channel bandwidth shall be selected first. |

Table 7.6A.3.2.4.1-3: Test configuration table for Intra-band non-contiguous CA

|  |
| --- |
| Default Conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | NOTE 1, NOTE 3 |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.1.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | Highest NRB\_aggNOTE 1 |
| Test SCS as specified in Table 5.3.5-1  | Lowest |
| Test Parameters |
|  | Downlink Configuration | Uplink Configuration |
| Test ID | CCMod'n | PCC RB allocation  | SCCs RB allocation | CCMod'n | PCC RB allocation  |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1.NOTE 2: In a band where UE supports 4Rx but not supports 8Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2a and Table 7.3.2.5-2b) is used in the test requirements. In a band where UE supports 8Rx, the test shall be performed only with 8Rx antennas ports connected and 8Rx REFSENS requirement (Table 7.3.2.5-2e and Table 7.3.2.5-2f) is used in the test requirements. Otherwise, the UE shall be verified with two Rx antenna ports. |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.3.2.4.1-1 or Table 7.6A.3.2.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.3.2.4.3*.*

7.6A.3.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 7.6A.3.2.4.1-1 or 7.6A.3.2.4.1-2 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. For the CCs the throughput is measured on according to Table 7.6A.3.2.4.2-1, set the parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below each SCC’s operating band for inter-band CA (single CC in the measured band) according to Table 7.6A.3.2.5.1-2, 7.6A.3.2.5.2-2 or 7.6A.3.2.5.2-4. The frequency step size is  MHz.

If CW interferer falls in a gap between FDL\_High(*j*) and FDL\_Low(*j*+1) where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.6A.3.2.5.2-2 and 7.6A.3.2.5.2-4 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1. Use the highest RIB,c among CA bands for Pinterferer calculation.

For inter-band CA combination listed in Table 7.6A.3.2.5.2-5, exceptions to the requirement specified in Table 7.6A.3.2.5.2-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

7. Set the downlink signal level according to Table 7.6A.3.2.5.1-1, 7.6A.3.2.5.2-1 or 7.6A.3.2.5.2-3 for all carriers. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6A.3.2.5.1-1, 7.6A.3.2.5.2-1 or 7.6A.3.2.5.2-3 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

- For UEs supporting Tx diversity, the transmit power is measured as the sum of the output power from both UE antenna connectors.

8. Measure the average throughput for the carrier(s) indicated in Table 7.6A.3.2.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

9. Record the frequencies for which the throughput doesn't meet the requirements and for each frequency, the carriers for which the throughput was not met.

10. Repeat steps 6 to 8 for each recorded frequency-carrier pair, with exception of pairs for which RIB,c is the same as RIB used in Step 6. In Step 6 use only recorded frequencies for interferer placement and use RIB,c relevant to recorded carrier for Pinterferer calculation. Remove the frequency-carrier pairs that meet the throughput requirements from the record.

11. Repeat steps from 6 to 10, using an interfering signal above the CA Band for intra-band CA, or above each SCC’s operating band for inter-band CA at step 6.

12. For Inter-band CA: repeat steps 1 to 11 for the CA configuration IDs in REFSENS indicated in Table 7.6A.3.2.4.2-1, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

