# 7 Receiver characteristics

TBD

## 7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective clauses below.

Unless otherwise stated, Channel Bandwidth shall be prioritized in the selecting of test points. Subcarrier spacing shall be selected after Test Channel Bandwidth is selected.

The applicability of receiver requirements for Band n90 is in accordance with that for Band n41; a UE supporting Band n90 shall meet the minimum requirements for Band n41.

With the exception of clause 7.3, the requirements shall be verified with the network signalling value NS\_01 configured (Table 6.2.3.3-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and A.3.3, and using the set-up specified in Annex C.3.1.

The minimum requirements specified in clauses 7.5, 7.6, 7.7 and 7.8 for NR band n48 refer to the minimum requirements for NR bands < 2.7 GHz.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks, an in-gap test refers to the case when the interfering signal is located at a negative offset with respect to the assigned lowest channel frequency of the highest sub-block and located at a positive offset with respect to the assigned highest channel frequency of the lowest sub-block.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks, an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two or more sub-blocks with channel bandwidth larger than or equal to 5 MHz, the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size Wgap for at least one of these carriers *j* = 1,2, so that the interferer frequency position does not change the nature of the core requirement tested:

Wgap ≥ 2∙|FInterferer (offset),*j*| – BWChannel(*j*)

where FInterferer (offset),*j*for a sub-block with a single component carrier is the interferer frequency offset with respect to carrier *j* as specified in clause 7.5, clause 7.6.2 and clause 7.6.4 for the respective requirement and BWChannel(*j*) the channel bandwidth of carrier *j*. FInterferer (offset),j for a sub-block with two or more contiguous component carriers is the interference frequency offset with respect to the carrier adjacent to the gap is specified in clause 7.5A, 7.6A.2 and 7.6A.3. The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow- band blocking shall be tested separately with a single in-gap interferer at a time.

For the additional requirements for operation with shared spectrum channel access, the receiver requirements apply

under the assumption that all 20 MHz sub-bands and all RBs of each sub-band within the downlink channel are

allocated with intra-cell guard bands configured to zero.

## 7.1A General

The minimum requirements for band combinations including Band n41 also apply for the corresponding band combinations with Band n90 replacing Band n41 but with otherwise identical parameters. For brevity the said band combinations with Band n90 are not listed in the tables below but are covered by this specification.

The minimum requirements specified in clauses 7.5A, 7.6A, 7.7A and 7.8A for NR band n48 refer to the minimum requirements for NR bands < 2.7 GHz.

## 7.1I General

For a Redcap UE the requirements in Section 7 shall be verified with the channel bandwidth up to 20MHz and REFSENS specified in clause 7.3I.

## 7.1J General for ATG

Unless otherwise stated, the receiver characteristics are specified at the antenna connector(s) of the ATG UE with one or multiple omni-directional antenna(s) or at the *transceiver array boundary* (TAB) connectors of the ATG UE with the antenna array. The definition about *transceiver array boundary* (TAB) is specified in clause 4.3.2 of TS 38.104 [27].

For the ATG UE with multiple omni-directional antennas, the receiver RF requirements are defined on top of each antenna connector.

For the ATG UE with the antenna array, the receiver RF requirements are defined on top of each TAB connector.

## 7.2 Diversity characteristics

The UE is required to be equipped with a minimum of two Rx antenna ports in all operating bands except for the bands n7, n38, n41, n77, n78, n79 where the UE is required to be equipped with a minimum of four Rx antenna ports. An exception is allowed for two Rx vehicular UE to be equipped with a minimum of two Rx antenna ports in bands n7, n38, n41, n77, n78, n79. This requirement applies when the band is used as a standalone band or as part of a band combination.

For the single carrier REFSENS requirements in clause 7, the UE shall be verified with two Rx antenna ports in all supported frequency bands, additional requirements for four Rx ports shall be verified in operating bands where the UE is equipped with four Rx antenna ports.

For Rx requirements other than single carrier REFSENS in Clause 7, the UE shall be verified with four Rx antenna ports and skip two Rx antenna ports requirements in operating bands where the UE is equipped with four Rx antenna ports, otherwise, the UE shall be verified with two Rx antenna ports.

The above rules apply for all subclasses with the exception of clause 7.9.

A RedCap UE is required to be equipped with a minimum of single Rx antenna port and maximum of two Rx antenna ports. Clause 7 requirements for four Rx antenna ports do not apply to a RedCap UE.

## 7.2J Diversity characteristics for ATG

The ATG UE is required to be equipped with a minimum of two Rx antenna ports in all operating bands. ATG UE is required optionally to be equipped with four Rx antenna ports.

## 7.3 Reference sensitivity

### 7.3.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

In later clauses of Clause 7 where the value of REFSENS is used as a reference to set the corresponding requirement:

In all bands, the UE shall be verified against those requirements by applying the REFSENS value in Table 7.3.2.3-1a, Table 7.3.2.3-1b and Table 7.3.2.3-1c or Table 7.3.2.3-1d with 2 Rx antenna ports tested;

For bands where the UE is required to be equipped with 4 Rx antenna ports, the UE shall additionally be verified against those requirements by applying the resulting REFSENS value derived from the requirement in Table 7.3.2.3-2 with 4 Rx antenna ports tested.

### 7.3.2 Reference sensitivity power level

7.3.2.1 Test purpose

The test purpose is to verify the ability of the UE 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.

7.3.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that don’t support RedCap.

7.3.2.3 Minimum conformance requirements

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, 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 7.3.2.3-1a, 7.3.2.3-1b, Table 7.3.2-1c, Table 7.3.2-1d and Table 7.3.2.3-2.

Table 7.3.2.3-1a: Two antenna port reference sensitivity QPSK PREFSENS for FDD bands

| Operating band / SCS / Channel bandwidth | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 35 MHz (dBm) | 40  MHz (dBm) | 45 MHz (dBm) | 50  MHz (dBm) |
| n1 | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 | -91.9 |  | -90.6 | -90.1 | -89.6 |
| 30 |  | -97.1 | -95.1 | -94.0 | -92.8 | -92.0 |  | -90.7 | -90.2 | -89.7 |
| 60 |  | -97.5 | -95.4 | -94.2 | -93.0 | -92.1 |  | -90.9 | -90.3 | -89.7 |
| n2 | 15 | -98 | -94.8 | -93 | -91.8 | -90.7 | -84.1 |  | -81.5 |  |  |
| 30 |  | -95.1 | -93.1 | -92 | -90.8 | -84.2 |  | -81.6 |  |  |
| 60 |  | -95.5 | -93.4 | -92.2 | -90.9 | -84.3 |  | -81.7 |  |  |
| n3 | 15 | -97.0 | -93.8 | -92.0 | -90.8 | -89.7 | -88.9 | -86.2 | -82.3 | -81.3 | -79.7 |
| 30 |  | -94.1 | -92.1 | -91.0 | -89.8 | -89.0 | -86.3 | -82.4 | -81.4 | -79.8 |
| 60 |  | -94.5 | -92.4 | -91.2 | -90.0 | -89.1 | -86.4 | -82.6 | -81.5 | -79.9 |
| n5 | 15 | -98.0 | -94.8 | -93.0 | -86.8 | -84.8 |  |  |  |  |  |
| 30 |  | -95.1 | -93.1 | -88.6 | -84.9 |  |  |  |  |  |
| n71 | 15 | -98.0 | -94.8 | -93.0 | -91.8 | -90.7 | -89.9 |  | -88.6 |  |  |
| 30 |  | -95.1 | -93.1 | -92.0 | -90.8 | -90.0 |  | -88.7 |  |  |
| 60 |  | -95.5 | -93.4 | -92.2 | -91.0 | -90.1 |  | -88.9 |  |  |
| n8 | 15 | -97.0 | -93.8 | -91.4 | -85.8 |  |  | -78.4 |  |  |  |
| 30 |  | -94.1 | -91.7 | -87.2 |  |  | -78.5 |  |  |  |
| n12 | 15 | -97.0 | -93.8 | -84.0 |  |  |  |  |  |  |  |
| 30 |  | -94.1 | -84.1 |  |  |  |  |  |  |  |
| n13 | 15 | -97.0 | -93.8 |  |  |  |  |  |  |  |  |
| 30 |  | -94.1 |  |  |  |  |  |  |  |  |
| n14 | 15 | -97.0 | -93.8 |  |  |  |  |  |  |  |  |
| 30 |  | -94.1 |  |  |  |  |  |  |  |  |
| n20 | 15 | -97.0 | -93.8 | -91.0 | -89.8 |  |  |  |  |  |  |
| 30 |  | -94.1 | -91.1 | -90.0 |  |  |  |  |  |  |
| n24 | 15 | -100.0 | -96.8 |  |  |  |  |  |  |  |  |
| 30 |  | -97.1 |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 |  |  |  |  |  |  |  |  |
| n25 | 15 | -96.5 | -93.3 | -91.5 | -90.3 | -89.3 | -82.2 | -81.7 | -79.5 | -77.6 |  |
| 30 |  | -93.6 | -91.6 | -90.5 | -89.4 | -82.3 | -81.8 | -79.6 | -77.7 |  |
| 60 |  | -94.0 | -91.9 | -90.7 | -89.6 | -82.4 | -81.9 | -79.7 | -77.8 |  |
| n26 | 15 | -97.56 | -94.56 | -92.76 | -87.6 |  |  |  |  |  |  |
| 30 |  | -94.86 | -92.76 | -87.7 |  |  |  |  |  |  |
| n28 | 15 | -98.5 | -95.5 | -93.5 | -90.8 |  | -78.5 |  |  |  |  |
| 30 |  | -95.6 | -93.6 | -91.0 |  | -78.6 |  |  |  |  |
| n30 | 15 | -99.0 | -95.8 |  |  |  |  |  |  |  |  |
| 30 |  | -96.1 |  |  |  |  |  |  |  |  |
| n65 | 15 | -99.5 | -96.3 | -94.5 | -93.3 |  |  |  |  |  | -89.2 |
| 30 |  | -96.6 | -94.6 | -93.5 |  |  |  |  |  | -89.3 |
| 60 |  | -97.0 | -94.9 | -93.7 |  |  |  |  |  | -89.4 |
| n66 | 15 | -99.5 | -96.3 | -94.5 | -93.3 | -92.2 | -91.4 |  | -90.1 | -89.6 |  |
| 30 |  | -96.6 | -94.6 | -93.5 | -92.3 | -91.5 |  | -90.2 | -89.7 |  |
| 60 |  | -97.0 | -94.9 | -93.7 | -92.5 | -91.6 |  | -90.4 | -89.8 |  |
|  | 15 | -100.0 | -96.8 | -95.0 | -93.8 | -92.7 |  |  |  |  |  |
| n70 | 30 |  | -97.1 | -95.1 | -94.0 | -92.8 |  |  |  |  |  |
|  | 60 |  | -97.5 | -95.4 | -94.2 | -93.0 |  |  |  |  |  |
| n71 | 15 | -97.2 | -94.0 | -91.6 | -86.0 | -84.1 | -82.5 | -80.7 |  |  |  |
| 30 |  | -94.3 | -91.9 | -87.4 | -84.2 | -82.6 | -80.8 |  |  |  |
| n74 | 15 | -99.53 | -96.33 | -94.53 | -89.33 |  |  |  |  |  |  |
| 30 |  | -96.63 | -94.63 | -89.53 |  |  |  |  |  |  |
| 60 |  | -97.03 | -94.93 | -89.63 |  |  |  |  |  |  |
| n100 | 15 | -100 |  |  |  |  |  |  |  |  |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4  NOTE 3: The requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9 - 1510.9 MHz.  NOTE 4: Void  NOTE 5: Void  NOTE 6: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.  NOTE 7: Void. | | | | | | | | | | | |

Table 7.3.2.3-1b: Two antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS | | | | |
| Operating band | SCS  kHz | Channel bandwidth (MHz) | REFSENS (dBm)8 | Duplex Mode |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11) |
| n381 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11) |
| n39 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11) |
| n40 | 15 | 5, 10, 15, 20, 25, 30, 40, 50 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.5 + 10log10(NRB/11) |
| n411 | 15 | 10, 15, 20, 30, 40, 50 | -94.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.5 + 10log10(NRB/11) |
| n481 | 15 | 5, 10, 15, 20, 30, 40, 505 | -99 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.5 + 10log10(NRB/11) |
| n50 | 15 | 5, 10, 15, 20, 30, 40, 50 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.5 + 10log10(NRB/11) |
| n51 | 15 | 5 | -100 | TDD |
| n53 | 15 | 5, 10 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10 | -97.1 |
| 60 | 10 | -97.5 |
| n757 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25) | SDL |
| 30 | 10,15,20 | -97.1 + 10log10(NRB/24) |
| 60 | 10,15,20 | -97.5 + 10log10(NRB/11) |
| n767 | 15 | 5 | -100 | SDL |
| n771,4 | 15 | 10, 15, 20, 40, 50 | -95.3 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -95.6 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.0 + 10log10(NRB/11) |
| n781 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 15, 20, 40, 50, 60, 70, 80, 90, 100 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 15, 20, 40, 50, 60, 70, 80, 90, 100 | -96.5 + 10log10(NRB/11) |
| n791 | 15 | 10,20,40, 50 | -95.8 + 10log10(NRB/52) | TDD |
| 30 | 10, 20, 40, 50, 60, 80, 100 | -96.1 + 10log10(NRB/24) |
| 60 | 10, 20, 40, 50, 60, 80, 100 | -96.5 + 10log10(NRB/11) |
| n91 | 15 | 5 | -100 | FDD |
| n92 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) | FDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) |
| n93 | 15 | 5 | -100 | FDD |
| n94 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) | FDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) |
| n101 | 15 | 5, 10 | -100 + 10log10(NRB/25) | TDD |
| 30 | 10 | -97.1 + 10log10(NRB/24) |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 6: Void  NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | | |

For power class 2 UEs, certain degradation of the reference sensitivity in Table 7.3.2.3-1a is allowed. The maximum amount of degradation is specified in Table 7.3.2.3-1c, and in Table 7.3.2.3-1d for a UE that indicates *txDiversity-r16* [26].

Table 7.3.2.3-1c Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE not supporting Tx Diversity

| Operating Band | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n1 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 |
| n3 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.8 | 1.1 | 1.5 | 2.3 | 2.8 |
| n8 | 0.5 | 0.7 | 0.8 | 2.3 | 2.8 | 3.2 | 3.1 |  |  |  |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4 | | | | | | | | | | |

Table 7.3.2.3-1d Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE supporting Tx Diversity

| Operating Band | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n1 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 |
| n3 | 1.4 | 1.5 | 1.5 | 1.5 | 1.6 | 1.7 | 2.8 | 5 | 5.5 | 6.0 |
| n8 | 1.3 | 1.4 | 2.1 | 5.8 | 6.1 | 6.5 | 7.0 |  |  |  |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4 | | | | | | | | | | |

For UE(s) equipped with 4 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3.2.3-1a and in Table 7.3.2.3-1b shall be modified by the amount given in ΔRIB,4R in Table 7.3.2.3-2 for the applicable operating bands.

Table 7.3.2.3-2: Four antenna port reference sensitivity allowance ΔRIB,4R

|  |  |
| --- | --- |
| Operating band | ΔRIB,4R (dB) |
| n8, n28, n71 | -2.71 |
| n1, n2, n3, n30, n40, n7, n34, n38, n39, n41, n66, n70 | -2.7 |
| n48, n77, n78, n79 | -2.2 |
| NOTE 1: 4 Rx operation is targeted for FWA form factor | |

The reference sensitivity (REFSENS) requirement specified in Table 7.3.2.3-1a, Table 7.3.2.3-1b, Table 7.3.2.3-1c, Table 7.3.2.3-1d and Table 7.3.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3.

Table 7.3.2.3-3: Uplink configuration for reference sensitivity

| Operating band / SCS (kHz) / Channel bandwidth (MHz) / Duplex mode | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 | Duplex Mode |
| n1 | 15 | 25 | 501 | 751 | 1001 | 1281 | 1281 |  | 1281 | 1281 | 1281 |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 361 | 501 | 641 | 641 |  | 641 | 641 | 641 |  |  |  |  |  |  |
|  | 60 |  | 101 | 18 | 24 | 301 | 301 |  | 301 | 301 | 301 |  |  |  |  |  |  |
| n2 | 15 | 25 | 501 | 501 | 501 | 501 | 481 |  | 401 |  |  |  |  |  |  |  | FDD |
|  | 30 | 101 | 24 | 241 | 241 | 241 | 241 |  | 201 |  |  |  |  |  |  |  |  |
|  | 60 |  | 101 | 101 | 101 | 101 | 101 |  | 101 |  |  |  |  |  |  |  |  |
| n3 | 15 | 25 | 501 | 501 | 501 | 501 | 501 | 501 | 501 | 501 | 501 |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 241 | 241 | 241 | 241 | 241 | 241 | 241 | 241 |  |  |  |  |  |  |
|  | 60 |  | 101 | 101 | 101 | 101 | 101 | 101 | 101 | 101 | 101 |  |  |  |  |  |  |
| n5 | 15 | 25 | 251 | 251 | 251 | Note 5 |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 101 | 101 | Note 5 |  |  |  |  |  |  |  |  |  |  |  |
| n7 | 15 | 25 | 501 | 751 | 751 | 721 | 641 |  | 451 |  | 451 |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 361 | 361 | 361 | 321 |  | 201 |  | 201 |  |  |  |  |  |  |
|  | 60 |  | 101 | 18 | 181 | 181 | 161 |  | 101 |  | 101 |  |  |  |  |  |  |
| n8 | 15 | 25 | 251 | 251 | 251 |  |  | Note 5 |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 101 | 101 |  |  | Note 5 |  |  |  |  |  |  |  |  |  |
| n12 | 15 | 201 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 101 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n13 | 15 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | 25 | 201 | 202 | 202 |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 102 | 102 |  |  |  |  |  |  |  |  |  |  |  |  |
| n24 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 | 25 | 501 | 501 | 501 | 501 | 481 | 401 | 401 | Note 5 |  |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 241 | 241 | 241 | 241 | 201 | 201 | Note 5 |  |  |  |  |  |  |  |
|  | 60 |  | 101 | 101 | 101 | 101 | 101 | 101 | 101 | Note 5 |  |  |  |  |  |  |  |
| n26 | 15 | 25 | 251 | 251 | 251 |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 121 | 121 | 121 |  |  |  |  |  |  |  |  |  |  |  |  |
| n28 | 15 | 25 | 251 | 251 | 251 |  | 251 |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 101 | 101 |  | 101 |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 | 25 | 50 | 75 |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 | 18 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n38 | 15 | 25 | 50 | 75 | 100 | 128 | 160 |  | 216 |  |  |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 | 64 | 75 |  | 100 |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 | 18 | 24 | 30 | 36 |  | 50 |  |  |  |  |  |  |  |  |
| n39 | 15 | 25 | 50 | 75 | 100 | 128 | 160 |  | 216 |  |  |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 | 64 | 75 |  | 100 |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 | 18 | 24 | 30 | 36 |  | 50 |  |  |  |  |  |  |  |  |
| n40 | 15 | 25 | 50 | 75 | 100 | 128 | 160 |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 | 64 | 75 |  | 100 |  | 128 | 162 |  | 216 |  |  |  |
|  | 60 |  | 10 | 18 | 24 | 30 | 36 |  | 50 |  | 64 | 75 |  | 100 |  |  |  |
| n41 | 15 |  | 50 | 75 | 100 |  | 160 |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 |  | 75 |  | 100 |  | 128 | 162 | 180 | 216f | 243 | 270 |  |
|  | 60 |  | 10 | 18 | 24 |  | 36 |  | 50 |  | 64 | 75 | 90 | 100 | 120 | 135 |  |
| n48 | 15 | 25 | 50 | 75 | 100 |  | 160 |  | 216 |  |  |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 |  | 75 |  | 100 |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 | 18 | 24 |  | 36 |  | 50 |  |  |  |  |  |  |  |  |
| n50 | 15 | 25 | 50 | 75 | 100 |  | 160 |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 |  | 75 |  | 100 |  | 128 | 162 |  | Note 3 |  |  |  |
|  | 60 |  | 10 | 18 | 24 |  | 36 |  | 50 |  | 64 | 75 |  | Note 3 |  |  |  |
| n51 | 15 | 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| n53 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
|  | 30 |  | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | 25 | 501 | 751 | 1001 |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 361 | 501 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 101 | 18 | 24 |  |  |  |  |  |  |  |  |  |  |  |  |
| n66 | 15 | 25 | 501 | 751 | 1001 | 1281 | 160 |  | 216 |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 361 | 501 | 641 | 751 |  | 1001 |  |  |  |  |  |  |  |  |
|  | 60 |  | 101 | 18 | 24 | 301 | 361 |  | 501 |  |  |  |  |  |  |  |  |
| n70 | 15 | 25 | 501 | 751 | Note 3 | Note 3 |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 24 | 361 | Note 3 | Note 3 |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 101 | 18 | Note 3 | Note 3 |  |  |  |  |  |  |  |  |  |  |  |
| n71 | 15 | 25 | 251 | 201 | 201 | Note 5 | Note 5 | Note 5 |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 121 | 101 | 101 | Note 5 | Note 5 | Note 5 |  |  |  |  |  |  |  |  |  |
| n74 | 15 | 25 | 251 | 251 | 251 |  |  |  |  |  |  |  |  |  |  |  | FDD |
|  | 30 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |  |  |  |
|  | 60 |  | 51 | 51 | 51 |  |  |  |  |  |  |  |  |  |  |  |  |
| n77 | 15 |  | 50 | 75 | 100 |  |  |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 |  |  |  | 100 |  | 128 | 162 | 180 | 216 | 243 | 270 |  |
|  | 60 |  | 10 | 18 | 24 |  |  |  | 50 |  | 64 | 75 | 90 | 100 | 120 | 135 |  |
| n78 | 15 |  | 50 | 75 | 100 | 128 | 160 |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 | 36 | 50 | 64 | 75 |  | 100 |  | 128 | 162 | 180 | 216 | 243 | 270 |  |
|  | 60 |  | 10 | 18 | 24 | 30 | 36 |  | 50 |  | 64 | 75 | 90 | 100 | 120 | 135 |  |
| n79 | 15 |  | 50 |  | 100 |  |  |  | 216 |  | 270 |  |  |  |  |  | TDD |
|  | 30 |  | 24 |  | 50 |  |  |  | 100 |  | 128 | 162 |  | 216 |  | 270 |  |
|  | 60 |  | 10 |  | 24 |  |  |  | 50 |  | 64 | 75 |  | 100 |  | 135 |  |
| n91 | 15 | 254 | 201,4 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | 15 | 25 | 201 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 | 101 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | 15 | 254 | 251,4 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | 15 | 25 | 251 | 201 | 201 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 121 | 101 | 101 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n100 | 15 | 25 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n101 | 15 | 25 | 50 |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1).  NOTE 2: For Band 20; for 15kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16; for 30kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 6 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 8; for 60kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 3 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 4.  NOTE 3: For DL channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest duplex distance shall be used.  NOTE 4: For band n91 and n93, largest supported UL bandwidth configuration shall be used.  NOTE 5: For this DL channel bandwidth, the UL configuration of the highest UL channel bandwidth specified in Table 5.3.6-1 and the nominal Tx-Rx frequency separation specified in Table 5.4.4-1 shall be used, i.e. ΔFTX-RX as defined in clause 5.3.does not apply. | | | | | | | | | | | | | | | | | |