Table 7.6A.3.2.4.2-1: Test repetition and measurement configuration

|  |  |  |
| --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on |
| Intra-band contiguous  | 14 | PCC, SCC1, SCC2 |
| Inter-band | 11 | SCC1, SCC2 |
| 21 |
| 31 |
| Intra-band contiguous + Inter-band | 12 | SCC2 |
| 22 | SCC1, SCC2 |
| Intra-band non-contiguous + Inter-band | 23 | SCC2 |
| 33 | SCC1, SCC2 |
| Intra-band non-contiguous | 15 | PCC, SCC1, SCC2 |
| Intra-band contiguous + Intra-band non-contiguous | 16 | PCC, SCC1, SCC2 |
| NOTE 1: CA configuration ID as defined in “Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band)” in Table 7.3A.2.4.1-1.NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA\_nXC-nYA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA Configurations (Intra-band contiguous + Inter-band)” in Table 7.3A.2.4.1-1.NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nYA Configuration (Intra-band non-contiguous + Inter-band)” in Table 7.3A.2.4.1-1.NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous)” in Table 7.3A.2.4.1-1.NOTE 5: CA configuration ID as defined in “Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)” in Table 7.3A.2.4.1-1.NOTE 6: CA configuration ID as defined in “Default Test Settings for a CA\_nX(A-C) and CA\_nX(A-B) Configuration (Intra-band contiguous + Intra-band non-contiguous)” in Table 7.3A.2.4.1-1. |

7.6A.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED.

7.6A.3.2.5 Test requirement

7.6A.3.2.5.1 Out-of-band blocking for Intra-band contiguous CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.2.5.1-1 and 7.6A.3.2.5.1-2.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed  in each assigned frequency channel when measured using a  MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.2.5.1-1: Out-of-band blocking parameters for intra-band contiguous CA

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | CA bandwidth class |
| D |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + CA bandwidth class specific value below |
| dB | 9 |  |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4. |

7.6A.3.2.5.1-2: Out of-band blocking for intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -45 | -30 | -15 |
| n41, n485, n66, n71 | Finterferer (CW) | MHz | -60 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60or60 ≤ f – FDL\_high < 85 |  1 ≤ f ≤ FDL\_low – 85orFDL\_high + 85 ≤ f≤ 12750 |
| n77, n78(NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)orFDL\_high+ MAX(200,3\*BWChannel\_CA)≤ f ≤ 12750 |
| n79(NOTE 4) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel\_CA)orFDL\_high + MAX(150,3\*BWChannel\_CA)≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz.NOTE 2: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signalNOTE 3: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 2700 MHz and FInterferer < 4800 MHz. For BWChannel\_CA > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3\*BWChannel\_CA from the band edge. For BWChannel\_CA larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3\*BWChannel\_CA from the band edge.NOTE 4: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 3650 MHz and FInterferer < 5750 MHz. For BWChannel\_CA ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3\*BWChannel\_CA from the band edge. NOTE 5: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2700 MHz and FInterferer < 4800 MHz.NOTE 6: The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41. |

7.6A.3.2.5.2 Out-of-band blocking for Inter-band CA

Except for the spurious response frequencies recorded in step 9 and step 10 of test procedure, the throughput measurement derived in the test procedure of SCCs shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.2.5.2-1 and 7.6A.3.2.5.2-2 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Tables 7.6A.3.2.5.2-3 and 7.6A.3.2.5.2-4 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 and step 10 of test procedure shall not exceed  in each assigned frequency channel when measured using a  MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

Table 7.6A.3.2.5.2-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
| dB | 6 | 6 | 7 | 9 | 10 |
| RX parameter | Units | Channel bandwidth |
| 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
| dB | 11 | 11.5 | 12 | 12.5 | 13 |
| RX parameter | Units | Channel bandwidth |
| 60 MHz | 70 MHz | **80 MHz** | **90 MHz** | **100 MHz** |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
| dB | 14 | 14.5 | 15 | 15.5 | 16 |
| NOTE: The transmitter shall be set to 4dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.6A.3.2.5.2-2: Out of-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range 1 | Range 2 | Range 3 |
| n1, n2, n3, n5, n7, n8, n12, n20, n25, n28, n34, n38, n39, n40, n41, n485, n50, n51, n66, n70, n71, n74, n75, n76 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60or60 ≤ f – FDL\_high < 85 |  1 ≤ f ≤ FDL\_low – 85or FDL\_high + 85 ≤ f≤ 12750 |
| NOTE1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz. NOTE 2: For band 51 the FDL\_high of band 50 is applied as FDL\_high for band 51. For band 50, the FDL\_low of band 51 is applied as FDL\_low for band 50.NOTE 3: For band 76 the FDL\_high of band 75 is applied as FDL\_high for band 76. For band 75, the FDL\_low of band 76 is applied as FDL\_low for band 75.NOTE 4: For UEs supporting both bands 38 and 41, the FDL\_high and FDL\_low of band 41 is applied as FDL\_high and FDL\_low for band 38. NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2700 MHz and FInterferer < 4800 MHz.NOTE 6: Void.NOTE 7: For UE supporting both bands 25 and 70, the FDL\_high of band 70 is applied as FDL\_high for band 25, and the FDL\_low of band 25 is applied as FDL\_low for band 70. |