Unless given by Table 7.3.2.3-4, the minimum requirements specified in Tables 7.3.2.3-1a, Tables 7.3.2.3-1b, Tables 7.3.2.3-1c, Tables 7.3.2.3-1d shall be verified with the network signalling value NS\_01 (Table 6.2.3.3-1) configured.

Table 7.3.2.3-4: Network signalling value for reference sensitivity

|  |  |
| --- | --- |
| Operating band | Network Signalling value |
| n2 | NS\_03 |
| n12 | NS\_06 |
| n13 | NS\_06 |
| n14 | NS\_06 |
| n24 | NS\_56 |
| n25 | NS\_03 |
| n30 | NS\_21 |
| n48 | NS\_27 |
| n53 | NS\_45 |
| n66 | NS\_03 |
| n70 | NS\_03 |
| n71 | NS\_35 |

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3.2.3-1 shall be increased by the amount given in ΔRIB,c defined in subclause 7.3.3 for the applicable operating bands.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3.2.

7.3.2.4 Test description

7.3.2.4.1 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, and channel bandwidths based on NR operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3 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 7.3.2.4.1-1: Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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] subclause4.3.1 | | | Low range, Mid range, High range (NOTE 4) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3) | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | | Uplink Configuration | |
|  | Modulation | RB allocation | Modulation | RB allocation |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) | DFT-s-OFDM QPSK | REFSENS (NOTE 2) |
| 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 Table 7.3.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band.  NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies.  NOTE 5: In a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated. | | | | |

Table 7.3.2.4.1-2: Downlink Configuration of each RB allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth | SCS(kHz) | LCRBmax | Outer RB allocation / Normal RB allocation |
| 5MHz | 15 | 25 | 25@0 |
| 30 | 11 | 11@0 |
| 60 | N/A | N/A |
| 10MHz | 15 | 52 | 52@0 |
| 30 | 24 | 24@0 |
| 60 | 11 | 11@0 |
| 15MHz | 15 | 79 | 79@0 |
| 30 | 38 | 38@0 |
| 60 | 18 | 18@0 |
| 20MHz | 15 | 106 | 106@0 |
| 30 | 51 | 51@0 |
| 60 | 24 | 24@0 |
| 25MHz | 15 | 133 | 133@0 |
| 30 | 65 | 65@0 |
| 60 | 31 | 31@0 |
| 30MHz | 15 | 160 | 160@0 |
| 30 | 78 | 78@0 |
| 60 | 38 | 38@0 |
| 35MHz | 15 | 188 | 188@0 |
| 30 | 92 | 92@0 |
| 60 | 44 | 38@0 |
| 40MHz | 15 | 216 | 216@0 |
| 30 | 106 | 106@0 |
| 60 | 51 | 51@0 |
| 45MHz | 15 | 242 | 242@0 |
| 30 | 119 | 119@0 |
| 60 | 58 | 58@0 |
| 50MHz | 15 | 270 | 270@0 |
| 30 | 133 | 133@0 |
| 60 | 65 | 65@0 |
| 60MHz | 15 | N/A | N/A |
| 30 | 162 | 162@0 |
| 60 | 79 | 79@0 |
| 70MHz | 15 | N/A | N/A |
| 30 | 189 | 189@0 |
| 60 | 93 | 93@0 |
| 80MHz | 15 | N/A | N/A |
| 30 | 217 | 217@0 |
| 60 | 107 | 107@0 |
| 90MHz | 15 | N/A | N/A |
| 30 | 245 | 245@0 |
| 60 | 121 | 121@0 |
| 100MHz | 15 | N/A | N/A |
| 30 | 273 | 273@0 |
| 60 | 135 | 135@0 |
| NOTE 1: Test Channel Bandwidths are checked separately for each NR band, the applicable channel bandwidths are specified in Table 5.3.5-1. | | | |

Table 7.3.2.4.1-3: Uplink configuration for reference sensitivity, LCRB @ RBstart format

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating  Band | SCS  kHz | 5  MHz | 10  MHz | 15  MHz | 20  MHz | 25  MHz | 30  MHz | 35  MHz | 40  MHz | 45  MHz | 50  MHz | 60  MHz | 70  MHz | 80  MHz | 90  MHz | 100  MHz | Duplex  Mode |
| n1 | 15 | 25@0 | 50@21 | 75@41 | 100@61 | 128@51 | 128@321 |  | 128@881 | 128@1141 | 128@1421 |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 36@21 | 50@11 | 64@11 | 64@141 |  | 64@421 | 64@551 | 64@691 |  |  |  |  |  |
| 60 |  | 10@11 | 18@0 | 24@0 | 30@11 | 30@81 |  | 30@211 | 30@281 | 30@351 |  |  |  |  |  |
| n2 | 15 | 25@0 | 50@21 | 50@291 | 50@561 | 50@831 | 48@1121 |  | 40@1761 |  |  |  |  |  |  |  | FDD |
| 30 | 10@11 | 24@0 | 24@141 | 24@271 | 24@411 | 24@541 |  | 20@861 |  |  |  |  |  |  |  |
| 60 |  | 10@11 | 10@81 | 10@141 | 10@211 | 10@281 |  | 10@411 |  |  |  |  |  |  |  |
| n3 | 15 | 25@0 | 50@21 | 50@291 | 50@561 | 50@831 | 50@1101 | 50@1381 | 50@1661 | 50@1921 | 50@2201 |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 24@141 | 24@271 | 24@411 | 24@541 | 24@681 | 24@821 | 24@951 | 24@1091 |  |  |  |  |  |
| 60 |  | 10@11 | 10@81 | 10@141 | 10@211 | 10@281 | 10@341 | 10@411 | 10@481 | 10@551 |  |  |  |  |  |
| n5 | 15 | 25@0 | 25@271 | 25@541 | 25@811 | Note 5 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 | 10@411 | Note 5 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n7 | 15 | 25@0 | 50@21 | 75@41 | 75@311 | 72@611 | 64@961 |  | 45@1711 |  | 45@2251 |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 36@21 | 36@151 | 36@291 | 32@461 |  | 20@861 |  | 20@1131 |  |  |  |  |  |
| 60 |  | 10@11 | 18@0 | 18@61 | 18@131 | 16@221 |  | 10@411 |  | 10@551 |  |  |  |  |  |
| n8 | 15 | 25@0 | 25@271 | 25@541 | 25@811 |  |  | Note 5 |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 | 10@411 |  |  | Note 5 |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | 15 | 20@51 | 20@321 | 20@591 |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n13 | 15 | 20@01 | 20@01 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@01 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | 20@01 | 20@01 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@01 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | 25@0 | 20@01 | 20@112 | 20@162 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@01 | 10@62 | 10@82 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n24 | 15 | 25@0 | 50@0 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 | 25@0 | 50@21 | 50@291 | 50@561 | 50@831 | 48@1121 | 40@1481 | 40@1761 | Note 5 |  |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 24@141 | 24@271 | 24@411 | 24@541 | 20@721 | 20@861 | Note 5 |  |  |  |  |  |  |
| 60 |  | 10@11 | 10@81 | 10@141 | 10@211 | 10@281 | 10@341 | 10@411 | Note 5 |  |  |  |  |  |  |
| n26 | 15 | 25@0 | 25@271 | 25@541 | 25@811 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 12@121 | 12@261 | 12@391 |  |  |  |  |  |  |  |  |  |  |  |
| n28 | 15 | 25@0 | 25@271 | 25@541 | 25@811 |  | 25@1351 |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 | 10@411 |  | 10@681 |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | 20@51 | 20@321 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 | 25@0 | 50@0 | 75@0 |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10@0 | 18@0 |  |  |  |  |  |  |  |  |  |  |  |  |
| n38 | 15 | 25@0 | 50@0 | 75@0 | 100@0 | 128@0 | 160@0 |  | 216@0 |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 | 64@0 | 75@0 |  | 100@0 |  |  |  |  |  |  |  |
| 60 |  | 10@0 | 18@0 | 24@0 | 30@0 | 36@0 |  | 50@0 |  |  |  |  |  |  |  |
| n39 | 15 | 25@0 | 50@0 | 75@0 | 100@0 | 128@0 | 160@0 |  | 216@0 |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 | 64@0 | 75@0 |  | 100@0 |  |  |  |  |  |  |  |
| 60 |  | 10@0 | 18@0 | 24@0 | 30@0 | 36@0 |  | 50@0 |  |  |  |  |  |  |  |
| n40 | 15 | 25@0 | 50@0 | 75@0 | 100@0 | 128@0 | 160@0 |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 | 64@0 | 75@0 |  | 100@0 |  | 128@0 | 162@0 |  | 216@0 |  |  |
| 60 |  | 10@0 | 18@0 | 24@0 | 30@0 | 36@0 |  | 50@0 |  | 64@0 | 75@0 |  | 100@0 |  |  |
| n41 | 15 |  | 50@0 | 75@0 | 100@0 |  | 160@0 |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 |  | 75@0 |  | 100@0 |  | 128@0 | 162@0 | 180@0 | 216@0 | 243@0 | 270@0 |
| 60 |  | 10@0 | 18@0 | 24@0 |  | 36@0 |  | 50@0 |  | 64@0 | 75@0 | 90@0 | 100@0 | 120@0 | 135@0 |
| n48 | 15 | 25@0 | 50@0 | 75@0 | 100@0 |  | 160@0 |  | 216@0 |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 |  | 75@0 |  | 100@0 |  |  |  |  |  |  |  |
| 60 |  | 10@0 | 18@0 | 24@0 |  | 36@0 |  | 50@0 |  |  |  |  |  |  |  |
| n50 | 15 | 25@0 | 50@0 | 75@0 | 100@0 |  |  |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 |  |  |  | 100@0 |  | 128@0 | 162@0 |  | NOTE 3 |  |  |
| 60 |  | 10@0 | 18@0 | 24@0 |  |  |  | 50@0 |  | 64@0 | 75@0 |  | NOTE 3 |  |  |
| n51 | 15 | 25@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | 15 | 25@0 | 50@0 |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | 25@0 | 50@21 | 75@41 | 100@61 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 36@21 | 50@11 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10@11 | 18@0 | 24@0 |  |  |  |  |  |  |  |  |  |  |  |
| n66 | 15 | 25@0 | 50@21 | 75@41 | 100@61 | 128@51 | 160@0 |  | 216@0 |  |  |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 36@21 | 50@11 | 64@11 | 75@31 |  | 100@61 |  |  |  |  |  |  |  |
| 60 |  | 10@11 | 18@0 | 24@0 | 30@11 | 36@21 |  | 50@11 |  |  |  |  |  |  |  |
| n70 | 15 | 25@0 | 50@21 | 75@41 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 24@0 | 36@21 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 10@11 | 18@0 | NOTE 3 | NOTE 3 |  |  |  |  |  |  |  |  |  |  |
| n71 | 15 | 25@0 | 25@01 | 20@01 | 20@01 | Note 5 | Note 5 | Note 5 |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 12@01 | 10@01 | 10@01 | Note 5 | Note 5 | Note 5 |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | 15 | 25@0 | 25@271 | 25@541 | 25@811 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 | 10@411 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | 5@61 | 5@131 | 5@191 |  |  |  |  |  |  |  |  |  |  |  |
| n77 | 15 |  | 50@0 | 75@0 | 100@0 | 128@0 | 160@0 |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 | 64@0 | 75@0 |  | 100@0 |  | 128@0 | 162@0 | 180@0 | 216@0 | 243@0 | 270@0 |
| 60 | - | 10@0 | 18@0 | 24@0 | 30@0 | 36@0 |  | 50@0 |  | 64@0 | 75@0 | 90@0 | 100@0 | 120@0 | 135@0 |
| n78 | 15 |  | 50@0 | 75@0 | 100@0 | 128@0 | 160@0 |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 | 36@0 | 50@0 | 64@0 | 75@0 |  | 100@0 |  | 128@0 | 162@0 | 180@0 | 216@0 | 243@0 | 270@0 |
| 60 |  | 10@0 | 18@0 | 24@0 | 30@0 | 36@0 |  | 50@0 |  | 64@0 | 75@0 | 90@0 | 100@0 | 120@0 | 135@0 |
| n79 | 15 |  | 50@0 |  | 100@0 |  |  |  | 216@0 |  | 270@0 |  |  |  |  |  | TDD |
| 30 |  | 24@0 |  | 50@0 |  |  |  | 100@0 |  | 128@0 | 162@0 |  | 216@0 |  | 270@0 |
| 60 |  | 10@0 |  | 24@0 |  |  |  | 50@0 |  | 64@0 | 75@0 |  | 100@0 |  | 135@0 |
| n91 | 15 | 25@04 | 20@321, 4 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | 15 | 25@0 | 20@321 | 20@591 | 20@861 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 10@141 | 10@281 | 10@411 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | 15 | 25@04 | 25@271, 4 |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | 15 | 25@0 | 25@271 | 20@591 | 20@861 |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | 12@121 | 10@281 | 10@411 |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n100 | 15 | 25@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| n101 | 15 | 25@0 | 50@0 |  |  |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | 24@0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1).  NOTE 2: For Band 20; for 15kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16; for 30kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 6 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 8; for 60kHz SCS, in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 3 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 4.  NOTE 3: For DL channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest duplex distance shall be used.  NOTE 4: For band n91 and n93, largest supported UL bandwidth configuration shall be used.  NOTE 5: For this DL channel bandwidth, the UL configuration of the highest UL channel bandwidth specified in Table 5.3.6-1 and the nominal Tx-Rx frequency separation specified in Table 5.4.4-1 shall be used, i.e. ΔFTX-RX as defined in clause 5.3. does not apply. | | | | | | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 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 UL and Reference Measurement Channel is set according to Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3.

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 7.3.2.4.3*.*

7.3.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.3.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.3.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.2.5-1 if 2Rx antennas connected or Table 7.3.2.5-2 if 4Rx antennas connected. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

7.3.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED for NR band.

Message contents are according to TS 38.508-1[5] subclause 4.6 with the following exceptions for each network signalling value.

7.3.2.4.3.1 Message contents exceptions (network signalled value "NS\_01")

Message contents according to TS 38.508-1 [5] subclause 4.6 can be used without exceptions.

7.3.2.4.3.2 Message contents exceptions (network signalled value "NS\_03")

1. Information element additionalSpectrumEmission is set to NS\_03. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.2-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_03" and NR band n2, n25 and n66

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 2 (NS\_03) |  |  |

Table 7.3.2.4.3.2-2: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_03" and NR band n70

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_03) |  |  |

7.3.2.4.3.3 Message contents exceptions (network signalled value "NS\_06")

1. Information element additionalSpectrumEmission is set to NS\_06. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.3-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_06" and NR band n12, n13 and n14

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_06) |  |  |

7.3.2.4.3.4 Message contents exceptions (network signalled value "NS\_35")

1. Information element additionalSpectrumEmission is set to NS\_35. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.4-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_35" and NR band n71

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_35) |  |  |

7.3.2.4.3.5 Message contents exceptions (network signalled value "NS\_27")

1. Information element additionalSpectrumEmission is set to NS\_27. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.5-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_27" and NR band n48

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_27) |  |  |

7.3.2.4.3.6 Message contents exceptions (network signalled value "NS\_21")

1. Information element additionalSpectrumEmission is set to NS\_21. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.6-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_21" and NR band n30

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] clause 4.6.3, Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_21) |  |  |

7.3.2.4.3.7 Message contents exceptions (network signalled value "NS\_45")

1. Information element additionalSpectrumEmission is set to NS\_45. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.7-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_45" and NR band n53

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_45) |  |  |

7.3.2.4.3.8 Message contents exceptions (network signalled value "NS\_56")

1. Information element additionalSpectrumEmission is set to NS\_56. This can be set in *SIB1* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 7.3.2.4.3.8-1: *AdditionalSpectrumEmission*: Additional spurious emissions test requirement for "NS\_56" and NR band n24

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-1 | | | |
| Information Element | Value/remark | Comment | Condition |
| additionalSpectrumEmission | 1 (NS\_56) |  |  |

7.3.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3.2.5-1a and Tables 7.3.2.5-1b for 2 Rx antenna port, Tables 7.3.2.5-2 a and Tables 7.3.2.5-2b for 4 Rx antenna port, Table 7.3.2.5-2c and Table 7.3.2.5-2d for PC2 UE on FDD bands, and parameters specified Tables 7.3.2.4.1-1, Tables 7.3.2.4.1-2 and Tables 7.3.2.4.1-3.