Table 7.6A.3.2.5.2-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth |
| 10 MHz | 15 MHz | 20 MHz | 40 MHz | 50 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
| dB | 6 | 7 | 9 | 9 | 9 |
| RX parameter | Units | Channel bandwidth |
| 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
| dB | 9 | 9 | 9 | 9 | 9 |
| NOTE: The transmitter shall be set to 4dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.6A.3.2.5.2-4: Out of-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range1 | Range 2 | Range 3 |
| n77, n78(NOTE 3) | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low ≤ -3\*BWChannelor3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)orMAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)orFDL\_high + MAX(200,3\*BWChannel)≤ f ≤ 12750 |
| n79(NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)orMAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)orFDL\_high + MAX(150,3\*BWChannel)≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz.NOTE 2: BWChannel denotes the channel bandwidth of the wanted signalNOTE 3: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 2700 MHz and FInterferer < 4800 MHz. For BWChannel > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3\*BWChannel from the band edge. For BWChannel larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3\*BWChannel from the band edge.NOTE 4: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 3650 MHz and FInterferer < 5750 MHz. For BWChannel ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3\*BWChannel from the band edge. |

If CW interferer falls in a gap between FDL\_High(*j*) and FDL\_Low(*j*+1) where the corresponding OOB ranges 1 and 2 overlap, then the lower level interferer limit of the overlapping OOB ranges applies.

For the UE which supports inter-band CA configuration in Table 7.3A.3.5.1.3-5, Pinterferer power defined in Table 7.6A.3.2.5.2-2 and 7.6A.3.2.5.2-4 is increased by the amount given by ΔRIB,c in Table 7.3A.3.5.1.3-1.

For inter-band CA combination listed in Table 7.6A.3.2.5.2-5, exceptions to the requirement specified in Table 7.6A.3.2.5.2-6 are allowed when the second order intermodulation product of the lower frequency band UL carrier and the CW interfering signal fully or partially overlaps with the higher frequency band DL carrier.

Table 7.6A.3.2.5.2-5: CA band combination with exceptions allowed

|  |
| --- |
| CA band combination |
| CA\_n8-n78 |
| CA\_n28-n78 |

Table 7.6A.3.2.5.2-6: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when $\left|f\_{Interferer}\pm f\_{UL}^{LB}- f\_{DL}^{HB}\right|\leq (BW\_{UL}^{LB}+ BW\_{DL}^{HB})/2$, where $f\_{UL}^{LB}$ and $f\_{DL}^{HB}$ are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. $BW\_{UL}^{LB} $and $BW\_{DL}^{HB} $are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. |

7.6A.3.2.5.3 Out-of-band blocking for Intra-band non-contiguous CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6A.3.2.5.2-1 and 7.6A.3.2.5.2-2 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Tables 7.6A.3.2.5.2-3 and 7.6A.3.2.5.2-4 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

The number of spurious response frequencies recorded in step 9 of test procedure shall not exceed  in each assigned frequency channel when measured using a  MHz step size. For these exceptions the requirements of clause 7.7A Spurious Response are applicable.

The throughput of each carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

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#### 7.6A.4.2 Narrow band blocking for CA (3DL CA)

7.6A.4.2.1 Test purpose

Verifies a receiver's ability to receive an NR signal at its assigned CA channel frequencies in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6A.4.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.6A.4.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.6A.4.0.