Table 7.3.2.5-1a: Two antenna port Reference sensitivity QPSK PREFSENS for FDD bands for PC3

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 35 MHz (dBm) | 40  MHz (dBm) | 45  MHz (dBm) | 50  MHz (dBm) | Duplex Mode |
| n1 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7  +TT | -91.9  +TT |  | -90.6 +TT | -90.1 +TT | -89.6 +TT | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT | -92.0 +TT |  | -90.7 +TT | -90.2 +TT | -89.7 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT | -92.1 +TT |  | -90.9 +TT | -90.3 +TT | -89.7 +TT |
| n2 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT | -90.7 +TT | -84.1 +TT |  | -81.5 +TT |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT | -90.8 +TT | -84.2 +TT |  | -81.6 +TT |  |  |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT | -90.9 +TT | -84.3 +TT |  | -81.7 +TT |  |  |
| n3 | 15 | -97.0 +TT | -93.8 +TT | -92.0 +TT | -90.8 +TT | -89.7 +TT | -88.9 +TT | -86.2+TT | -87.6 +TT | -81.3+TT | -79.7 +TT | FDD |
| 30 |  | -94.1 +TT | -92.1 +TT | -91.0 +TT | -89.8 +TT | -89.0 +TT | -86.3+TT | -87.7 +TT | -81.4+TT | -79.8 +TT |
| 60 |  | -94.5 +TT | -92.4 +TT | -91.2 +TT | -90.0 +TT | -89.1 +TT | -86.4+TT | -87.9 +TT | -81.5+TT | -79.9 +TT |
| n5 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -86.8 +TT | -84.8 +TT |  |  |  |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -88.6 +TT | -84.9 +TT |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n71 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |  |  |  |  |  |  |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |  |  |  |  |  |  |
| n8 | 15 | -97.0 +TT | -93.8 +TT | -91.4 +TT | -85.8 +TT |  |  | -78.4+TT |  |  |  | FDD |
| 30 |  | -94.1 +TT | -91.7 +TT | -87.2 +TT |  |  | -78.5+TT |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n12 | 15 | -97.0 +TT | -93.8 +TT | -84.0 +TT |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -84.1 +TT |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n13 | 15 | -97.0 +TT | -93.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | -97.0 +TT | -93.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | -97.0 +TT | -93.8 +TT | -91.0 +TT | -89.8 +TT |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -91.1 +TT | -90.0 +TT |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n24 | 15 | -100.0 +TT | -96.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 +TT |  |  |  |  |  |  |  |  |
| n25 | 15 | -96.5 +TT | -93.3 +TT | -91.5 +TT | -90.3 +TT | -89.3 +TT | -82.2 +TT | -81.7 +TT | -79.5 +TT | -77.6+TT |  | FDD |
| 30 |  | -93.6 +TT | -91.6 +TT | -90.5 +TT | -89.4 +TT | -82.3 +TT | -81.8 +TT | -79.6 +TT | -77.7 +TT |  |
| 60 |  | -94.0 +TT | -91.9 +TT | -90.7 +TT | -89.6 +TT | -82.4 +TT | -81.9 +TT | -79.7 +TT | -77.8 +TT |  |
| n26 | 15 | -97.5 +TT | -94.5 +TT | -92.7 +TT | -87.6 +TT |  |  |  |  |  |  |  |
| 30 |  | -94.8 +TT | -92.7 +TT | -87.7 +TT |  |  |  |  |  |  |
| n28 | 15 | -98.5 +TT | -95.5 +TT | -93.5 +TT | -90.8 +TT |  | -78.5 +TT |  |  |  |  | FDD |
| 30 |  | -95.6 +TT | -93.6 +TT | -91.0 +TT |  | -78.6 +TT |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | -99.0 +TT | -95.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.1 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | -99.5+TT | -96.3+TT | -94.5+TT | -93.3+TT |  |  |  |  |  |  | FDD |
| 30 |  | -96.6+TT | -94.6+TT | -93.5+TT |  |  |  |  |  |  |
| 60 |  | -97.0+TT | -94.9+TT | -93.7+TT |  |  |  |  |  |  |
| n66 | 15 | -99.5 +TT | -96.3 +TT | -94.5 +TT | -93.3 +TT | -92.2 +TT | -91.4 +TT |  | -90.1 +TT |  |  | FDD |
| 30 |  | -96.6 +TT | -94.6 +TT | -93.5 +TT | -92.3 +TT | -91.5 +TT |  | -90.2 +TT |  |  |
| 60 |  | -97.0 +TT | -94.9 +TT | -93.7 +TT | -92.5 +TT | -91.6 +TT |  | -90.4 +TT |  |  |
| n70 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7 +TT |  |  |  |  |  | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT |  |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT |  |  |  |  |  |
| n71 | 15 | -97.2 +TT | -94.0 +TT | -91.6 +TT | -86.0 +TT | -84.1 +TT | -82.5 +TT | -80.7 +TT |  |  |  | FDD |
| 30 |  | -94.3 +TT | -91.9 +TT | -87.4 +TT | -84.2 +TT | -82.6 +TT | -80.8 +TT |  |  |  |
| 60 | - |  |  |  |  |  |  |  |  |  |
| n74 | 15 | -99.53 +TT | -96.33 +TT | -94.53 +TT | -93.33 +TT |  |  |  |  |  |  | FDD |
| 30 |  | -96.63 +TT | -94.63 +TT | -93.53 +TT |  |  |  |  |  |  |
| 60 |  | -97.03 +TT | -94.93 +TT | -93.73 +TT |  |  |  |  |  |  |
| n100 | 15 | -100.0 +TT |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in subclause 6.2.4  NOTE 3: 3 indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.  NOTE 4: Void  NOTE 5: Void  NOTE 6: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | | | | | | | | | |

Table 7.3.2.5-1b: Two antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands for PC3, PC2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS | | | | |
| Operating band | SCS  kHz | Channel bandwidth (MHz) | REFSENS (dBm)8 | Duplex Mode |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11)+TT |
| n381 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11)+TT |
| n39 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11)+TT |
| n40 | 15 | 5, 10, 15, 20, 25, 30, 40, 50 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.5 + 10log10(NRB/11)+TT |
| n411 | 15 | 10, 15, 20, 30, 40, 50 | -94.8 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.5 + 10log10(NRB/11)+TT |
| n481 | 15 | 5, 10, 15, 20, 30, 40, 505 | -99 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 15, 20, 30, 40, 505, 605, 705, 805, 905, 1005 | -96.5 + 10log10(NRB/11)+TT |
| n50 | 15 | 5, 10, 15, 20, 30, 40, 50 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 30, 40, 50, 60, 80 | -97.5 + 10log10(NRB/11)+TT |
| n51 | 15 | 5 | -100+TT | TDD |
| n53 | 15 | 5, 10 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10 | -97.1+TT |
| 60 | 10 | -97.5+TT |
| n771,4 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.3 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -95.6 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.0 + 10log10(NRB/11)+TT |
| n781 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.8 + 10log10(NRB/52) +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.5 + 10log10(NRB/11)+TT |
| n791 | 15 | 10, 20, 40, 50 | -95.8 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 20, 40, 50, 60, 80, 100 | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 20, 40, 50, 60, 80, 100 | -96.5 + 10log10(NRB/11) +TT |
| n91 | 15 | 5 | -100+TT | FDD |
| n92 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | FDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24)+TT |
| n93 | 15 | 5 | -100+TT | FDD |
| n94 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | FDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24)+TT |
| n101 | 15 | 5, 10 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10 | -97.1 + 10log10(NRB/24)+TT |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 6: Void  NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.  NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | |

Table 7.3.2.5-2a: Four antenna port Reference sensitivity QPSK PREFSENS FDD bands for PC3

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30  MHz (dBm) | 35  MHz (dBm) | 40  MHz (dBm) | 45 MHz  (dBm) | 50  MHz (dBm) | Duplex Mode |
| n1 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4  +TT | -94.6 +TT |  | -93.3 +TT | -92.8 +TT | -92.3 +TT | FDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT | -94.7 +TT |  | -93.4 +TT | -92.9 +TT | -92.4 +TT |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT | -94.8 +TT |  | -93.6 +TT | -93 +TT | -92.4 +TT |
| n2 | 15 | -100.7 +TT | -97.5 +TT | -95.7 +TT | -94.5 +TT | -93.4 +TT | -86.8 +TT |  | -84.2 +TT |  |  | FDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.7 +TT | -93.5 +TT | -86.9 +TT |  | -83.3 +TT |  |  |
| 60 |  | -98.2 +TT | -96.1 +TT | -94.9 +TT | -93.6 +TT | -87.0 +TT |  | -84.4 +TT |  |  |
| n3 | 15 | -99.7 +TT | -96.5 +TT | -94.7 +TT | -93.5 +TT | -92.4 +TT | -91.6 +TT | -88.9+TT | -90.3 +TT | -84.0+TT | -82.4 +TT | FDD |
| 30 |  | -96.8 +TT | -94.8 +TT | -93.7 +TT | -92.5 +TT | -91.7 +TT | -90.0+TT | -90.4 +TT | -84.1+TT | -82.5 +TT |
| 60 |  | -97.2 +TT | -95.1 +TT | -93.9 +TT | -92.7 +TT | -91.8 +TT | -90.1+TT | -90.6 +TT | -84.2+TT | -82.6 +TT |
| n71 | 15 | -100.7 +TT | -97.5 +TT | -95.7 +TT | -94.5 +TT | -90.7 +TT | -89.9 +TT |  | -88.6 +TT |  | -81.5 +TT | FDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.7 +TT | -90.8 +TT | -90.0 +TT |  | -88.7 +TT |  | -81.5 +TT |
| 60 |  | -98.2 +TT | -97.1 +TT | -94.9 +TT | -91.0 +TT | -90.1 +TT |  | -88.9 +TT |  | -81.5 +TT |
| n8 | 15 | -99.7 +TT | -96.5 +TT | -94.1 +TT | -88.5 +TT |  |  | -81.1 +TT |  |  |  | FDD |
| 30 |  | -96.8 +TT | -94.4 +TT | -89.9 +TT |  |  | -81.2 +TT |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | -101.7 +TT | -98.5 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -98.8 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |
| n66 | 15 | -102.2 +TT | -99.0 +TT | -97.2 +TT | -96.0 +TT | -94.9 +TT | -94.1 +TT |  | -92.8 +TT |  |  | FDD |
| 30 |  | -99.3 +TT | -97.3 +TT | -96.2 +TT | -95.0 +TT | -94.2 +TT |  | -92.9 +TT |  |  |
| 60 |  | -99.7 +TT | -97.6 +TT | -96.4 +TT | -95.2 +TT | -94.3 +TT |  | -93.1 +TT |  |  |
| n70 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4 +TT |  |  |  |  |  | FDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT |  |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT |  |  |  |  |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2 The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 3: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | | | | | | | | | |

Table 7.3.2.5-2b: Four antenna port Reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands for PC3, PC2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS | | | | |
| Operating band | SCS  kHz | Channel bandwidth (MHz) | REFSENS (dBm)8 | Duplex Mode |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25)-2.7 +TT | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24)+-2.7 TT |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11)-2.7 +TT |
| n381 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25)-2.7 +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24)-2.7 +TT |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11)-2.7 +TT |
| n39 | 15 | 5, 10, 15, 20, 25, 30, 40 | -100 + 10log10(NRB/25)-2.7 +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40 | -97.1 + 10log10(NRB/24)-2.7 +TT |
| 60 | 10, 15, 20, 25, 30, 40 | -97.5 + 10log10(NRB/11)-2.7 +TT |
| n40 | 15 | 5, 10, 15, 20, 25, 30, 40, 50 | -100 + 10log10(NRB/25) -2.7 +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.1 + 10log10(NRB/24)-2.7 +TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | -97.5 + 10log10(NRB/11)-2.7 +TT |
| n411 | 15 | 10, 15, 20, 30, 40, 50 | -94.8 + 10log10(NRB/52)-2.7 +TT | TDD |
| 30 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.1 + 10log10(NRB/24)-2.7 +TT |
| 60 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | -95.5 + 10log10(NRB/11)-2.7 +TT |
| n481 | 15 | 5, 10, 15, 20, 30, 40, 505 | -99 + 10log10(NRB/25)-2.2 +TT | TDD |
| 30 | 10, 15, 20, 40, 505, 605, 705, 805, 905, 1005 | -96.1 + 10log10(NRB/24)-2.2 +TT |
| 60 | 10, 15, 20, 40, 505, 605, 705, 805, 905, 1005 | -96.5 + 10log10(NRB/11)-2.2+TT |
| n771,4 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.3 + 10log10(NRB/52)-2.2 +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -95.6 + 10log10(NRB/24)-2.2 +TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.0 + 10log10(NRB/11)-2.2 +TT |
| n781 | 15 | 10, 15, 20, 25, 30, 40, 50 | -95.8 + 10log10(NRB/52)-2.2 +TT | TDD |
| 30 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.1 + 10log10(NRB/24)-2.2 +TT |
| 60 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | -96.5 + 10log10(NRB/11)-2.2 +TT |
| n791 | 15 | 10, 20, 40, 50 | -95.8 + 10log10(NRB/52)-2.2 +TT | TDD |
| 30 | 10, 20, 40, 50, 60, 80, 100 | -96.1 + 10log10(NRB/24)-2.2 +TT |
| 60 | 10, 20, 40, 50, 60, 80, 100 | -96.5 + 10log10(NRB/11)-2.2 +TT |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE. Four Rx antenna ports for RedCap UE is not supported for this operating band.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 6: Void  NOTE 7: For SDL bands, the reference sensitivity requirements shall be verified by inter-band CA combinations with SDL band, which are supported by UE.  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.  NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | |

Table 7.3.2.5-2c: Reference Sensitivity for PC2 UE on FDD bands for UE not supporting Tx Diversity

| Operating Band | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | - | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 |
| n3 | REFSENS\_n3 +0.5 | REFSENS\_n3+ 0.5 | REFSENS\_n3+ 0.5 | REFSENS\_n3+ 0.5 | REFSENS\_n3+ 0.6 | REFSENS\_n3+ 0.8 | REFSENS\_n3+ 1.1 | REFSENS\_n3+ 1.5 | REFSENS\_n3+ 2.3 | REFSENS\_n3+ 2.8 |
| n8 | REFSENS\_n8 +0.5 | REFSENS\_n8 +0.7 | REFSENS\_n8 +0.8 | REFSENS\_n8 +2.3 | - | - | REFSENS\_n8 +3.1 | - | - | - |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4  NOTE 2: REFSENS\_n1 refers to the two antenna port and four antenna port Reference Sensitivity of n1 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.  NOTE 3: REFSENS\_n3 refers to the two antenna port and four antenna port Reference Sensitivity of n3 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.  NOTE 4: REFSENS\_n8 refers to the two antenna port and four antenna port Reference Sensitivity of n8 in Table 7.3.2.5-1a and Table 7.3.2.5-2a. | | | | | | | | | | |

Table 7.3.2.5-2d: Reference Sensitivity for PC2 UE on FDD bands for UE supporting Tx Diversity operation bands

| Operating Band | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 | - | REFSENS\_n1 | REFSENS\_n1 | REFSENS\_n1 |
| n3 | REFSENS\_n3+ 1.4 | REFSENS\_n3+ 1.5 | REFSENS\_n3+ 1.5 | REFSENS\_n3+ 1.5 | REFSENS\_n3+ 1.6 | REFSENS\_n3+ 1.7 | REFSENS\_n3+ 2.8 | REFSENS\_n3+ 5 | REFSENS\_n3+ 5.5 | REFSENS\_n3+ 6.0 |
| n8 | REFSENS\_n8 +1.3 | REFSENS\_n8 +1.4 | REFSENS\_n8 +2.1 | REFSENS\_n8 +5.8 | - | - | REFSENS\_n8 +7.0 |  |  |  |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4  NOTE 2: REFSENS\_n1 refers to the two antenna port and four antenna port Reference Sensitivity of n1 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.  NOTE 3: REFSENS\_n3 refers to the two antenna port and four antenna port Reference Sensitivity of n3 in Table 7.3.2.5-1a and Table 7.3.2.5-2a.  NOTE 4: REFSENS\_n8 refers to the two antenna port and four antenna port Reference Sensitivity of n8 in Table 7.3.2.5-1a and Table 7.3.2.5-2a. | | | | | | | | | | |

Table 7.3.2.5-3: Test Tolerance (TT) for RX sensitivity level

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0 GHz |
| 0.7 dB | 1.0 dB |

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3.2.5-1 a and Table 7.3.2.5-1b shall be increased by the amount given in ΔRIB,c defined in subclause 7.3.3 for the applicable operating bands.

### 7.3.3 ΔRIB,c

For a UE supporting CA, SUL or DC band combination, the minimum requirement for reference sensitivity in Table 7.3.2.3-1 shall be increased by the amount given by ΔRIB,c defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional ΔRIB,c shall be the average value for all band combinations defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ΔRIB,c among the different supported band combinations involving such band shall be applied

- When the operating band frequency range is > 1 GHz, the applicable additional ΔRIB,c shall be the maximum value for all band combinations defined in subclause 7.3A.0.3, 7.3C.0.3, 7.3B in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

## 7.3A Reference sensitivity for CA

Editor's Note: This clause is incomplete. The following aspects are either missing or not yet determined:

Test requirement table for 2DL/2UL is not complete.

- Reference sensitivity power level for 4DL\_CA and 5DL\_CA are FFS.

- Test description for exceptional cases are incomplete.

### 7.3A.0 Minimum conformance requirements

#### 7.3A.0.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel. For operations with 4 Rx antenna ports, the MSD in the applicable bands shall be increased by the absolute value of ΔRIB,4R in Table 7.3.2.3-2 when MSD > 0.

For reference sensitivity exception test points where the specified carrier frequency does not correspond to a valid NR-ARFCN, the closest NR-ARFCN as specified in clause 5.4.2 applies.

#### 7.3A.0.2 Reference sensitivity power level for CA

##### 7.3A.0.2.1 Reference sensitivity power level for Intra-band contiguous CA

For intra-band contiguous carrier aggregation, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2.2, A.2.3.2, 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 7.3.2.3-1a, Table 7.3.2.3-1b, Table 7.3.2.3-1c, Table 7.3.2.3-1d, Table 7.3.2.3-2, and Table 7.3.2.3-3.

For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.2.3-3 and the downlink PCC carrier centre frequency shall be configured closer to uplink operating band than any of the downlink SCC centre frequency.

##### 7.3A.0.2.2 Reference sensitivity power level for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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 parameters specified in Table 7.3.2.3-1, Table 7.3.2.3-2, and Table 7.3A.0.2.2-1 with the reference sensitivity power level increased by ΔRIBNC given in Table 7.3A.0.2.2-1 for the SCC(s).

For aggregation of two or more downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0.2.2-1. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS\_01 (Table 6.2.3.3.1-1) configured.

Table 7.3A.0.2.2-1: Intra-band non-contiguous CA with one uplink configuration for reference sensitivity in FDD bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CA configuration | SCS (PCC/SCC)  (kHz) | Aggregated channel bandwidth (PCC+SCC) | Wgap / [MHz] | UL PCC allocation | ΔRIBNC (dB) | Duplex mode |
| CA\_n2(2A) | 15/15 | 5MHz + 5MHz | Wgap = 55.0 | 105 | 5.0 | FDD |
| Wgap = 30.0 | 25 | 0.0 |
| CA\_n66(2A), CA\_n66(3A) | N/A | NOTE 1 | NOTE 2 | NOTE 3, NOTE 4 | 0.0 | FDD |
| CA\_n71(2A) | 15/15 | 5MHz + 5MHz | Wgap = 25.0 | 5 | 4.0 | FDD |
| Wgap = 5.0 | 20 | 0.0 |
| 10MHz + 5MHz | Wgap = 20.0 | 5 (RBstart = 9) | 4.6 |
| Wgap = 5.0 | 20 (RBstart = 9) | 2.3 |
| 15MHz + 10MHz | Wgap = 10.0 | 5 (RBstart = 2) | 22.2 |
| Wgap = 5.0 | 20 (RBstart = 19) | 5.2 |
| NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.2-1.  NOTE 2: All applicable sub-block gap sizes.  NOTE 3: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE 4: The carrier centre frequency of PCC in the DL operating band is configured closer to the UL operating band.  NOTE 5: Refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission.  NOTE 6: Wgap is the sub-block gap between the two sub-blocks.  NOTE 7: The carrier centre frequency of SCC in the DL operating band is configured closer to the UL operating band. | | | | | | |

##### 7.3A.0.2.3 Reference sensitivity power level 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 throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, 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 7.3.2.3-1, Table 7.3.2.3-2 and Table 7.3.2.3-3 modified in accordance with subclause 7.3A.0.3.2. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. Exceptions to reference sensitivity are allowed in accordance with subclause 7.3A.0.4, 7.3A.0.5 and 7.3A.0.6.

For the combination of intra-band and inter-band carrier aggregation, the intra-band CA relaxation, ΔRIBC and ΔRIBNC, are also applied according to the clause 7.3A.0.2.1 and 7.3A.0.2.2.

##### 7.3A.0.2.4 Void

#### 7.3A.0.3 ΔRIB,c for CA

##### 7.3A.0.3.1 General

For a UE supporting a CA configuration, the ΔRIB,c applies for both SC and CA operation.

##### 7.3A.0.3.2 ΔRIB,c for Inter-band CA

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in subclause 7.3A.0 shall be increased by the amount given by ΔRIB,c defined in subclause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional ΔRIB,c shall be the average value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ΔRIB,c among the different supported band combinations involving such band shall be applied.

- When the operating band frequency range is > 1 GHz, the applicable additional ΔRIB,c shall be the maximum value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14] for the applicable operating bands.

7.3A.0.3.2.1 ΔRIB,c for two bands

Table 7.3A.0.3.2.1-1: ΔRIB,c due to CA (two bands)

|  |  |  |
| --- | --- | --- |
| Inter-band CA configuration | NR Band | ΔRIB,c (dB) |
| CA\_n1-n28 | n28 | 0.2 |
| CA\_n1-n41 | n1 | 0 |
|  | n41 | 0 |
| CA\_n1-n77 | n1 | 0.2 |
| n77 | 0.5 |
| CA\_n1-n78 | n78 | 0.5 |
| CA\_n2-n48 | n2 | 0.2 |
| n48 | 0.5 |
| CA\_n2-n66 | n2 | 0.3 |
| n66 | 0.3 |
| CA\_n2-n77 | n2 | 0.2 |
| n77 | 0.5 |
| CA\_n3-n28 | n3 | 0 |
|  | n28 | 0 |
| CA\_n3-n41 | n41 | 02 |
|  | 0.53 |
| CA\_n3-n77 | n3 | 0.2 |
| n77 | 0.5 |
| CA\_n3-n78 | n3 | 0.2 |
| n78 | 0.5 |
| CA\_n5-n77 | n5 | 0.2 |
| n77 | 0.5 |
| CA\_n5-n78 | n5 | 0.2 |
| n78 | 0.5 |
| CA\_n7-n78 | n7 | 0.5 |
| n78 | 0.5 |
| CA\_n8-n78 | n8 | 0.2 |
| n78 | 0.5 |
| CA\_n14-n77 | n14 | 0.2 |
| n77 | 0.5 |
| CA\_n20-n78 | n78 | 0.5 |
| CA\_n24-n48 | n24 | 0.2 |
|  | n48 | 0.5 |
| CA\_n24-n77 | n24 | 0.2 |
|  | n77 | 0.5 |
| CA\_n25-n66 | n25 | 0.3 |
| n66 | 0.3 |
| CA\_n25-n77 | n25 | 0.2 |
| n77 | 0.5 |
| CA\_n25-n78 | n25 | 0.2 |
| n78 | 0.5 |
| CA\_n28-n77 | n28 | 0.2 |
| n77 | 0.5 |
| CA\_n28-n78 | n28 | 0.2 |
| n78 | 0.5 |
| CA\_n28-n79 | n28 | 0.2 |
| n79 | 0.5 |
| CA\_n39-n41 | n39 | 0.26 |
|  | n41 | 0.26 |
|  | n39 | 0.27 |
|  | n41 | 0.27 |
| CA\_n41-n66 | n41 | 0.54 |
| 15 |
| n66 | 0.5 |
| CA\_n41-n71 | n71 | 0.2 |
| CA\_n41-n771 | n77 | 0.5 |
| CA\_n41-n79 | n41 | 0.5 |
| n79 | 0.5 |
| CA\_n48-n66 | n48 | 0.5 |
| n66 | 0.2 |
| CA\_n48-n70 | n48 | 0.5 |
| n70 | 0.2 |
| CA\_n66-n77 | n66 | 0.2 |
| n77 | 0.5 |
| CA\_n66-n78 | n66 | 0.2 |
| n78 | 0.5 |
| CA\_n71-n77 | n71 | 0.2 |
| n77 | 0.5 |
| CA\_n71-n78 | n71 | 0.2 |
| n78 | 0.5 |
| NOTE 1: The requirements only apply when the sub-frame and Tx-Rx timings are synchronized between the component carriers. In the absence of synchronization, the requirements are not within scope of these specifications.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690 MHz.  NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2545-2690 MHz.  NOTE 5: The requirement is applied for UE transmitting on the frequency range of 2496-2545 MHz.  NOTE 6: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx.  NOTE 7: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx. | | |

7.3A.0.3.2.2 Void

7.3A.0.3.2.3 ΔRIB,c for three bands

Table 7.3A.0.3.2.3-1: ΔRIB,c due to CA (three bands)

|  |  |  |
| --- | --- | --- |
| Inter-band CA combination | NR Band | ΔRIB,c (dB) |
| CA\_n1-n3-n28 | n28 | 0.2 |
| CA\_n1-n3-n77 | n1 | 0.2 |
|  | n3 | 0.2 |
|  | n77 | 0.5 |
| CA\_n1-n3-n78 | n1 | 0.2 |
|  | n3 | 0.2 |
|  | n78 | 0.5 |
| CA\_n1-n8-n78 | n8 | 0.2 |
|  | n78 | 0.5 |
| CA\_n1-n8-n78 | n8 | 0.2 |
|  | n78 | 0.5 |
| CA\_n1-n28-n77 | n1 | 0.2 |
|  | n28 | 0.2 |
|  | n77 | 0.5 |
| CA\_n1-n28-n78 | n28 | 0.2 |
|  | n78 | 0.5 |
| CA\_n1-n41-n77 | n1 | 0.2 |
|  | n77 | 0.5 |
| CA\_n1-n78-n79 | n78 | 0.5 |
| CA\_n2-n5-n48 | n2 | 0.2 |
|  | n5 | 0..0 |
|  | n48 | 0.5 |
| CA\_n2-n5-n77 | n2 | 0.2 |
|  | n5 | 0.5 |
|  | n77 | 0.5 |
| CA\_n2-n48-n66 | n2 | 0.3 |
|  | n48 | 0.5 |
|  | n66 | 0.3 |
| CA\_n2-n48-n77 | n2 | 0.2 |
|  | n48 | 0.5 |
|  | n77 | 0.5 |
| CA\_n2-n66-n77 | n2 | 0.2 |
|  | n66 | 0.2 |
|  | n77 | 0.5 |
| CA\_n3-n28-n41 | n41 | 01/0.52 |
| CA\_n3-n28-n77 | n3 | 0.2 |
|  | n28 | 0.2 |
|  | n77 | 0.5 |
| CA\_n3-n28-n78 | n28 | 0.2 |
|  | n78 | 0.5 |
| CA\_n3-n41-n77 | n3 | 0.2 |
|  | n41 | 01/0.52 |
|  | n77 | 0.5 |
| CA\_n5-n48-n66 | n5 | 0 |
|  | n48 | 0.5 |
|  | n66 | 0.2 |
| CA\_n5-n48-n77 | n5 | 0.2 |
|  | n48 | 0.5 |
|  | n77 | 0.5 |
| CA\_n5-n66-n77 | n5 | 0.2 |
|  | n66 | 0.2 |
|  | n77 | 0.5 |
| CA\_n25-n66-n77 | n25 | 0.3 |
|  | n66 | 0.3 |
|  | n77 | 0.5 |
| CA\_n25-n66-n78 | n25 | 0.3 |
|  | n66 | 0.3 |
|  | n78 | 0.5 |
| CA\_n28-n41-n79 | n28 | 0.2 |
|  | n41 | 0.5 |
|  | n79 | 0.5 |
| CA\_n41-n66-n71 | n41 | 0.51 |
| 12 |
| n66 | 0.5 |
| CA\_n48-n66-n70 | n48 | 0.5 |
| n66 | 0.2 |
| n70 | 0.2 |
| CA\_n48-n66-n71 | n48 | 0.2 |
| n70 | 0.2 |
| n71 | 0.2 |
| CA\_n48-n66-n77 | n48 | 0.5 |
|  | n66 | 0.2 |
|  | n77 | 0.5 |
| CA\_n48-n70-n71 | n48 | 0.2 |
| n70 | 0.2 |
| n71 | 0.2 |
| CA\_n66-n71-n77 | n66 | 0.2 |
| n71 | 0.2 |
| n77 | 0.5 |
| CA\_n66-n71-n78 | n66 | 0.2 |
| n71 | 0.2 |
| n78 | 0.5 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2: Applicable for the frequency range of 2496-2515 MHz. | | |

7.3A.0.3.2.4 ΔRIB,c for four bands

Table 7.3A.0.3.2.4-1: ΔRIB,c due to CA (four bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Inter-band CA combination | ΔRIB,c for NR bands (dB)7 | | | |
| Component band in order of bands in configuration8 | | | |
| CA\_n1-n3-n28-n78 | 0.2 | 0.2 | 0.2 | 0.5 |
| CA\_n2-n5-n48-n66 | 0.2 | - | 0.5 | 0.2 |
| CA\_n2-n5-n48-n77 | 0.2 | - | 0.5 | 0.5 |
| CA\_n2-n5-n66-n77 | 0.3 | - | 0.3 | 0.5 |
| CA\_n2-n48-n66-n77 | 0.3 | 0.5 | 0.3 | 0.5 |
| CA\_n5-n48-n66-n77 | 0.2 | 0.5 | 0.2 | 0.5 |
| NOTE 1: FFS  NOTE 2: FFS  NOTE 5: FFS  NOTE 6: FFS  NOTE 7: “-” denotes ΔRIB,c = 0.  NOTE 8: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n7-n78 the band order from left to right is n1 n3, n7 and n78. | | | | |

#### 7.3A.0.4 Reference sensitivity exceptions due to UL harmonic interference for CA

Editor’s Note:

* 38.101-1 (V17.9.0) Table 7.3A.4-4 UL n77 agressor band impacts on DL band n5 indicates a case of UL/DL bandwidth of 5 MHz/5 MHz, but there is no definition of reference sensitivity for 5MHz bandwidth of n77. Therefore in Table 7.3A.0.4-4b corresponding case, UL n77 minimum bandwidth of 10 MHz is used instead.

Table 7.3A.0.4-1: Reference sensitivity exceptions due to UL harmonic for NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| **(MHz)** | **(kHz)** | LCRB | (MHz) | (dB) |
| n1 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n1 | n77 | 20 | 15 | 100 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n1 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n2 | n48 | 5 | 15 | 25 (RBstart=0) | 5 | 27.1 | NOTE 2 | UL2/DL1  direct-hit |
| n2 | n48 | 10 | 15 | 50 (RBstart=0) | 1007 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n2 | n48 | 5 | 15 | 25 (RBstart=0) | 10 | 1.9 | NOTE 6 | UL2/DL1  near-miss |
| n2 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n2 | n77 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n2 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n3 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n3 | n77 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n3 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n3 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n3 | n78 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n3 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n5 | n778 | 5 | 15 | 16 (RBstart=0) | 10 | 10.5 | NOTE 4 | UL4/DL1  direct-hit |
| n5 | n778 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n5 | n778 | 5 | 15 | 16 (RBstart=0) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| n5 | n778 | 5 | 15 | 25 (RBstart=0) | 100 | 0.7 | NOTE 5 | UL5/DL1  direct-hit |
| n5 | n78 | 5 | 15 | 16 (RBstart=0) | 10 | 10.5 | NOTE 4 | UL4/DL1  direct-hit |
| n5 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n8 | n78 | 5 | 15 | 16 (RBstart=0) | 10 | 10.8 | NOTE 4 | UL4/DL1  direct-hit |
| n8 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n14 | n77 | 5 | 15 | 10 (RBstart=0) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| n14 | n77 | 5 | 15 | 20 (RBstart=0) | 100 | 0.7 | NOTE 5 | UL5/DL1  direct-hit |
| n20 | n78 | 5 | 15 | 16 (RBstart=0) | 10 | 10.8 | NOTE 4 | UL4/DL1  direct-hit |
| n20 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n24 | n7712 | N/A | N/A | N/A | N/A | N/A | NOTE 2 | UL2/DL1  direct-hit |
| n24 | n7712 | N/A | N/A | N/A | N/A | N/A | NOTE 2 | UL2/DL1  direct-hit |
| n25 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n25 | n77 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n25 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n25 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n25 | n78 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n25 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n28 | n1 | 5 | 15 | 8 (RBstart=0) | 5 | 10.2 | NOTE 3 | UL3/DL1  direct-hit |
| n28 | n1 | 5 | 15 | 25 (RBstart=0) | 50 | 1.1 | NOTE 3 | UL3/DL1  direct-hit |
| n28 | n77 | 5 | 15 | 10 (RBstart=0) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| n28 | n77 | 5 | 15 | 25 (RBstart=0) | 100 | 0.7 | NOTE 5 | UL5/DL1  direct-hit |
| n28 | n78 | 5 | 15 | 10 (RBstart=0) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| n28 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 0.7 | NOTE 5 | UL5/DL1  direct-hit |
| n66 | n48 | 5 | 15 | 12 (RBstart=0) | 5 | 27.1 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n48 | 40 | 15 | 200 (RBstart=0) | 1007 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n48 | 5 | 15 | 12 (RBstart=0) | 5 | 1.9 | NOTE 6 | UL2/DL1  near-miss |
| n66 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n77 | 20 | 15 | 100 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n77 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n66 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n78 | 20 | 15 | 100 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n66 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n71 | n41 | 5 | 15 | 16 (RBstart=0) | 10 | 10.8 | NOTE 4 | UL4/DL1  direct-hit |
| n71 | n41 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n71 | n70 | 5 | 15 | 8 (RBstart=0) | 5 | 9.9 | NOTE 3 | UL3/DL1  direct-hit |
| n71 | n70 | 5 | 15 | 20 (RBstart=0) | 25 | 4.1 | NOTE 3 | UL3/DL1 |
| n71 | n78 | 5 | 15 | 10 (RBstart=0) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd / 3rd / 4th / 5th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.  NOTE 2: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 3: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that  in MHz and  with the carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the low band.  NOTE 4: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 6: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.  NOTE 7: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 8: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped.  NOTE 9: Void.  NOTE 10: These requirements apply when the lower edge frequency of the 10 MHz, 15 MHz, or 20 MHz uplink channel in Band 71 is located at or below 668 MHz and the downlink channel in Band n25 is located with its upper edge at 1995 MHz.  NOTE 11: These requirements apply when the lower edge frequency of the uplink channel in Band n71 is located at or below 668 MHz and the downlink channel in Band n25 is located with its upper edge at 1990 MHz.  NOTE 12: In the USA, n77 band is restricted to 3450 – 3550 MHz and 3700 – 3980 MHz. There is no UL harmonic due to n24 UL in downlink for n77 operating in 3450 – 3550 MHz and 3700 – 3980 MHz.  NOTE 13: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity for all active downlink component carriers is only verified when this is not the case (the requirements specified in clause 7.3.2 apply unless otherwise specified). | | | | | | | | |

Table 7.3A.0.4-1a: Void

Table 7.3A.0.4-2: Void

Table 7.3A.0.4-3: Void

Table 7.3A.0.4-3a: Void

Sensitivity degradation is allowed for a band if it is impacted by receiver harmonic mixing due to another band part of the same CA configuration. Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC3 aggressor NR UL band for DL NR CA FR1 is specified in Table 7.3A.0.4-4b. Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1 is specified in Table 7.3A.0.4-4c.

Table 7.3A.0.4-4: Void

Table 7.3A.0.4-4a: Void

Table 7.3A.0.4-4b: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC3 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n77 | n2 | 10 | 15 | 25 (RBstart=0) | 5 | 6.7 | NOTE 7 | UL1/DL2 |
| n77 | n2 | 20 | 15 | 100 (RBstart=0) | 20 | 3,7 | NOTE 7 | UL1/DL2 |
| n77 | n5 | 10 | 15 | 25 (RBstart=0) | 5 | 5.7 | NOTE 8 | UL1/DL4 |
| n77 | n5 | 20 | 15 | 100 (RBstart=0) | 20 | 2.7 | NOTE 8 | UL1/DL4 |
| n77 | n14 | 10 | 15 | 25 (RBstart=0) | 5 | 31 | NOTE 5 | UL1/DL5 |
| n77 | n14 | 10 | 15 | 50 (RBstart=0) | 10 | 28 | NOTE 5 | UL1/DL5 |
| n77 | n25 | 10 | 15 | 25 (RBstart=0) | 5 | 6.7 | NOTE 7 | UL1/DL2 |
| n77 | n25 | 20 | 15 | 100 (RBstart=0) | 40 | 1.1 | NOTE 7 | UL1/DL2 |
| n77 | n41 | 20 | 30 | 50 (RBstart=0) | 10 | 10.4 | NOTE 2 | UL2/DL3 |
| n77 | n41 | 20 | 30 | 50 (RBstart=0) | 100 | 6.3 | NOTE 2 | UL2/DL3 |
| n78 | n28 | 10 | 15 | 25 (RBstart=0) | 5 | 31 | NOTE 5 | UL1/DL5 |
| NOTE 1: FFS.  NOTE 2: FFS.  NOTE 3: FFS.  NOTE 4: FFS.  NOTE 5: The requirements should be verified for DL NR-ARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz.  NOTE 6: FFS.  NOTE 7: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band.  NOTE 8: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

**Table 7.3A.0.4-4c: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n2 | 10 | 15 | 25 (RBstart=0) | 5 | 9.1 | NOTE 4 | UL1/DL2 |
| n77 | n2 | 20 | 15 | 100 (RBstart=0) | 20 | 6.7 | NOTE 4 | UL1/DL2 |
| n77 | n5 | 10 | 15 | 25 (RBstart=0) | 5 | 8.1 | NOTE 5 | UL1/DL4 |
| n77 | n5 | 20 | 15 | 20 (RBstart=0) | 20 | 4.3 | NOTE 5 | UL1/DL4 |
| n77 | n14 | 10 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| n77 | n14 | 10 | 15 | 50 (RBstart=0) | 10 | 31 | NOTE 1 | UL1/DL5 |
| n78 | n3 | 5 | 15 | 25 (RBstart=0) | 5 | 8.1 | NOTE 4 | UL1/DL2 |
| n78 | n3 | 40 | 15 | 216 (RBstart=0) | 40 | 1 | NOTE 4 | UL1/DL2 |
| NOTE 1: The requirements should be verified for DL NR-ARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz.  NOTE 2: FFS  NOTE 3: FFS  NOTE 4: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band.  NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

#### 7.3A.0.5 Reference sensitivity exceptions due to intermodulation interference due to 2UL CA

For inter-band carrier aggregation with uplink assigned to two NR bands given in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a, the reference sensitivity is defined only for the specific uplink and downlink test points specified in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a. For these test points the reference sensitivity requirement specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 are relaxed by the amount of the corresponding parameter MSD given in Table 7.3A.0.5-1 and Table 7.3A.0.5-1a.