7.6A.4.2.4 Test description

7.6A.4.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.6A.4.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.4.2.4.1-1: Test configuration table for 3DL CA

|  |
| --- |
| Default Conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | Inter-band : NOTE 5Intra-band contiguous + Inter-band: NOTE 5Intra-band non-contiguous, Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5) |
| Test CC Combination setting (NRB\_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE. | Highest NRB\_aggNOTE 3NOTE 6 |
| Test SCS as specified in Table 5.3.5-1 | Lowest (NOTE 7) |
| Test Parameters |
|  | Downlink Configuration | Uplink Configuration |
| Test ID | CCMod'n | PCC RB allocation  | SCCs RB allocation | CCMod'n | PCC RB allocation  |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3A.2.4.1-1.NOTE 2: Void.NOTE 3: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested with exceptions defined in Table 7.3A.2.4.1-1. NOTE 4: In a band where UE supports 4Rx but not supports 8Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2a and Table 7.3.2.5-2b) is used in the test requirements. In a band where UE supports 8Rx, the test shall be performed only with 8Rx antennas ports connected and 8Rx REFSENS requirement (Table 7.3.2.5-2e and Table 7.3.2.5-2f) is used in the test requirements. Otherwise, the UE shall be verified with two Rx antenna ports.NOTE 5: Test frequency is set to Mid Range for PCC and SCCs with exceptions defined in Table 7.3A.2.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.NOTE 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.2. DL channel bandwidth shall be selected first.NOTE 7: For cells where T-put measurement is performed, CH BW/SCS shall be according to table 7.6.4.3-1. |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.6A.4.2.4.1-1 or Table 7.6A.4.2.4.1-2.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6A.4.2.4.3*.*

7.6A.4.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.4.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6A.4.2.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 7.6A.4.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal below each SCC’s operating band for inter-band CA according to Table 7.6.4.5-1. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, PUW power defined in Table 7.6.4.5-1is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

7. Set the downlink signal level for all carriers according to Table 7.6.4.5-1. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.6.4.5-1 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

- For UEs supporting Tx diversity, the transmit power is measured as the sum of the output power from both UE antenna connectors.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above each SCC’s operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell as per corresponding test IDs defined in Table 7.3A.2.4.1-1 and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.6A.4.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED.

7.6A.4.2.5 Test requirement

7.6A.4.2.5.1 Narrow band blocking for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the narrow band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested, i.e. the requirements are tested only for the SCell downlink.

The throughput of each carrier, when operated as SCC, shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.4.5-1. The test requirement of configurations for CA operating band including Band n41 also apply for the corresponding CA operating bands with Band n90 replacing Band n41.

Table 7.6A.4.2.5.1-1: Void

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, PUW power defined in Table 7.6.4.5-1 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

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#### 7.8A.2.2 Wide band Intermodulation for CA (3DL CA)

7.8A.2.2.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8A.2.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 3DL CA.

7.8A.2.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.8A.2.0.

7.8A.2.2.4 Test description

7.8A.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and sub-carrier spacing based on NR CA configurations specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.8A.2.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3 respectively. The details of the OCNG patterns used are specified in Annex A.5. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8A.2.2.4.1-1: Test configuration table for CA