Table 7.3A.0.5-1: 2DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC3 CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | | MSD  (dB) | Duplex mode |  |
| CA\_n1-n3 | n1 | 1950 | 5 | 25 | 2140 | | 23 | FDD | IMD3 |
| n3 | 1760 | 5 | 25 | 1855 | | N/A | FDD | N/A |
| CA\_n1-n8 | n1 | 1965 | 5 | 25 | 2155 | | 6.0 | FDD | IMD4 |
| n8 | 887.5 | 5 | 25 | 932.5 | | N/A | FDD | N/A |
| CA\_n1-n78 | n1 | 1950 | 5 | 25 | 2140 | | 8.0 | FDD | IMD4 |
| n78 | 3710 | 10 | 50 | 3710 | | N/A | TDD | N/A |
| CA\_n2-n48 | n2 | 1852.5 | 5 | 25 | 1932.5 | | 12 | FDD | IMD4 |
| n48 | 3625 | 20 | 100 | 3625 | | N/A | TDD | N/A |
| CA\_n2-n66 | n2 | 1855 | 5 | 25 | 1935 | | 20 | FDD | IMD3 |
| n66 | 1775 | 5 | 25 | 2175 | | N/A | FDD | N/A |
| n2 | 1883.3 | 5 | 25 | 1963.3 | | N/A | FDD | N/A |
| n66 | 1750 | 5 | 25 | 2150 | | 4 | FDD | IMD5 |
| CA\_n2-n77 | n2 | 1855 | 5 | 25 | 1935 | | 26 | FDD | IMD2 |
| n77 | 3790 | 10 | 50 | 3790 | | N/A | TDD | N/A |
| n2 | 1900 | 5 | 25 | 1980 | | 8.0 | FDD | IMD4 |
| n77 | 3720 | 10 | 50 | 3720 | | N/A | TDD | N/A |
| n2 | 1885 | 5 | 25 | 1965 | | 5 | FDD | IMD5 |
| n77 | 3810 | 10 | 50 | 3810 | | N/A | TDD | N/A |
| n2 | N/A | 5 | N/A | 1987.5 | | 2.7 | FDD | IMD7 |
| n7712 | 3455 | 10 | 1 RBSTART=10 | 3455 | | N/A | TDD | N/A |
| 3945 | 10 | 1  1 RBSTART=0 | 3945 | |
| CA\_n3-n5 | n3 | 1771 | 10 | 50 | 1866 | | 4 | FDD | IMD4 |
| n5 | 838 | 5 | 25 | 883 | | N/A | FDD | N/A |
| CA\_n3-n8 | n3 | 1755 | 10 | 50 | 1850 | | N/A | FDD | N/A |
| n8 | 900 | 5 | 25 | 945 | | 8 | FDD | IMD44 |
| n3 | 1747.5 | 10 | 50 | 1842.5 | | 6.4 | FDD | IMD5 |
| n8 | 897.5 | 5 | 25 | 942.5 | | N/A | FDD | N/A |
| CA\_n3-n41 | n3 | 1740 | 5 | 25 | 1835 | | 8.2 | FDD | IMD4 |
| n41 | 2657.5 | 10 | 50 | 2657.5 | | N/A | TDD | N/A |
| CA\_n3-n5 | n3 | 1721 | 10 | 50 | 1816 | | N/A | FDD | N/A |
| n5 | 838 | 5 | 25 | 883 | | 24 | FDD | IMD23 |
| CA\_n3-n77 | n3 | 1740 | 5 | 25 | 1835 | | 26 | FDD | IMD24 |
| n77 | 3575 | 10 | 50 | 3575 | | N/A | TDD | N/A |
| n3 | 1765 | 5 | 25 | 1860 | | 8.0 | FDD | IMD44 |
| n77 | 3435 | 10 | 50 | 3435 | | N/A | TDD | N/A |
| CA\_n3-n78 | n3 | 1740 | 5 | 25 | 1835 | | 26 | FDD | IMD24 |
| n78 | 3575 | 10 | 25 | 3575 | | N/A | TDD | N/A |
| n3 | 1765 | 5 | 25 | 1860 | | 8.0 | FDD | IMD44 |
| n78 | 3435 | 10 | 25 | 3435 | | N/A | TDD | N/A |
| CA\_n5-n66 | n5 | 838 | 5 | 25 | 883 | | 30 | FDD | IMD24 |
| n66 | 1721 | 5 | 25 | 2121 | | N/A | FDD | N/A |
| CA\_n5-n776 | n5 | 844 | 5 | 25 | 889 | | 8.3 | FDD | IMD4 |
| n77 | 3421 | 10 | 50 | 3421 | | N/A | TDD | N/A |
| n5 | 829 | 5 | 25 | 874 | | 5.5 | FDD | IMD5 |
| n77 | 4190 | 10 | 50 | 4190 | | N/A | TDD | N/A |
| CA\_n8-n78 | n8 | 897.5 | 5 | 25 | 942.5 | | 8.3 | FDD | IMD4 |
| n78 | 3635 | 10 | 50 | 3635 | | N/A | TDD | N/A |
| CA\_n14A-n77A | n14 | 793 | 5 | 20 | 763 | | 5.5 | FDD | IMD5 |
| n77 | 3935 | 10 | 50 | 3935 | | N/A | TDD |
| CA\_n20A-n78A | n20 | 850 | 5 | 25 | 809 | | 11 | FDD | IMD4 |
| n78 | 3359 | 10 | 50 | 3359 | | N/A | TDD | N/A |
| CA\_n24-n7710 | n24 | N/A | N/A | N/A | N/A | | N/A | FDD | IMD4 |
|  | n77 | N/A | N/A | N/A | N/A | | N/A | TDD | N/A |
| e | n66 | 1775 | 5 | 25 | 2175 | | N/A | FDD | N/A |
| n25 | 1855 | 5 | 25 | 1935 | | 20 | FDD | IMD3 |
| n66 | 1712.5 | 5 | 25 | 2112.5 | | 23 | FDD | IMD3 |
| n25 | 1912.5 | 5 | 25 | 1992.5 | | N/A | FDD | N/A |
| n66 | 1750 | 5 | 25 | 2150 | | 4 | FDD | IMD5 |
| n25 | 1883.3 | 5 | 25 | 1963.3 | | N/A | FDD | N/A |
| CA\_n25-n77 | n25 | 1855 | 5 | 25 | 1935 | | 26 | FDD | IMD2 |
| n77 | 3790 | 10 | 50 | 3790 | | N/A | TDD | N/A |
| n25 | 1900 | 5 | 25 | 1980 | | 8.0 | FDD | IMD4 |
| n77 | 3690 | 10 | 50 | 3690 | | N/A | TDD | N/A |
| n25 | 1885 | 5 | 25 | 1965 | | 5 | FDD | IMD5 |
| n77 | 3790 | 10 | 50 | 3790 | | N/A | TDD | N/A |
| CA\_n25-n78 | n25 | 1855 | 5 | 25 | 1935 | | 26 | FDD | IMD24 |
| n78 | 3790 | 10 | 50 | 3790 | | N/A | TDD | N/A |
| CA\_n26-n66 | n26 | 838 | 5 | 25 | 883 | | 30 | FDD | IMD24 |
| n66 | 1721 | 5 | 25 | 2121 | | N/A | FDD | N/A |
| CA\_n26-n70 | n26 | 831 | 5 | 25 | 876 | | 30 | FDD | IMD24 |
| n70 | 1707.5 | 5 | 25 | 2007.5 | | N/A | FDD | N/A |
| CA\_n28-n77 | n28 | 705.5 | 5 | 25 | 760.5 | | 5.5 | FDD | IMD5 |
| n77 | 3582.5 | 10 | 50 | 3582.5 | | N/A | TDD | N/A |
| CA\_n41-n77 | n41 | 2545 | 60 | 1 (RBSTART=0) | 2545 | N/A | | TDD | N/A |
|  |  | 2625 | 100 | 1 (RBSTART=272) | 2625 |  | |  |  |
|  | n77 | N/A | 10 | N/A | 3305 | 2.7 | | FDD | IMD9 |
| CA\_n48-n66 | n48 | 3660 | 5 | 25 | 3660 | | N/A | TDD | N/A |
| n66 | 1730 | 5 | 25 | 2130 | | 5.0 | FDD | IMD5 |
| CA\_n48-n70 | n70 | 1697.5 | 25/15 | 25 | 1997.5 | | 26 | FDD | IMD24 |
| n48 | 3695 | 10 | 50 | 3695 | | N/A | TDD | N/A |
| CA\_n66-n71 | n66 | 1750 | 5 | 25 | 2150 | | 5 | FDD | IMD4 |
| n71 | 675 | 5 | 25 | 629 | | N/A | FDD | N/A |
| CA\_n66-n77 | n66 | 1775 | 5 | 25 | 2175 | | 31 | FDD | IMD2 |
| n77 | 3950 | 10 | 50 | 3950 | | N/A | TDD | N/A |
| n66 | 1760 | 5 | 25 | 2160 | | 5.0 | FDD | IMD5 |
| n77 | 3720 | 10 | 50 | 3720 | | N/A | TDD | N/A |
| n66 | N/A | 5 | N/A | 2197.5 | | 15 | FDD | IMD513 |
| n7712 | 3305 | 10 | 1 (RBSTART=0) | 3305 | | N/A | TDD | N/A |
|  | 3855 | 10 | 1 (RBSTART=8) | 3855 | |  |  |  |
| n66 | N/A | 5 | N/A | 2197.5 | | 1.7 | FDD | IMD7 |
| n7712 | 3455 | 10 | 1 (RBSTART=10) | 3455 | | N/A | TDD | N/A |
|  | 3875 | 10 | 1 (RBSTART=0) | 3875 | |  |  |  |
| CA\_n66-n78 | n66 | 1730 | 5 | 25 | 2130 | | 5.0 | FDD | IMD5 |
| n78 | 3660 | 10 | 50 | 3660 | | N/A | TDD | N/A |
| CA\_n70-n71 | n70 | 1697.5 | 5 | 25 | 1997.5 | | 5 | FDD | IMD4 |
| n71 | 695.5 | 5 | 25 | 649.5 | | N/A | FDD | N/A |
| CA\_n71-n77 | n71 | 671 | 5 | 25 | 625 | | 5.5 | FDD | IMD5 |
|  | n77 | 3309 | 10 | 50 | 3309 | | N/A | TDD | N/A |
| CA\_n71-n78 | n71 | 681.5 | 5 | 25 | 635.5 | | 5.5 | FDD | IMD5 |
| n78 | 3361.5 | 10 | 50 | 3361.5 | | N/A | TDD | N/A |
| NOTE 1: Both of the transmitters shall be set min(+20 dBm, PCMAX\_L,f,c) as defined in subclause 6.2A.4  NOTE 2: RBSTART = 0, 15kHz SCS is assumed.  NOTE 3: No requirements apply when there is at least one individual RE within the intermodulation generated by the dual uplink is within the downlink transmission bandwidth of the FDD band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3 apply).  NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 5: Void.  NOTE 6: TBD  NOTE 7: TBD  NOTE 8: TBD  NOTE 9: TBD  NOTE 10: There is no IMD4 product in band n24 downlink for n77 operating in 3450 – 3980 MHz and n24 uplink restricted to between 1627.5 – 1637.5 MHz and between 1646.5 – 1656.5 MHz.  NOTE 11: TBD  NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 13: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | | |

Table 7.3A.0.5-1a: 2DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n78 | n1 | 1950 | 5 | 25 | 2140 | 17.8 | FDD | IMD4 |
|  | n78 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
| CA\_n2-n77 | n2 | 1855 | 5 | 25 | 1935 | 32.10 | FDD | IMD2 |
|  | n77 | 3790 | 10 | 50 | 3790 | N/A | TDD | N/A |
|  | n2 | 1900 | 5 | 25 | 1980 | 19.10 | FDD | IMD4 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
| CA\_n3-n41 | n3 | 1740 | 5 | 25 | 1835 | 18.4 | FDD | IMD4 |
|  | n41 | 2657.5 | 10 | 50 | 2657.5 | N/A | TDD | N/A |
| CA\_n3-n78 | n3 | 1740 | 5 | 25 | 1835 | 31.9 | FDD | IMD2 |
|  | n78 | 3575 | 10 | 50 | 3575 | N/A | TDD | N/A |
|  | n3 | 1765 | 5 | 25 | 1860 | 18.5 | FDD | IMD4 |
|  | n78 | 3435 | 10 | 50 | 3435 | N/A | TDD | N/A |
| CA\_n5-n77 | 5 | 844 | 5 | 25 | 889 | 18.6 | FDD | IMD4 |
|  | n77 | 3421 | 10 | 50 | 3421 | N/A | TDD | N/A |
| CA\_n66-n77 | n66 | 1775 | 5 | 25 | 2175 | 34.33 | FDD | IMD2 |
|  | n77 | 3950 | 10 | 50 | 3950 | N/A | TDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 11.27 | FDD | IMD5 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
| NOTE 1: Both of the transmitters shall be set min(+23 dBm, PCMAX\_L,f,c) as defined in clause 6.2A.4  NOTE 2: RBSTART = 0, 15 kHz SCS is assumed.  NOTE 3: No requirements apply when there is at least one individual RE within the intermodulation generated by the dual uplink is within the downlink transmission bandwidth of the FDD band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3 apply). | | | | | | | | |

Editor’s Note:

The n78 UL RB size of 10MHz BW in CA\_n1-n3-n78 is different from the Table 7.3A.5-2 in TS 38.101-1 (V17.9.0), since the values in the latter cannot be applied to DFT-s-OFDM. The closest smaller valid value has been applied in Table 7.3A.0.5-2.

Table 7.3A.0.5-2: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n3-n28 | n1 | 1975 | 5 | 25 | 2165 | N/A | FDD | N/A |
|  | n28 | 710.5 | 5 | 25 | 765.5 | N/A | FDD | N/A |
|  | n3 | 1723.5 | 5 | 25 | 1818.5 | 4.0 | FDD | IMD5 |
|  | n3 | 1780 | 5 | 25 | 1875 | N/A | FDD | N/A |
|  | n28 | 710.5 | 5 | 25 | 765.5 | N/A | FDD | N/A |
|  | n1 | 1949 | 5 | 25 | 2139 | 11.0 | FDD | IMD4 |
| CA\_n1-n3-n77 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n3 | 1750 | 5 | 25 | 1845 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3700 | 28.4 | TDD | IMD22 |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n3 | N/A | 5 | N/A | 1807.5 | 31.5 | FDD | IMD21,2 |
|  | n77 | 3757.5 | 10 | 50 | 3757.5 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 31.0 | FDD | IMD21 |
|  | n3 | 1775 | 5 | 25 | 1870 | N/A | FDD | N/A |
|  | n77 | 3915 | 10 | 50 | 3915 | N/A | TDD | N/A |
| CA\_n1-n3-n78 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n3 | 1750 | 5 | 25 | 1845 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3700 | 28.4 | TDD | IMD2 |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n3 | 1770 | 5 | 25 | 1865 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3360 | 11.2 | TDD | IMD4 |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n3 | N/A | 5 | N/A | 1830 | 27.9 | FDD | IMD2 |
|  | n78 | 3780 | 10 | 50 | 3780 | N/A | TDD | N/A |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n8-n78 | n1 | 1945 | 5 | 25 | 2135 | N/A | FDD | N/A |
|  | n8 | 900 | 5 | 25 | 945 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3745 | 14.9 | TDD | IMD3 |
|  | n1 | 1940 | 5 | 25 | 2130 | N/A | FDD | N/A |
|  | n8 | N/A | 5 | N/A | 940 | 3.3 | FDD | IMD5 |
|  | n78 | 3380 | 10 | 50 | 3380 | N/A | TDD | N/A |
| CA\_n1-n28-n77 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n28 | 733 | 5 | 25 | 788 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3416 | 15.7 | TDD | IMD32 |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
|  | n28 | N/A | 5 | N/A | 790 | 4.2 | FDD | IMD5 |
|  | n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |
|  | n77 | 3630 | 10 | 50 | 3630 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2150 | 15.7 | FDD | IMD3 |
| CA\_n1-n28-n78 | n1 | N/A | 5 | N/A | 2150 | 15.7 | FDD | IMD3 |
|  | n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |
|  | n78 | 3630 | 10 | 50 | 3630 | N/A | TDD | N/A |
|  | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n28 | N/A | 5 | N/A | 794 | 4.2 | FDD | IMD5 |
|  | n78 | 3352 | 10 | 50 | 3352 | N/A | TDD | N/A |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n28 | 733 | 5 | 25 | 788 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3416 | 15.7 | TDD | IMD3 |
| CA\_n1-n41-n77 | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n41 | 2650 | 10 | 50 | 2650 | N/A | TDD | N/A |
|  | n77 | N/A | 10 | N/A | 3330 | 19.6 | TDD | IMD31,2 |
|  | n1 | 1975 | 5 | 10 | 2165 | N/A | FDD | N/A |
|  | n77 | 3410 | 10 | 50 | 3410 | N/A | TDD | N/A |
|  | n41 | N/A | 10 | N/A | 2515 | 11.5 | TDD | IMD41 |
|  | n41 | 2640 | 10 | 50 | 2640 | N/A | TDD | N/A |
|  | n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 9.3 | FDD | IMD4 |
| CA\_n1-n78-n79 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n78 | 3410 | 10 | 50 | 3410 | N/A | TDD | N/A |
|  | n79 | 4870 | 40 | 216 | 4870 | 15.9 | TDD | IMD31,3 |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n78 | 3490 | 10 | 50 | 3490 | 4.6 | TDD | IMD53 |
|  | n79 | 4670 | 40 | 216 | 4670 | N/A | TDD | N/A |
|  | n1 | 1950 | 5 | 25 | 2140 | 15.6 | FDD | IMD31,2 |
|  | n78 | 3400 | 10 | 50 | 3400 | N/A | TDD | N/A |
|  | n79 | 4660 | 40 | 216 | 4660 | N/A | TDD | N/A |
| CA\_n2-n5-n30 | n2 | 1870 | 5 | 25 | 1959 | N/A | FDD | N/A |
|  | n5 | 835 | 5 | 25 | 880 | 9.7 | FDD | IMD4 |
|  | n30 | 2310 | 10 | 50 | 2355 | N/A | FDD | N/A |
| CA\_n2-n5-n48 | n2 | N/A | 5 | N/A | 1962 | 15.6 | FDD | IMD3 |
|  | n5 | 839 | 5 | 25 | 884 | N/A | FDD | N/A |
|  | n48 | 3640 | 10 | 50 | 3640 | N/A | TDD | N/A |
|  | n2 | 1905 | 5 | 25 | 1985 | N/A | FDD | N/A |
|  | n5 | 844 | 5 | 25 | 889 | N/A | FDD | N/A |
|  | n48 | N/A | 10 | 50 | 3593 | 16.6 | TDD | IMD3 |
| CA\_n2-n5-n66 | n2 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n5 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2140 | 7.2 | FDD | IMD4 |
| CA\_n2-n5-n77 | n2 | 1907.5 | 5 | 25 | 1987.5 | N/A | FDD | N/A |
|  | n5 | N/A | 5 | N/A | 887.5 | 3.8 | FDD | IMD55 |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1987 | 16.5 | FDD | IMD35 |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n77 | 3680 | 10 | 50 | 3680 | N/A | TDD | N/A |
|  | n2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n5 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3540 | 16.0 | TDD | IMD31 |
| CA\_n2-n12-n77 | n2 | 1880 | 5 | 25 | 1960 | 16.5 | FDD | IMD32 |
|  | n12 | 707.5 | 5 | 25 | 737.5 | N/A | FDD | N/A |
|  | n77 | 3375 | 10 | 50 | 3375 | N/A | TDD | N/A |
|  | n2 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n12 | 707.5 | 5 | 25 | 737.5 | N/A | FDD | N/A |
|  | n77 | 3315 | 10 | 50 | 3315 | 16.0 | TDD | IMD31,2 |
| CA\_n2-n14-n77 | n2 | 1880 | 5 | 25 | 1960 | 16.5 | FDD | IMD3 |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n77 | 3546 | 10 | 50 | 3546 | N/A | TDD | N/A |
|  | n2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n77 | 3466 | 10 | 50 | 3466 | 16.0 | TDD | IMD31 |
| CA\_n2-n30-n77 | n2 | 1906 | 5 | 25 | 1986 | 8.6 | FDD | IMD4 |
|  | n30 | 2312 | 5 | 25 | 2357 | N/A | FDD | N/A |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n2 | 1905 | 5 | 25 | 1985 | N/A | FDD | N/A |
|  | n30 | 2309 | 5 | 25 | 2354 | 10.6 | FDD | IMD41 |
|  | n77 | 3361 | 10 | 50 | 3361 | N/A | TDD | N/A |
|  | n2 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 4180 | 10 | 50 | 4180 | 29.4 | TDD | IMD22 |
| CA\_n2-n48-n66 | n2 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
|  | n48 | N/A | 10 | 50 | 3625 | 32.0 | TDD | IMD2 |
|  | n66 | 1770 | 5 | 25 | 2190 | N/A | FDD | N/A |
|  | n2 | 1905 | 5 | 25 | 1985 | N/A | FDD | N/A |
|  | n48 | 3560 | 10 | 50 | 3560 | N/A | TDD | N/A |
|  | n66 | N/A | 5 | N/A | 2155 | 12.1 | FDD | IMD4 |
|  | n2 | N/A | 5 | N/A | 1960 | 28.3 | FDD | IMD21 |
|  | n48 | 3695 | 10 | 50 | 3695 | N/A | TDD | N/A |
|  | n66 | 1735 | 5 | 25 | 2135 | N/A | FDD | N/A |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n2-n66-n77 | n2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3620 | 29.4 | TDD | IMD25 |
|  | n2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3900 | 8.9 | TDD | IMD4 |
|  | n2 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2115 | 29.2 | FDD | IMD2 |
|  | n77 | 3970 | 10 | 50 | 3970 | N/A | TDD | N/A |
|  | n2 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2140 | 10.4 | FDD | IMD4 |
|  | n77 | 3500 | 10 | 50 | 3500 | N/A | TDD | N/A |
|  | n2 | 1885 | 5 | 25 | 1965 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2175 | 4.0 | FDD | IMD5 |
|  | n77 | 3915 | 10 | 50 | 3915 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1960 | 32.1 | FDD | IMD2 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1960 | 9.1 | FDD | IMD45 |
|  | n66 | 1770 | 5 | 25 | 2170 | N/A | FDD | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1960 | 2.1 | FDD | IMD55 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3620 | 10 | 50 | 3620 | N/A | TDD | N/A |
| CA\_n3-n28-n41 | n3 | 1715 | 5 | 25 | 1810 | N/A | FDD | N/A |
|  | n28 | 743 | 5 | 25 | 798 | N/A | FDD | N/A |
|  | n41 | 2518 | 5 | 25 | 2518 | 27.4 | TDD | IMD2 |
|  | n3 | 1715 | 5 | 25 | 1810 | N/A | FDD | N/A |
|  | n28 | 743 | 5 | 25 | 798 | N/A | FDD | N/A |
|  | n41 | 2687 | 5 | 25 | 2687 | 15.9 | TDD | IMD3 |
|  | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n41 | 2510 | 5 | 25 | 2510 | N/A | TDD | N/A |
|  | n28 | 735 | 5 | 25 | 790 | 26.0 | FDD | IMD24 |
|  | n28 | 710.5 | 5 | 25 | 765.5 | N/A | FDD | N/A |
|  | n41 | 2543 | 10 | 50 | 2543 | N/A | TDD | N/A |
|  | n3 | 1737.5 | 5 | 25 | 1832.5 | 26.0 | FDD | IMD2 |
| CA\_n3-n28-n77 | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n28 | 733 | 5 | 25 | 788 | N/A | FDD | N/A |
|  | n77 | 4173 | 10 | 50 | 4173 | 15.9 | TDD | IMD3 |
|  | n28 | 735 | 5 | 25 | 790 | N/A | FDD | N/A |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
|  | n3 | 1755 | 5 | 25 | 1850 | 17.0 | FDD | IMD3 |
|  | n3 | 1712.5 | 5 | 25 | 1807.5 | N/A | FDD | N/A |
|  | n77 | 4195 | 10 | 50 | 4195 | N/A | TDD | N/A |
|  | n28 | 715 | 5 | 25 | 770 | 15.3 | FDD | IMD3 |
| CA\_n3-n28-n78 | n3 | 1755 | 5 | 25 | 1850 | N/A | FDD | N/A |
|  | n28 | 735 | 5 | 25 | 790 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3320 | 17.3 | TDD | IMD3 |
|  | n3 | 1750 | 5 | 25 | 1845 | N/A | FDD | N/A |
|  | n28 | 743 | 5 | 25 | 798 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3764 | 4.5 | TDD | IMD5 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n41-n77 | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n77 | 3900 | 10 | 50 | 3900 | N/A | TDD | N/A |
|  | n41 | N/A | 5 | N/A | 2640 | 5.3 | TDD | IMD5 |
|  | n41 | 2620 | 5 | 25 | 2620 | N/A | TDD | N/A |
|  | n77 | 3400 | 10 | 50 | 3400 | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1840 | 16.4 | FDD | IMD3 |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3440 | 16.8 | TDD | IMD31 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n5-n12-n77 | n5 | 835 | 5 | 25 | 880 | 3.9 | FDD | IMD5 |
|  | n12 | 707.5 | 5 | 25 | 737.5 | N/A | FDD | N/A |
|  | n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
|  | n5 | 835 | 5 | 25 | 880 | N/A | FDD | N/A |
|  | n12 | 710 | 5 | 25 | 740 | 4.4 | FDD | IMD5 |
|  | n77 | 4080 | 10 | 50 | 4080 | N/A | TDD | N/A |
|  | n5 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n12 | 707.5 | 5 | 25 | 737.5 | N/A | FDD | N/A |
|  | n77 | 3905 | 10 | 50 | 3905 | 4.4 | TDD | IMD5 |
| CA\_n5-n14-n77 | n5 | 835 | 5 | 25 | 880 | 3.9 | FDD | IMD5 |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n77 | 4052 | 10 | 50 | 4052 | N/A | TDD | N/A |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n14 | 795.5 | 5 | 25 | 765.5 | 11.6 | FDD | IMD41 |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n5 | 835 | 5 | 25 | 880 | N/A | FDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n77 | 3298 | 10 | 50 | 3298 | 10.3 | TDD | IMD41 |
| CA\_n5-n25-n66 | n5 | 834 | 5 | 25 | 879 | N/A | FDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1712 | 5 | 25 | 2132 | 7.2 | FDD | IMD4 |
| CA\_n5-n25-n77 | n5 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n77 | 3540 | 10 | 50 | 3540 | 16.0 | TDD | IMD3 |
|  | n5 | 844 | 5 | 25 | 889 | 3.8 | FDD | IMD5 |
|  | n25 | 1907 | 5 | 25 | 1987 | N/A | FDD | N/A |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n25 | 1907 | 5 | 25 | 1987 | 16.5 | FDD | IMD3 |
|  | n77 | 3680 | 10 | 25 | 3680 | N/A | TDD | N/A |
| CA\_n5-n30-n66 | n5 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n30 | 2307.5 | 5 | 25 | 2352.5 | N/A | FDD | N/A |
|  | n66 | 1725 | 5 | 25 | 2125 | 4 | FDD | IMD5 |
| CA\_n5-n30-n77 | n5 | 835 | 5 | 25 | 880 | 15.2 | FDD | IMD3 |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3740 | 10 | 50 | 3740 | N/A | TDD | N/A |
|  | n5 | 835 | 5 | 25 | 880 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | 13.2 | FDD | IMD3 |
|  | n77 | 4025 | 10 | 50 | 4025 | N/A | TDD | N/A |
|  | n5 | 840 | 5 | 25 | 885 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3780 | 10 | 50 | 3780 | 16.1 | TDD | IMD3 |
| CA\_n5-n48-n66 | n5 | 829 | 5 | 25 | 874 | N/A | FDD | N/A |
|  | n48 | N/A | 10 | N/A | 3622 | 3.6 | TDD | IMD5 |
|  | n66 | 1760 | 5 | 216 | 2160 | N/A | FDD | N/A |
| CA\_n5-n66-n77 | n5 | 845 | 5 | 25 | 890 | N/A | FDD | N/A |
|  | n66 | 1775 | 5 | 25 | 2175 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3465 | 16.1 | TDD | IMD3 |
|  | n5 | 826.5 | 5 | 25 | 871.5 | N/A | FDD | N/A |
|  | n66 | 1712.5 | 5 | 25 | 2112.5 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 4192 | 8.2 | TDD | IMD45 |
|  | n5 | 835 | 5 | 25 | 880 | N/A | FDD | N/A |
|  | n66 | 1735 | 5 | 25 | 2135 | N/A | FDD | N/A |
|  | n77 | N/A | 10 | N/A | 3535 | 3.3 | TDD | IMD5 |
|  | n5 | 826.5 | 5 | 25 | 871.5 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2142 | 13.2 | FDD | IMD3 |
|  | n77 | 3795 | 10 | 50 | 3795 | N/A | TDD | N/A |

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| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n12-n30-n77 | n12 | 710 | 5 | 25 | 740 | 15.2 | FDD | IMD31 |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3880 | 10 | 50 | 3880 | N/A | TDD | N/A |
|  | n12 | 707.5 | 5 | 25 | 737.5 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | 13.2 | FDD | IMD3 |
|  | n77 | 3770 | 10 | 50 | 3770 | N/A | TDD | N/A |
|  | n12 | 707 | 5 | 25 | 737 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3913 | 10 | 50 | 3913 | 16.0 | TDD | IMD3 |
| CA\_n12-n66-n77 | n12 | 710 | 5 | 25 | 740 | 15.2 | FDD | IMD3 |
|  | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n77 | 4180 | 10 | 50 | 4180 | N/A | TDD | N/A |
|  | n12 | 707 | 5 | 25 | 737 | N/A | FDD | N/A |
|  | n66 | 1746 | 5 | 25 | 2146 | 13.2 | FDD | IMD3 |
|  | n77 | 3560 | 10 | 50 | 3560 | N/A | TDD | N/A |
|  | n12 | 704 | 5 | 25 | 734 | N/A | FDD | N/A |
|  | n66 | 1723 | 5 | 25 | 2123 | N/A | FDD | N/A |
|  | n77 | 4150 | 10 | 50 | 4150 | 16.0 | TDD | IMD31,2 |
| CA\_n14-n30-n77 | n14 | 793 | 5 | 25 | 763 | 15.2 | FDD | IMD31 |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3857 | 10 | 50 | 3857 | N/A | TDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | 13.2 | FDD | IMD3 |
|  | n77 | 3941 | 10 | 50 | 3941 | N/A | TDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n77 | 3896 | 10 | 50 | 3896 | 16.0 | TDD | IMD3 |
| CA\_n14-n66-n77 | n14 | 793 | 5 | 25 | 763 | 15.2 | FDD | IMD3 |
|  | n66 | 1712.5 | 5 | 25 | 2112.5 | N/A | FDD | N/A |
|  | n77 | 4188 | 10 | 50 | 4188 | N/A | TDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n66 | 1755 | 5 | 25 | 2155 | 13.2 | FDD | IMD3 |
|  | n77 | 3741 | 10 | 50 | 3741 | N/A | TDD | N/A |
|  | n14 | 793 | 5 | 25 | 763 | N/A | FDD | N/A |
|  | n66 | 1755 | 5 | 25 | 2155 | N/A | FDD | N/A |
|  | n77 | 3341 | 10 | 50 | 3341 | 16.0 | TDD | IMD31,2 |

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| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n25-n41-n66 | n25 | 1860 | 5 | 25 | 1940 | 11.0 | FDD | IMD4 |
|  | n41 | 2685 | 10 | 50 | 2685 | N/A | TDD | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n25-n66-n77 | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 29.2 | FDD | IMD2 |
|  | n77 | 4060 | 10 | 50 | 4060 | N/A | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 10.4 | FDD | IMD4 |
|  | n77 | 3540 | 10 | 50 | 3540 | 10 | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 4.0 | FDD | IMD5 |
|  | n77 | 3930 | 10 | 50 | 3930 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 32.1 | FDD | IMD2 |
|  | n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | 3700 | 10 | 50 | 3700 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 9.1 | FDD | IMD4 |
|  | n66 | 1770 | 5 | 25 | 2170 | N/A | FDD | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 2.1 | FDD | IMD5 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3620 | 10 | 50 | 3620 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | 3620 | 10 | 50 | 3620 | 29.4 | TDD | IMD2 |
|  | n25 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
|  | n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | 3340 | 10 | 50 | 3340 | 8.9 | TDD | IMD4 |
| CA\_n25-n66-n78 | n25 | 1880 | 5 | 25 | 1960 | N/A | FDD | N/A |
| n66 | 1740 | 5 | 25 | 2140 | N/A | FDD | N/A |
| n78 | N/A | 10 | N/A | 3620 | 29.4 | TDD | IMD2 |
| CA\_n25-n71-n77 | n25 | 1907.5 | 5 | 25 | 1987.5 | N/A | FDD | N/A |
|  | n71 | 695.5 | 5 | 25 | 649.5 | N/A | FDD | N/A |
|  | n77 | 3305 | 10 | 50 | 3305 | 8.0 | TDD | IMD31,2 |
|  | n25 | 1874 | 5 | 25 | 1954 | 16.5 | FDD | IMD32 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3340 | 10 | 50 | 3340 | N/A | TDD | N/A |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n28-n41-n79 | n28 | N/A | 5 | N/A | 780 | 13.0 | FDD | IMD31 |
|  | n41 | 2600 | 10 | 50 | 2600 | N/A | TDD | N/A |
|  | n79 | 4600 | 40 | 216 | 4600 | N/A | TDD | N/A |
|  | n28 | 720 | 5 | 25 | 780 | N/A | FDD | N/A |
|  | n41 | 2600 | 10 | 50 | 2600 | N/A | TDD | N/A |
|  | n79 | N/A | 40 | N/A | 4600 | 10.1 | TDD | IMD32 |
|  | n28 | 735 | 5 | 25 | 790 | N/A | FDD | N/A |
|  | n41 | N/A | 10 | N/A | 2645 | 10.4 | TDD | IMD4 |
|  | n79 | 4850 | 40 | 216 | 4850 | N/A | TDD | N/A |
| CA\_n28-n77-n79 | n77 | 3620 | 10 | 52 | 3620 | N/A | N/A | n77 |
|  | n79 | 4420 | 40 | 216 | 4420 | N/A | N/A | n79 |
|  | n28 | 745 | 5 | 25 | 800 | 16.2 | IMD21,2 | n28 |
| CA\_n30-n66-n77 | n30 | 2310 | 5 | 25 | 2355 | 29.2 | FDD | IMD21 |
|  | n66 | 1745 | 5 | 25 | 2145 | N/A | FDD | N/A |
|  | n77 | 4100 | 10 | 50 | 4100 | N/A | TDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 8.7 | FDD | IMD4 |
|  | n77 | 3390 | 10 | 50 | 3390 | N/A | TDD | N/A |
|  | n30 | 2310 | 5 | 25 | 2355 | N/A | FDD | N/A |
|  | n66 | 1745 | 5 | 25 | 2145 | N/A | FDD | N/A |
|  | n77 | 4055 | 10 | 50 | 4055 | 28.4 | TDD | IMD21 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n41-n66-n77 | n41 | 2560 | 5 | 25 | 2560 | N/A | TDD | N/A |
|  | n66 | 1730 | 5 | 25 | 2130 | N/A | FDD | N/A |
|  | n77 | 3390 | 10 | 50 | 3390 | 16.1 | TDD | IMD31,2 |
|  | n41 | 2670 | 5 | 25 | 2670 | 5.2 | TDD | IMD5 |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |
|  | n77 | 4190 | 10 | 50 | 4190 | N/A | TDD | N/A |
|  | n41 | 2530 | 5 | 25 | 2530 | N/A | TDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 9.0 | FDD | IMD4 |
|  | n77 | 3610 | 10 | 50 | 3610 | N/A | TDD | N/A |
| CA\_n41-n71-n77 | n41 | 2615 | 5 | 25 | 2615 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | 29.1 | TDD | IMD21 |
|  | n41 | 2615 | 5 | 25 | 2615 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 4001 | 10 | 50 | 4001 | 16.3 | TDD | IMD31 |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3774 | 10 | 50 | 3774 | 10.3 | TDD | IMD41 |
|  | n41 | 2615 | 5 | 25 | 2615 | 28.7 | TDD | IMD2 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | N/A | TDD | N/A |
|  | n41 | 2615 | 5 | 25 | 2615 | 15.5 | TDD | IMD3 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 4001 | 10 | 50 | 4001 | N/A | TDD | N/A |
|  | 41 | 2642 | 5 | 25 | 2642 | N/A | TDD | N/A |
|  | n71 | 743 | 5 | 25 | 798 | 30.8 | FDD | IMD2 |
|  | n77 | 3440 | 10 | 50 | 3440 | N/A | TDD | N/A |
| CA\_n48-n66-n70 | n48 | 3625 | 10 | 50 | 3625 | N/À | TDD | N/A |
|  | n66 | 1742.5 | 5 | 25 | 2142.5 | 2.8 | FDD | IMD5 |
|  | n70 | 1702.5 | 5 | 25 | 2002.5 | N/A | FDD | N/A |
| CA\_n48-n66-n71 | n48 | 3552.5 | 10 | 50 | 3552.5 | N/A | TDD | N/A |
|  | n66 | 1761.5 | 5 | 25 | 2161.5 | 14.4 | FDD | IMD3 |
|  | n71 | 695.5 | 5 | 25 | 649.5 | N/A | FDD | N/A |
|  | n48 | 3695 | 10 | 50 | 3695 | 5.2 | TDD | IMD4 |
|  | n66 | 1712.5 | 5 | 25 | 2112.5 | N/A | FDD | N/A |
|  | n71 | 665.5 | 5 | 25 | 619.5 | N/A | FDD | N/A |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n48-n70-n71 | n48 | 3694 | 10 | 50 | 3694 | 9 | TDD | IMD41 |
|  | n70 | 1697.5 | 5 | 25 | 1997.5 | N/A | FDD | N/A |
|  | n71 | 665.5 | 5 | 25 | 619.5 | N/A | FDD | N/A |
| CA\_n66-n71-n77 | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n71 | 668 | 5 | 25 | 622 | N/A | FDD | N/A |
|  | n77 | 4108 | 10 | 50 | 4108 | 15.9 | TDD | IMD31,2 |
|  | n66 | 1760 | 5 | 25 | 2160 | 15.5 | FDD | IMD32 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3546 | 10 | 50 | 3546 | N/A | TDD | N/A |
|  | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n71 | 686 | 5 | 25 | 640 | 15.3 | FDD | IMD3 |
|  | n77 | 4080 | 10 | 50 | 4080 | N/A | TDD | N/A |
| CA\_n66-n71-n78 | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
| n71 | 668 | 5 | 25 | 622 | N/A | FDD | N/A |
| n78 | N/A | 10 | N/A | 3724 | 9 | TDD | IMD41 |
| n66 | N/A | 5 | N/A | 2160 | 15.5 | FDD | IMD3 |
| n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
| n78 | 3546 | 10 | 50 | 3546 | N/A | TDD | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 2: This band is subject to IMD4 also which MSD is not specified.  NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  NOTE 4: This band is subject to IMD3 also which MSD is not specified.  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped.  NOTE 6: Both of the transmitters shall be set min(+20 dBm, PCMAX\_L,f,c) as defined in clause 6.2A.4 | | | | | | | | |

Table 7.3A.0.5-2a: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCR | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n2A-n5A-n77A | n2 | 1907.5 | 5 | 25 | 1987.5 | N/A | FDD | N/A |
|  | n5 | N/A | 5 | N/A | 887.5 | 13.6 | FDD | IMD55 |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1987 | 24.8 | FDD | IMD35 |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n77 | 3680 | 10 | 50 | 3680 | N/A | TDD | N/A |
| CA\_n2-n66-n77 | n2 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2115 | 34.7 | FDD | IMD21,2 |
|  | n77 | 3970 | 10 | 50 | 3970 | N/A | TDD | N/A |
|  | n2 | N/A | 5 | N/A | 1960 | 37.6 | FDD | IMD21,2 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
| CA\_n5-n66-n77 | n5 | 826.5 | 5 | 25 | 871.5 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2142 | 22.2 | FDD | IMD3 |
|  | n77 | 3795 | 10 | 50 | 3795 | N/A | TDD | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 2: This band is subject to IMD4 also which MSD is not specified.  NOTE 3: FFS  NOTE 4: FFS  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 of 38.101-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 7.3A.0.6 Reference sensitivity exceptions due to cross band isolation for CA

Sensitivity degradation is allowed for a band if it is impacted by UL of another band part which belongs to NR band of the same NR CA configuration due to cross band isolation issues. The reference sensitivity degradation for the victim band due to cross band isolation is specified only for the specific uplink and downlink test points specified in Table 7.3A.0.6-1 for either PC3 and PC2 NR CA from a PC3 aggressor NR UL band

In Tables 7.3A.0.6-1 the following terminology is used to define the source of cross-band isolation interference:

- "ACLR1" indicates that the first adjacent channel of the aggressor UL band falls into the Rx channel of victim band.

- "ACLR2" indicates that the second adjacent channel of the aggressor UL band falls into the Rx channel of victim band.

">ACLR2" indicates that neither the first, nor the second adjacent channel of the aggressor UL band falls into the Rx channel of victim band.