|  |
| --- |
| Default Conditions |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | Normal |
| Test Frequencies as specified in TS 38.508-1 [5] subclause 4.3.1 | Intra-band contiguous: Mid rangeInter-band: NOTE 3Intra-band contiguous + Inter-band: NOTE 3Intra-band non-contiguous + Inter-band: NOTE 3Intra-band non-contiguous: NOTE 3Intra-band contiguous + Intra-band non-contiguous: NOTE 3MaxWGap for Intra-band non-contiguous NOTE 3 |
| Test CC Combination setting (NRB\_agg) as specified in Tables 5.5A.1-1, 5.5A.2-1, or tables in clauses 5.5A.3.x for the CA Configuration across bandwidth combination sets supported by the UE. | Highest NRB\_aggNOTE 4NOTE 6 |
| Test SCS as specified in Table 5.3.5-1  | Highest |
| Test Parameters |
|  | Downlink Configuration | Uplink Configuration |
| Test ID | CCMod'n | PCC RB allocation  | SCCs RB allocation | CCMod'n | PCC RB allocation  |
| Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous) |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band) |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| Default Test Settings for a CA\_nXC-nYA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA Configurations(Intra-band contiguous + Inter-band) |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| Default Test Settings for a CA\_nX(2A)-nYA Configuration(Intra-band non-contiguous + Inter-band) |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| **Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)** |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| Default Test Settings for a CA\_nX(A-C) and CA\_nX(A-B) Configuration**(Intra-band contiguous + Intra-band non-contiguous)** |
| 1 | CP-OFDM QPSK | Full RB1 | Full RB1 | DFT-s-OFDM QPSK | REFSENS2 |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3A.2.4.1-1.NOTE 2: REFSENS refers to the single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3.NOTE 3: The specific test frequencies for PCC and SCCs and Wgap for intra-band non-contiguous are defined in Table 7.3A.2.4.1-1.NOTE 4: If the UE supports multiple CC Combinations in the CA Configuration with the same NRB\_agg, only the combination with the highest NRB\_PCC is tested with exceptions defined in Table 7.3A.2.4.1-1. NOTE 5: In a band where UE supports 4Rx but not supports 8Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2a and Table 7.3.2.5-2b) is used in the test requirements. In a band where UE supports 8Rx, the test shall be performed only with 8Rx antennas ports connected and 8Rx REFSENS requirement (Table 7.3.2.5-2e and Table 7.3.2.5-2f) is used in the test requirements. Otherwise, the UE shall be verified with two Rx antenna ports.NOTE 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.2. DL channel bandwidth shall be selected first. |

Table 7.8A.2.2.4.1-2: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.7 for TE diagram and section A.3.2 for UE diagram.

2. The parameter settings for the cell are set up according to TS 38.508-1 [5] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, C.2, and C.3.1, and uplink signals according to Annex G.0, G.1, G.2, and G.3.1.

4. The DL and UL Reference Measurement Channels are set according to Table 7.8A.2.2.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On,* Test Mode *On* and Test Loop Function *On* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.8A.2.2.4.3*.*

7.8A.2.2.4.2 Test procedure

1. Configure SCCs according to Annex C.0, C.1, C.2 for all downlink physical channels.

2. The SS shall configure SCCs as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.8A.2.2.4.3.

3. SS activates SCCs by sending the activation MAC CE (Refer TS 38.321 [18], clauses 5.9, 6.1.3.10). Wait for at least 2 seconds (Refer TS 38.133[19], clause 9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.8A.2.2.4.1-1 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

5. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC according to Table 7.8A.2.2.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. Set the Interfering signal levels to the values as defined in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2 and frequency below the CA Band for intra-band CA, or below each SCC’s operating band for inter-band CA according to Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2, using a modulated interferer bandwidth as defined in Annex D of the present document. For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.8A.2.2.5.2-1 and 7.8A.2.2.5.2-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

7. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2. Send uplink power control commands to the UE using 1dB power step size to ensure that the UE output power measured by the test system is within the Uplink power control window, defined as -MU to -(MU + Uplink power control window size) dB of the target power level in Table 7.8A.2.2.5.1-1, 7.8A.2.2.5.1-2, 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2 for at least the duration of the Throughput measurement, where:

- MU is the test system uplink power measurement uncertainty and is specified in Table F.1.3-1 for the carrier frequency f and the channel bandwidth BW

- Uplink power control window size = 1dB (UE power step size) + 0.7dB (UE power step tolerance) + (Test system relative power measurement uncertainty), where, the UE power step tolerance is specified in TS 38.101-1 [2], Table 6.3.4.3-1 and is 0.7dB for 1dB power step size, and the Test system relative power measurement uncertainty is specified for test case 6.3.4.3 in Table F.1.2-1.

- For UEs supporting Tx diversity, the transmit power is measured as the sum of the output power from both UE antenna connectors.

8. Measure the average throughput of SCCs for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of all carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Repeat steps from 6 to 8, using an interfering signal above the CA Band for intra-band CA, or above the each SCC’s operating band for inter-band CA at step 6.

10. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 9, except for operating bands without uplink band.

NOTE: The purpose of the Uplink power control window is to ensure that the actual UE output power is no greater than the target power level, and as close as possible to the target power level. The relationship between the Uplink power control window, the target power level and the corresponding possible actual UE Uplink power window is illustrated in Annex F.4.3.

7.8A.2.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED.

7.8A.2.2.5 Test requirement

7.8A.2.2.5.1 Wide band intermodulation for Intra-band contiguous CA

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8A.2.2.5.1-1 or 7.8A.2.2.5.1-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8A.2.2.5.1-1: Wide band intermodulation parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | NR CA bandwidth class |
| B | C | D |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 10 | REFSENS + 6 | REFSENS + 13.8 |
| PInterferer 1 (CW) | dBm | -46 |
| PInterferer 2(Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | 20 | BWChannel\_CA | 50 |
| FInterferer 1(Offset) | MHz | -Foffset-30/Foffset+30 | -2BWChannel\_CA/+2BWChannel\_CA | -Foffset-75/Foffset+75 |
| FInterferer 2(Offset) | MHz | 2\*FInterferer 1 |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4.NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the closest carrier.NOTE 4: The Finterferer 1 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer. |

Table 7.8A.2.2.5.1-2: Wide band intermodulation parameters for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | NR CA bandwidth class |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 16 | REFSENS + 22 |
| PInterferer 1 (CW) | dBm | -46 | -46 |
| PInterferer 2(Modulated) | dBm | -46 | -46 |
| BWInterferer 2 | MHz | 5 | 5 |
| FInterferer 1(Offset) | MHz | -Foffset-7.5/Foffset+7.5 | -Foffset-7.5/Foffset+7.5 |
| FInterferer 2(Offset) | MHz | 2\*FInterferer 1 | 2\*FInterferer 1 |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4.NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the 15 kHz SCS.NOTE 4: The Finterferer 1 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer. |

7.8A.2.2.5.2 Wide band intermodulation for Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested.

The throughput of each carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters defined in Table 7.8A.2.2.5.2-1 or 7.8A.2.2.5.2-2.

Table 7.8A.2.2.5.2-1: Wide band intermodulation parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units  | Channel bandwidth |
| 5MHz | 10MHz | 15MHz | 20MHz | 25MHz | 30MHz | 40MHz | 50MHz | 60MHz | 80MHz | 90MHz | 100MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm |  REFSENS + channel bandwidth specific value below |
| 6 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 15 | 16 |
| PInterferer 1(CW) | dBm | -46 |
| PInterferer 2(Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | 5 |
| FInterferer 1(Offset) | MHz | -BW/2 – 7.5/+BW/2 + 7.5 |
| FInterferer 2(Offset) | MHz | 2\*FInterferer 1 |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4.NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS.NOTE 4: The Finterferer 1 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer. |

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.8A.2.2.5.2-1 and 7.8A.2.2.5.2-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.2.5.2-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units  | Channel bandwidth |
| 10MHz | 20MHz | 40MHz | 50MHz | 60MHz | 80MHz | 90MHz | 100MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 6 |
| PInterferer 1(CW) | dBm | -46 |
| PInterferer 2(Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | BW |
| FInterferer 1(Offset) | MHz | -2BW/+2BW |
| FInterferer 2(Offset) | MHz | 2\*FInterferer 1 |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4.NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and the same SCS as the wanted signal.NOTE 4: The Finterferer 1 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the modulated interferer. |

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