Table 7.3A.0.6-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC3 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n1 | n3 | 1922.5 | 5 | 15 | 25 (RBstart=0) | 1877.5 | 5 | 3 | >ACLR2 |
| n1 | n3 | 1945 | 50 | 15 | 128 (RBstart=0) | 1877.5 | 5 | 19.7 | ACLR1 |
| n1 | n41 | 1955 | 50 | 15 | 128 (RBstart=142) | 2501 | 10 | 6.1 | >ACLR2 |
| n1 | n41 | 1970 | 20 | 15 | 100 (RBstart=6) | 2546 | 100 | 0.7 | >ACLR2 |
| n3 | n41 | 1765 | 40 | 15 | 50 (RBstart=166) | 2501 | 10 | 0.7 | >ACLR2 |
| n3 | n41 | 1765 | 40 | 15 | 50 (RBstart=166) | 2546 | 100 | 0.7 | >ACLR2 |
| n41 | n1 | 2546 | 100 | 30 | 270 (RBstart=0) | 2167.5 | 5 | 18.1 | >ACLR2 |
| n41 | n3 | 2546 | 100 | 30 | 270 (RBstart=0) | 1877.5 | 5 | 0.6 | >ACLR2 |
| n411 | n66 | 2546 | 100 | 30 | 270 (RBstart=0) | 2197.5 | 5 | 10.5 | >ACLR2 |
| n41 | n77 | 2640 | 100 | 30 | 270 (RBstart=3) | 3305 | 10 | 8.3 | >ACLR2 |
| n71 | n29 | 688 | 20 | 15 | 20 (RBstart=86) | 719.5 | 5 | 17.5 | ACLR2 |
| n77 | n411 | 3350 | 100 | 30 | 270 (RBstart=0) | 2685 | 10 | 4.5 | >ACLR2 |
| n77 | n411 | 3350 | 100 | 30 | 270 (RBstart=0) | 2640 | 100 | 4.5 | >ACLR2 |
| n78 | n71 | 3350 | 100 | 30 | 270 (RBstart=0) | 2687.5 | 5 | 4.5 | >ACLR2 |
| n783 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4420 | 40 | 2 | >ACLR2 |
| n783 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4450 | 100 | 2 | >ACLR2 |
| n79 | n783 | 4450 | 100 | 30 | 270 (RBstart=0) | 3795 | 10 | 2.6 | >ACLR2 |
| n79 | n783 | 4450 | 100 | 30 | 270 (RBstart=0) | 3750 | 100 | 2.6 | >ACLR2 |
| NOTE 1: Applicable only when harmonic mixing MSD for this combination is not applied.  NOTE 2: Void  NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  NOTE 4: Void  NOTE 5: The MSD exceptions are applicable to the case that interference of UL band 3rd order IMD product falls into the affected DL channels. | | | | | | | | | |

Table 7.3A.0.6-2: Void

Table 7.3A.0.6-3: Void

Table 7.3A.0.6-3a: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n41 | n3 | 2546 | 100 | 30 | 270 (RBstart=0) | 1877.5 | 5 | 2.3 | >ACLR2 |
| n41 | n79 | 2640 | 100 | 30 | 270 (RBstart=3) | 4405 | 10 | 3.1 | >ACLR2 |
| n77 | n2 | 3305 | 100 | 30 | 270 (RBstart=0) | 1987.5 | 5 | 1.0 | >ACLR2 |
| n77 | n66 | 3350 | 100 | 30 | 270 (RBstart=0) | 2197.5 | 5 | 1.0 | >ACLR2 |
| n79 | n41 | 4450 | 100 | 30 | 270 (RBstart=0) | 2685 | 10 | 3.5 | >ACLR2 |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3.A.

### 7.3A.1 Reference sensitivity power level for 2DL CA without exception

7.3A.1.1 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 when no CA exceptions are allowed and single carrier requirements apply.

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

7.3A.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 2DL CA.

7.3A.1.3 Minimum requirements

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

7.3A.1.4 Test description

7.3A.1.4.1 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 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3. 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.1.4.1-1: Test Configuration Table for intra-band contiguous 2DL CA without exception

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 | | | | Low range, High range | | |
| Test CC Combination setting (NRB\_agg) as specified in subclause Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | Lowest NRB\_agg, Highest NRB\_agg  (NOTE 3) | | |
| Test SCS as specified in Table 5.3.5-1 | | | | Lowest | | |
| Test Parameters CA Configurations | | | | | | |
| CA Configuration /NRB | | DL Allocation | | UL Allocation | | |
| PCC NRB | SCC  NRB | CC MOD | PCC & SCC RB allocation | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| Lowest NRB\_agg  (NOTE 4) | Lowest NRB\_agg  (NOTE 4) | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| Highest NRB\_agg  (NOTE 4) | Highest NRB\_agg  (NOTE 4) | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS | - |
| 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 CA\_n66B configuration with the same NRB\_agg CC combination, PCC shall be selected as the lower CH BW  Note 5: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected. | | | | | | |

Table 7.3A.1.4.1-2: Test Configuration Table for inter-band 2DL CA without exception

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | | | | | | | Mid range for PCC and SCC with exceptions for CA configurations containing the following band combinations (Note 8):  CA\_n1-n77: Mid in band n1 and Low in band n77  CA\_n2-n77: UL and DL Mid in band n2 and band n77 at 3850MHz  CA\_n3-n77: Mid in band 3 and High in band 77.  CA\_n8-nX: Low range for PCC in Band 8  CA\_n14-n77: Mid in band n14 and Low in band n77  CA\_n70-n71: High range for PCC in band 71.  CA\_n3-n78: Mid in band 3 and High in band 78.  CA\_n5-n78: Mid in band 5 and High in band 78  CA\_n29-n71: Low in band 29 and High in band 71.  CA\_n41-n71: Low in band 41 and Low in band 71. | | | | | |
| Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | Refer to “PCC NRB”and “SCC NRB ” columns | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | Lowest | | | | | |
| Network signalling value | | | | | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | |
| ID | CA Configuration / CBW | | | | | | DL Allocation | | | UL Allocation (Note 2,3) | | |
| CA Configuration | | | | PCC NRB | SCC NRB | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | SCC | | PCC | SCC |
| Band | Range | Band | Range |
| Default Test Settings for a CA\_nXA-nYA Configuration | | | | | | | | | | | | |
| 1 | nX | default | nY | default | Highest (Note 6) | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | nX | default | Highest (Note 6) | Highest | 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: 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: X,Y correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A, X=1, Y=3.  Note 4: REFSENS refers to the PCC bands and PCC NRB 's single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.  Note 5: For band combinations including operating band without uplink band (as noted in Table 5.2-1), only the CA configuration where PCC band has uplink band shall be tested.  Note 6: Each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first.  Note 7: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.  Note 8: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  Note 9: CA\_n29A-n71A testpoint 2, is tested according to reference sensitivity levels specified in Clause 7.3A.1\_1.5 due to cross band isolation exception specified in Table 7.3A.0.6-3. Testpoint 1 is not applicable due to SDL.  Note 10: CA\_n41A-n66A, testpoint 1, is tested according to reference sensitivity levels specified in Clause 7.3A.1\_1.5 due to cross band isolation exception specified in Table 7.3A.0.6-3. Testpoint 2 (UL on n66) shall be tested in this testcase. | | | | | | | | | | | | |

Table 7.3A.1.4.1-3: Test Configuration Table for intra-band non-contiguous 2DL CA without exception

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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. | | | | | | |
| Test CC Combination setting (CBW) as specified in subclause Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | | | Refer to “PCC NRB”and “SCC NRB ” columns | | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | | Lowest | | | | | | |
| Network signalling value | | | | | | | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | |
| ID |  | | CA Configuration / CBW | | | | | | DL Allocation | | | | UL Allocation (Note 2,3) | | |
| CA Configuration | | | | | PCC | Wgap / [MHz] | SCC | | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | | SCC | | PCC | SCC |
| Band | Range | | Band | Range |
| Default Test Settings for a CA\_nX(2A) Configuration | | | | | | | | | | | | | | | |
| 1 | nX | CC1 | | nX | CC2 | Highest | Max (NOTE 4) | Lowest | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nX | CC1 | | nX | CC2 | Highest NRB\_agg (NOTE 5) | Max (NOTE 4) | Highest NRB\_agg(NOTE 5) | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| Test Settings for a CA\_n2(2A) Configuration | | | | | | | | | | | | | | | |
| 1 | n2 | CC1 | | n2 | CC2 | 5MHz | 30.0  (NOTE 7) | 5MHz | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | 25@0 | - |
| Test Settings for a CA\_n71(2A) Configuration | | | | | | | | | | | | | | | |
| 1 | n71 | CC1 | | n71 | CC2 | 5MHz | 5.0  (NOTE 8) | 5MHz | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | 20@0 | - |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  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: REFSENS refers to the PCC bands and PCC NRB ‘s single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3.  Note 4: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration  Note 5: 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 6: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.  Note 7: The Wgap is centered in the middle of the band. Specific frequency parameters are defined in Table 7.3A.1.4.1-3a.  Note 8: The Wgap is centered in the middle of the band. Specific frequency parameters are defined in Table 7.3A.1.4.1-3b. | | | | | | | | | | | | | | | |

Table 7.3A.1.4.1-3a: Test Frequencies for NR Intra-Band non-contiguous CA configuration CA\_n2(2A), SCS=15 kHz, Wgap = 30MHz

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL/DL Bandwidth  combination | CBW [MHz] | carrierBandwidth  [PRBs] | Range | | Carrier centre  [MHz] | Carrier centre  [ARFCN] | point A [MHz] | absoluteFrequencyPointA [ARFCN] | offsetToCarrier [Carrier PRBs] | SS block SCS  [kHz] | GSCN | absoluteFrequencySSB  [ARFCN] |  | Offset Carrier CORESET#0  [RBs]  Note 2 | CORESET#0 Index (Offset  [RBs])  Note 1 | offsetToPointA (SIB1)  [PRBs]  Note 1 |
| 5/5 | 5 | 25 | Downlink | SB1 | 1942.5 | 388500 | 1940.25 | 388050 | 0 | 15 | 4857 | 388590 | 0 | 1 | 2 (4) | 5 |
|  |  |  |  | SB2 | 1977.5 | 395500 | 1884.53 | 376906 | 504 |  | 4943 | 395530 | 4 | 1 | 1 (2) | 507 |
|  | 5 | 25 | Uplink | SB1 | 1862.5 | 372500 | 1860.25 | 372050 | 0 | - | - | - | - | - | - | - |
|  |  |  |  | SB2 | 1897.5 | 379500 | 1894.17 | 378834 | 6 |  | - | - | - | - | - | - |

Table 7.3A.1.4.1-3b: Test Frequencies for NR Intra-Band non-contiguous CA configuration CA\_n71(2A), SCS=15 kHz, Wgap = 5MHz

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL/DL Bandwidth  combination | CBW [MHz] | carrierBandwidth  [PRBs] | Range | | Carrier centre  [MHz] | Carrier centre  [ARFCN] | point A [MHz] | absoluteFrequencyPointA [ARFCN] | offsetToCarrier [Carrier PRBs] | SS block SCS  [kHz] | GSCN | absoluteFrequencySSB  [ARFCN] |  | Offset Carrier CORESET#0  [RBs]  Note 2 | CORESET#0 Index (Offset  [RBs])  Note 1 | offsetToPointA (SIB1)  [PRBs]  Note 1 |
| 5/5 | 5 | 25 | Downlink | SB1 | 629.5 | 125900 | 627.25 | 125450 | 0 | 15 | 1573 | 125810 | 0 | 0 | 0 (0) | 0 |
|  |  |  |  | SB2 | 639.5 | 127900 | 546.53 | 109306 | 504 |  | 1598 | 127930 | 4 | 1 | 1 (2) | 507 |
|  | 5 | 25 | Uplink | SB1 | 675.5 | 135100 | 673.25 | 134650 | 0 | - | - | - | - | - | - | - |
|  |  |  |  | SB2 | 685.5 | 137100 | 682.17 | 136434 | 6 |  | - | - | - | - | - | - |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3.

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 7.3A.1.4.3*.*

7.3A.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.1.4.3.

3. SS activates SCC 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 Tables 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3 on both PCC and SCC. 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 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1, 7.3.2.5-2. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.1.4.3 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.

7.3A.1.5 Test requirement

For 2DL carrier aggregation, test parameters are specified in table 7.3A.1.4.1-1, 7.3A.1.4.1-2 and 7.3A.1.4.1-3. For the CA configurations listed in table 7.3A.1.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with reference power level specified in table 7.3.2.5-1 for non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

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.

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by ΔRIB,c defined in clause 7.3A.0.3 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

For intra-band non-contiguous 2 DL CA, the test requirement for shall be increased by ΔRIBNC given in Table 7.3A.0.2.2-1 for the SCC. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS\_01 (Table 6.2.3.1-1) configured.

Table 7.3A.1.5-1: Reference sensitivity requirement for 2DL CA

|  |  |  |
| --- | --- | --- |
| Carrier aggregation type | DL CA configuration | UL CA configuration |
|  | CA\_n41C | - |
|  | CA\_n48B | - |
| Intra-band contiguous 2DL CA | CA\_n66B | - |
|  | CA\_n77C | - |
|  | CA\_n78B | - |
|  | CA\_n78C | - |
|  | CA\_n48(2A) | - |
|  | CA\_n2(2A) | - |
|  | CA\_n66(2A) | - |
| Intra-band non-contiguous 2DL CA | CA\_n77(2A) | - |
|  | CA\_n78(2A) | - |
|  | CA\_n71(2A) | - |
|  | CA\_n1A-n3A |  |
|  | CA\_n1A-n8A | - |
|  | CA\_n1A-n28A | - |
|  | CA\_n1A-n41A |  |
|  | CA\_n1A-n77A | - |
|  | CA\_n1A-n78A | - |
|  | CA\_n2A-n5A |  |
|  | CA\_n2A-n14A |  |
|  | CA\_n2A-n48A | - |
|  | CA\_n2A-n66A | - |
|  | CA\_n2A-n77A | - |
|  | CA\_n3A-n5A |  |
|  | CA\_n3A-n8A | - |
|  | CA\_n3A-n28A | - |
|  | CA\_n3A-n41A |  |
|  | CA-n3A-n77A | - |
| Inter-band 2DL CA | CA\_n3A-n78A | - |
|  | CA\_n5A-n48A |  |
|  | CA\_n5A-n66A | - |
|  | CA\_n5A-n77A | - |
|  | CA\_n5A-n78A |  |
|  | CA\_n8A-n78A | - |
|  | CA\_n14A-n30A |  |
|  | CA\_n14A-n66A |  |
|  | CA\_n14A-n77A |  |
|  | CA\_n20A-n78A | - |
|  | CA\_n24A-n41A |  |
|  | CA\_n24A-n48A |  |
|  | CA\_n24A-n77A |  |
|  | CA\_n25A-n77A | - |
|  | CA\_n25A-n78A | - |
|  | CA\_n28A-n41A | - |
|  | CA\_n28A-n77A | - |
|  | CA\_n28A-n78A | - |
|  | CA\_n28A-n79A | - |
|  | CA\_n39A-n41A |  |
|  | CA\_n41A-n66A (Note 1) | - |
|  | CA\_n41A-n71A | - |
|  | CA\_n41A-n77A |  |
|  | CA\_n41A-n79A | - |
|  | CA\_n48A-n77A | - |
|  | CA\_n66A-n70A | - |
|  | CA\_n66A-n71A | - |
|  | CA\_n66A-n77A |  |
|  | CA\_n66A-n78A | - |
|  | CA\_n70A-n71A | - |
|  | CA\_n71A-n77A | - |
|  | CA\_n71A-n78A | - |
| SDL configuration | CA\_n29A-n66A | - |
|  | CA\_n29A-n70A | - |
|  | CA\_n29A-n71A (NOTE 1) | - |
| Note 1: Configuration has sensitivity exceptions according to notes in table 7.3A.1.4.1-2. Other Rx cases shall be tested with reference sensitivity levels defined in Clause 7.3A.1\_1  Note 2: CA\_n41A-66A testpoint 1, reference sensitivity requirement is tested in Clause 7.3A.1\_1 due to cross band isolation exception specified in Table 7.3A.0.6-3. Other Rx cases using configuration for testpoint 1 shall be tested with reference sensitivity levels defined in Clause 7.3A.1\_1.5. | | |

Table 7.3A.1.5-2: Reference sensitivity for SDL bands

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | SCS (kHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB | dB |
| n29 | 15 | -97.0 +TT | -93.8 +TT |  |  |  |  |  |  |  |  |  |  |
| 30 |  | -94.1 +TT |  |  |  |  |  |  |  |  |  |  |
| Note 1: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | | | | | | | | | | |

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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 parameters specified in Table 7.3.2.4.1-1, Table 7.3.2.4.1-2, Table 7.3.2.4.1-3, Table 7.3.2.5-1, Table 7.3.2.5-2 and Table 7.3A.1.4-1 with the reference sensitivity power level increased by ΔRIBNC given in Table 7.3A.0.2.2-1 for the SCC(s). For aggregation of two downlink FDD carriers with one uplink carrier the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3A.0.2.2-1. The requirements apply with all downlink carriers active. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS\_01 (Table 6.2.3.1-1) configured.

For band combinations including operating bands without uplink band (as noted in Table 5.2-1), the requirements are specified in Table 7.3A.1.5-1 and for any band with uplink the uplink configuration specified in Table 7.3.2.4.1-2. 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). The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active.

### 7.3A.1\_1 Reference sensitivity power level for 2DL CA exceptions

Editor’s Note: The following aspects are either missing or not yet determined:

- Test point analysis for CA\_n3A-n5A IMD2 and IMD4 is currently missing in TR 38.905.

7.3A.1\_1.1 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 when CA exceptions are allowed.

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

7.3A.1\_1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 2DL CA

7.3A.1\_1.3 Minimum requirements

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

7.3A.1\_1.4 Test description

7.3A.1\_1.4.1 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 7.3A.1\_1.4.1-1. 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.1\_1.4.1-1: Test Configuration Table for inter-band 2DL CA 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. | | | | | |
| Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE | | | | | | | Refer to “PCC”and “SCC” columns | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | Lowest | | | | | |
| Network signalling value | | | | | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | |
| ID | CA Configuration / CBW | | | | | | DL Allocation | | | UL Allocation (Note 2) | | |
| CA Configuration | | | | PCC | SCC | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | SCC | | PCC | SCC |
| Band | Range | Band | Range |
| Test Settings for CA\_n1A-n3A Configuration | | | | | | | | | | | | |
| 1 | n1 | 1950 MHz  (UL) | n3 | 1760  MHz | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n1 | Low | n3 | High | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 3 | n1 | Low | n3 | High | 50MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| Test Settings for CA\_n1A-n8A Configuration | | | | | | | | | | | | |
| 1 | n1 | 1965 MHz  (UL) | n8 | 887.5  MHz | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n1A-n28A Configuration | | | | | | | | | | | | |
| 1 | n1 | 2139 MHz | n28 | 713 MHz (UL) | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n1 | 2139 MHz | n28 | 713 MHz (UL) | 50 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| **Test Settings for CA\_n1A-n41A Configuration** | | | | | | | | | | | | |
| 1 | n1 | 1955 MHz  (UL) | n41 | 2501  MHz | 50 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 2 | n1 | 1970 MHz  (UL) | n41 | 2546  MHz | 20 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 3 | n41 | 2546  MHz | n1 | 2167.5  MHz  (UL) | 30 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| Test Settings for CA\_n1A-n77A Configuration | | | | | | | | | | | | |
| 1 | n1 | Mid | n77 | 3900 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n1 | Mid | n77 | 3900 MHz | 20 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n1 | Mid | n77 | 3875 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test Parameters for CA Configurations | | | | | | | | | | | | |
| ID | CA Configuration / CBW | | | | | | DL Allocation | | | UL Allocation (Note 2) | | |
| CA Configuration | | | | PCC | SCC | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | SCC | | PCC | SCC |
| Band | Range | Band | Range |
| Test Settings for CA\_n1A-n78A Configuration | | | | | | | | | | | | |
| 1 | n1 | 1950 MHz  (UL) | n78 | 3710 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n2A-n48A Configuration | | | | | | | | | | | | |
| 1 | n2 | 1860 MHz  (UL) | n48 | 3690 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n2 | UL 1852.5/DL 1932.5 | n48 | 3625 MHz | 5 MHz | 20 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n2A-n66A Configuration** | | | | | | | | | | | | |
| 1 | n2 | UL 1855/DL 1935 | n66 | UL 1775/DL 2175 | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n2 | UL 1883.3/DL 1963.3 | n66 | UL 1750/DL 2150 | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n2A-n77A Configuration | | | | | | | | | | | | |
| 1 | n2 | 1880 MHz (UL) | n77 | 3760 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n2 | 1880 MHz (UL) | n77 | 3760 MHz | 10 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n2 | 1880 MHz (UL) | n77 | 3735 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n77 | 3920 MHz | n2 | DL Mid | 10 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 5 | n77 | 3920 MHz | n2 | DL Mid | 20 MHz | 20 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 6 | n2 | UL 1855/DL 1935 | n77 | 3790 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 7 | n2 | UL 1900/DL 1980 | n77 | 3720 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 8 | n2 | UL 1885/DL 1965 | n77 | 3810 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 95 | n2 | 1987.5 MHz (DL) | n77 | 3305 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_4 |
| **Test Settings for CA\_n3A-n5A Configuration** | | | | | | | | | | | | |
| 1 | n3 | TBD | n77 | TBD | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 2 | n3 | 1721  MHz  (UL) | n5 | 838  MHz | 10 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n3A-n8A Configuration** | | | | | | | | | | | | |
| 1 | n3 | 1755MHz | n8 | 900MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n3 | Mid | n8 | Mid | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n3A-n41A Configuration** | | | | | | | | | | | | |
| 1 | n3 | 1740 MHz (UL) | n41 | 2657.5 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n41 | 2546 MHz (UL) | n3 | 1877.5 MHz | 100 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| **Test Settings for CA\_n3A-n77A Configuration** | | | | | | | | | | | | |
| 1 | n3 | Mid | n77 | 3495 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 2 | n3 | Mid | n77 | 3495 MHz | 10 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 3 | n3 | Mid | n77 | 3470 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 4 | n3 | 1740 MHz (UL) | n77 | 3575 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 5 | n3 | 1765 MHz (UL) | n77 | 3435 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n3A-n78A Configuration** | | | | | | | | | | | | |
| 1 | n3 | Mid | n78 | 3495 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n3 | Mid | n78 | 3495 MHz | 10 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n3 | Mid | n78 | 3470 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n3 | 1740 MHz (UL) | n78 | 3575 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 5 | n3 | 1765 MHz (UL) | n78 | 3435 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 65 | n78 | 3685 MHz | n3 | DL Mid | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 75 | n78 | 3685 MHz | n3 | DL Mid | 40 MHz | 40 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| Test Settings for a CA\_n5A-n66A Configuration | | | | | | | | | | | | |
| 1 | n5 | UL 838/DL 883 | n66 | UL 1721/DL 2121 | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for a CA\_n5A-n77A Configuration | | | | | | | | | | | | |
| 1 | n5 | 836.5 MHz  (UL) | n77 | 3346 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n5 | 846.5 MHz  (UL) | n77 | 3386 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n5 | 826.5 MHz  (UL) | n77 | 4132.5 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n5 | 826.5 MHz  (UL) | n77 | 4132.5 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 5 | n77 | 3526 MHz | n5 | DL Mid | 20 MHz | 20 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 6 | n77 | 3526 MHz | n5 | DL Mid | 10 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 7 | n5 | UL 844/ DL 889 | n77 | 3421 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 8 | n5 | UL 829/ DL 874 | n77 | 4190 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |

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| Test Parameters for CA Configurations | | | | | | | | | | | | |
| ID | CA Configuration / CBW | | | | | | DL Allocation | | | UL Allocation (Note 2) | | |
| CA Configuration | | | | PCC | SCC | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | SCC | | PCC | SCC |
| Band | Range | Band | Range |
| Test Settings for CA\_n5A-n78A Configuration | | | | | | | | | | | | |
| 1 | n5 | Mid | n78 | 3346 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n5 | 846.5 MHz (UL) | n78 | 3386 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| Test Settings for CA\_n7A-n78A Configuration | | | | | | | | | | | | |
| 1 | n78 | 3350 MHz | n7 | 2687.5 MHz | 100 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| Test Settings for CA\_n8A-n78A Configuration | | | | | | | | | | | | |
| 1 | n8 | Mid | n78 | 3590 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n8 | Mid | n78 | 3590 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n8 | 897.5 MHz (UL) | n78 | 3635 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n14A-n77A Configuration** | | | | | | | | | | | | |
| 1 | n14 | Mid | n77 | 3965 MHz | 5 Mhz | 10 Mhz | CP-OFDM QPSK | 10@0 | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n14 | Mid | n77 | 3965 MHz | 5 Mhz | 100 Mhz | CP-OFDM QPSK | 20@0 | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n14 | 793 MHz (UL) | n77 | 3935 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 4 | n77 | 3815 MHz | n14 | Mid | 10 MHz | 5 MHz | CP-OFDM QPSK | 25@0 | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_2 |
| 5 | n77 | 3815 MHz | n14 | Mid | 10 MHz | 10 MHz | CP-OFDM QPSK | 50@0 | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_2 |
| Test Settings for CA\_n20A-n78A Configuration | | | | | | | | | | | | |
| 1 | n20 | Mid | n78 | High | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 2 | n20 | Mid | n78 | 3388 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 3 | n20 | 850 MHz (UL) | n78 | 3359 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 |  |
| Test Settings for CA\_n25A-n77A Configuration | | | | | | | | | | | | |
| 1 | n25 | 1882.5 MHz (UL) | n77 | 3765 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n25 | 1882.5 MHz (UL) | n77 | 3765 MHz | 10 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n25 | 1852.5 MHz (UL) | n77 | 3680 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n25 | 1962.5 MHz | n77 | 3925 MHz (UL) | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_2 |
| 5 | n25 | 1962.5 MHz | n77 | 3925 MHz (UL) | 40 MHz | 20 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_2 |
| Test Settings for CA\_n25A-n78A Configuration | | | | | | | | | | | | |
| 1 | n25 | 1882.5 MHz (UL) | n78 | 3765 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n25 | 1882.5 MHz (UL) | n78 | 3765 MHz | 10 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n25 | 1852.5 MHz (UL) | n78 | 3680 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| Test Settings for CA\_n26A-n66A Configuration | | | | | | | | | | | | |
| 1 | n66 | 1721 MHz (UL) | n26 | 838 MHz (UL) | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n26A-n70A Configuration | | | | | | | | | | | | |
| 1 | n70 | 1707.5 MHz (UL) / 2007.5 MHz (DL) | n26 | 831 MHz (UL) / 876 MHz (DL) | 5 MHz UL / 5 MHz DL | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n28A-n77A Configuration** | | | | | | | | | | | | |
| 1 | n28 | 705.5 MHz (UL) | n77 | 3527.5 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 2 | n28 | 705.5 MHz (UL) | n77 | 3527.5 MHz | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 |  |
| 3 | n28 | 705.5 MHz (UL) | n77 | 3587.5 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n28A-n78A Configuration | | | | | | | | | | | | |
| 1 | n28 | 705.5 MHz (UL) | n78 | 3527.5 MHz | 5 MHz | 10MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n28 | 705.5 MHz (UL) | n78 | 3527.5 MHz | 5 MHz | 100MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n28 | 705.5 MHz | n78 | 3527.5 MHz (UL) | 5 MHz | 10MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | - | REFSENS\_CA\_2 |
| Test Settings for CA\_n29A-n71A Configuration | | | | | | | | | | | | |
| 1 | n71 | High | n29 | Low | 20 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 |  |

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| Test Parameters for CA Configurations | | | | | | | | | | | | |
| ID | CA Configuration / CBW | | | | | | DL Allocation | | | UL Allocation (Note 2) | | |
| CA Configuration | | | | PCC | SCC | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | SCC | | PCC | SCC |
| Band | Range | Band | Range |
| Test Settings for a CA\_n41A-n66A Configuration | | | | | | | | | | | | |
| 1 | n41 | 2546 MHz | n66 | 2197.5 MHz | 100 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| **Test Settings for CA\_n41A-n71A Configuration** | | | | | | | | | | | | |
| 1 | n71 | Low | n41 | 2662 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n71 | Low | n41 | High | 5 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| **Test Settings for CA\_n41A-n77A Configuration** | | | | | | | | | | | | |
| 1 | n77 | 3960 MHz | n41 | 2640 MHz | 20 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 2 | n77 | 3960 MHz | n41 | 2640 MHz | 20 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_2 | - |
| 3 | n41 | 2545 MHz | n77 | 3305 MHz | 60 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 4 | n41 | 2625 MHz | n77 | 3305 MHz | 100 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 5 | n41 | 2640 MHz | n77 | 3305 MHz | 100 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 6 | n77 | 3350 MHz | n41 | 2685 MHz | 100 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 7 | n77 | 3350 MHz | n41 | 2640 MHz | 100 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| **Test Settings for CA\_n41A-n79A Configuration** | | | | | | | | | | | | |
| 15 | n41 | 2640 MHz | n79 | 4405 MHz | 100 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| 25 | n79 | 4450 MHz | n41 | 2685 MHz | 100 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_4 | - |
| Test Settings for CA\_n48A-n66A Configuration | | | | | | | | | | | | |
| 1 | n66 | 1730 MHz (UL) | n48 | 3660 MHz (UL) | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n66 | High | n48 | 3555 MHz | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n66 | High | n48 | Low | 40 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n66 | 1777.5 MHz | n48 | 3580 MHz | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| Test Settings for CA\_n48A-n70A Configuration | | | | | | | | | | | | |
| 1 | n48 | 3695 MHz (UL) | n70 | 1697.5 MHz (UL) | 10 MHz | 15 MHz UL / 25 MHz DL | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Test Settings for CA\_n66A-n71A Configuration | | | | | | | | | | | | |
| 1 | n66 | 1750 MHz (UL) | n71 | 675 MHz (UL) | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n66A-n77A Configuration** | | | | | | | | | | | | |
| 1 | n66 | 1750 MHz  (UL) | n77 | 3500 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n66 | 1750 MHz (UL) | n77 | 3500 MHz | 20 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n66 | 1712.5 MHz  (UL) | n77 | 3400 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 4 | n66 | UL 1775/ DL 2175 | n77 | 3950 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 5 | n66 | UL 1760/ DL 2160 | n77 | 3720 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n66A-n78A Configuration** | | | | | | | | | | | | |
| 1 | n66 | 1750 MHz  (UL) | n78 | 3500 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n66 | 1750 MHz (UL) | n78 | 3500 MHz | 20 MHz | 100 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n66 | 1712.5 MHz  (UL) | n78 | 3400 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |

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| **Test Settings for CA\_n70A-n71A Configuration** | | | | | | | | | | | |
| 1 | n71 | Low | n70 | Low | 5 MHz | 25 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n71 | Low | n70 | Low | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 3 | n70 | 1697.5 MHz (UL) | n71 | 695.5 MHz (UL) | 5 MHz | 5 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n71A-n77A Configuration** | | | | | | | | | | | |
| 1 | n71 | 671 MHz (UL) | n77 | 3309 MHz (UL) | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| **Test Settings for CA\_n71A-n78A Configuration** | | | | | | | | | | | |
| 1 | n71 | 680.5 MHz (UL) | n78 | 3402.5 MHz | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_1 | - |
| 2 | n71 | 681.5 MHz (UL) | n78 | 3361.5MHz (UL) | 5 MHz | 10 MHz | CP-OFDM QPSK | Full RB | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  Note 2: REFSENS refers to the PCC bands and PCC NRB ‘s single carrier Uplink RB allocation for reference sensitivity according to table 7.3.2.4.1-3. REFSENS\_CA\_1 refers to the Uplink RB allocation for reference sensitivity exceptions due to UL harmonic interference according to table 7.3A.0.4-1. REFSENS\_CA\_2 refers to the Uplink RB allocation for reference sensitivity exceptions due to receiver harmonic mixing according to table 7.3A.0.4-4b for PC3 and Table 7.3A.0.4-4c for PC2. REFSENS\_CA\_3 refers to the Uplink RB allocation for reference sensitivity exceptions due to intermodulation interference due to 2UL CA according to table 7.3A.0.5-1 for PC3 and table 7.3A.0.5-1a for PC2.  REFSENS\_CA\_4 refers to the Uplink RB allocation for reference sensitivity exceptions due to cross band isolation for NR CA FR1 according to table 7.3A.0.6-1 for PC3 and Table 7.3A.0.6-3a for PC2.  Note 3: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.  Note 4: The test points are executed only when UEs support simultaneous Rx/Tx capability as indicated in Table A.4.3.2A.4.1-3 of TS 38.508-2.  Note5: This test ID is for UL PC2 only. | | | | | | | | | | | |

Table 7.3A.1\_1.4.1-2: Test Configuration Table for intra-band non-contiguous 2DL CA exceptions

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Initial Conditions | | | | | | | | | | | | | | | |
| Test Environment as specified in TS 38.508-1 [5] subclause 4.1 | | | | | | | | | NC, 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. | | | | | | |
| Test CC Combination setting (CBW) as specified in subclause Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | | | Refer to “PCC NRB”and “SCC NRB ” columns | | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | | Lowest | | | | | | |
| Network signalling value | | | | | | | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | | | |
| Test Parameters for CA Configurations | | | | | | | | | | | | | | | |
| ID |  | | CA Configuration / CBW | | | | | | DL Allocation | | | | UL Allocation (Note 2,3) | | |
| CA Configuration | | | | | PCC | Wgap / [MHz] | SCC | | CC MOD | PCC & SCC RB allocation | | CC MOD | PCC & SCC RB allocations (LCRB @ RBstart) | |
| PCC | | | SCC | | PCC | SCC |
| Band | Range | | Band | Range |
| Test Settings for a CA\_n71(2A) Configuration | | | | | | | | | | | | | | | |
| 1 | n71 | CC1 | | n71 | CC2 | 5MHz | 25.0 | 5MHz | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | 5@0 | - |
| 2 | n71 | CC1 | | n71 | CC2 | 15MHz | 10.0 | 10MHz | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | 5@2 | - |
| 3 | n71 | CC1 | | n71 | CC2 | 15MHz | 5.0 | 10MHz | | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | 20@19 | - |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  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: REFSENS\_CA\_1 refers to the Uplink RB allocation for reference sensitivity exceptions according to table 7.3A.0.2.2-1  Note 4: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration  Note 5: 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 6: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected. | | | | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.3A.1\_1.4.1-1 and 7.3A.1\_1.4.1-2.

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 7.3A.1\_1.4.3*.*

7.3A.1\_1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.1\_1.1.4.3.

3. SS activates SCC 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 Tables 7.3A.1\_1.4.1-1 and 7.3A.1\_1.4.1-2. on both PCC and SCC. 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 6.2A.1.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3A.1\_1.5-1 and 7.3A.1\_1.5-2 for PC3 CA, and in Table 7.3A.1\_1.5-1a for PC2 CA. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.1\_1.4.3 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 and following exception:

For test points with “REFSENS\_CA\_3” UL configuration in table 7.3A.1\_1.4.1-1, message exception in table 7.3A.1\_1.4.3-1 applies.

Table 7.3A.1\_1.4.3-1: FrequencyInfoUL-SIB

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 [5] Table 4.6.3-62 FrequencyInfoUL-SIB | | | |
| Information Element | Value/remark | Comment | Condition |
| p-Max | 20 |  | Power class 3 and Inter-band 2UL CA |
|  | 23 |  | Power class 2 and Inter-band 2UL CA |

7.3A.1\_1.5 Test requirement

For inter-band carrier aggregation the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2 with parameters specified in Table 7.3A.1\_1.5-1 for PC3 2UL CA configuration and CA configuration with single uplink carrier indicating power class 3 in TS 38.508-2 table A.4.3.2A.4.1-3, and in Table 7.3A.1\_1.5-1a for PC2 2UL CA configuration and CA configuration with single uplink carrier indicating power class 2 in TS 38.508-2 table A.4.3.2A.4.1-3. 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 7.3A.1\_1.5-1: Reference sensitivity requirement for inter band CA with PC3 single UL carrier or PC3 2UL CA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CA configuration | Test ID | | NR band | CBW | REFSENS test requirement of NR band (dBm) | |
|  | |  | (MHz) | 2Rx | 4Rx |
| CA\_n1A-n3A | 1 | | n1 | 5 | -100+23+TT | -100 +23+TT |
|  |  | | n3 | 5 | -97+TT | --97-2.7+TT |
|  | 2 | | n1 | 5 | -100+TT | -100-2.7+TT |
|  |  | | n3 | 5 | -97+3+TT | --97+3+TT |
|  | 3 | | n1 | 5 | -89.6+TT | -89.6-2.7+TT |
|  |  | | n3 | 5 | -97+19.7+TT | -97+19.7+TT |
| CA\_n1A-n8A | 1 | | n1 | 5 | -100+6+TT | -100+6+TT |
|  |  | | n8 | 5 | -97+TT | -97-2.76+TT |
| CA\_n1A-n28A | 1 | | n1 | 5 | -100+10.2+TT | -100+10.2+TT |
| n28 | 5 | -98.5+TT | -98.5-2.7+TT |
| 2 | | n1 | 50 | -89.6+1.1+TT | -89.6+1.1+TT |
| n28 | 5 | -98.5+TT | -98.5-2.7+TT |
| CA\_n1A-n41A | 1 | | n1 | 50 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n41 | 10 | -94.8+6.1+TT | -94.8+6.1+TT |
|  | 2 | | n1 | 20 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n41 | 100 | -94.8+0.7+TT | -94.8+0.7+TT |
|  | 3 | | n1 | 5 | -93.8+18.1+TT | -93.8+18.1+TT |
|  |  | | n41 | 100 | -94.8+TT | -94.8-2.7+TT |
| CA\_n1A-n77A | 1 | | n1 | 5 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n77 | 10 | -95.34+27.1+TT | -95.34+27.1+TT |
|  | 2 | | n1 | 20 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n77 | 100 | -85.14+13.8+TT | -85.14+13.8+TT |
|  | 3 | | n1 | 5 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n77 | 10 | -95.34+1.9+TT | -95.34+1.9+TT |
| CA\_n1A-n78A | 1 | | n1 | 5 | -100 +8+TT | -100 +8+TT |
|  |  | | n78 | 10 | -95.8 +TT | -95.8 -2.2 +TT |
| CA\_n2A-n48A | 1 | | n2 | 5 | -98.0 +TT | -100.7+TT |
|  |  | | n48 | 10 | -95.8+1.9+TT | -95.8+1.9+TT |
|  | 2 | | n2 | 5 | -98.0 +12+TT | -98.0 +12+TT |
|  |  | | n48 | 20 | -92.7 +TT | -94.9 +TT |
| CA\_n2A-n66A | 1 | | n2 | 5 | -98.0 +20+TT | -98.0+20+TT |
|  |  | | n66 | 5 | -99.5+TT | -102.2+TT |
|  | 2 | | n2 | 5 | -98.0 +TT | -100.7 +TT |
|  |  | | n66 | 5 | -99.5 +4+TT | -99.5+4+TT |
| CA\_n2A-n77A | 1 | | n2 | 5 | -98+TT | -98-2.7+TT |
|  |  | | n774 | 10 | -95.3+23.9+TT | -95.3+23.9+TT |
|  | 2 | | n2 | 10 | -94.8+TT | -94.8-2.7+TT |
|  |  | | n774 | 100 | -89.4+13.8+TT | -89.4+13.8+TT |
|  | 3 | | n2 | 5 | -98+TT | -98-2.7+TT |
|  |  | | n774 | 10 | -95.3+1.1+TT | -95.3+1.1+TT |
|  | 4 | | n2 | 5 | -98+6.7+TT | -98+6.7+TT |
|  |  | | n774 | 10 | -95.3+TT | -95.3-2.2+TT |
|  | 5 | | n2 | 20 | -91.8+3,7+TT | -91.8+3,7+TT |
|  |  | | n774 | 20 | -92.2+TT | -92.2-2.2+TT |
|  | 6 | | n2 | 5 | -98.0 +26+TT | -98.0+28.7+TT |
|  |  | | n774 | 10 | -95.3+TT | -97.5+TT |
|  | 7 | | n2 | 5 | -98.0 +8+TT | -98.0 +8+TT |
|  |  | | n774 | 10 | -95.3+TT | -97.5+TT |
|  | 8 | | n2 | 5 | -98.0 +5+TT | -98.0 +5+TT |
|  |  | | n774 | 10 | -95.3+TT | -97.5+TT |
| CA\_n3A-n8A | 1 | | n3 | 10 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n8 | 5 | -97.0+8+TT | -97.0‑+8+TT |
|  | 2 | | n3 | 10 | -93.8+6.4+TT | -93.8+6.4+TT |
|  |  | | n8 | 5 | -97.0+TT | -97.0-2.76+TT |
| CA\_n3A-n41A | | 1 | n3 | 5 | -97.0+8.2+TT | -97.0+8.2+TT |
|  | |  | n41 | 10 | -94.9 +TT | -94.9 -2.7 +TT |
|  | | 2 | n3 | 5 | -97.0+0.6+TT | -97.0+0.6+TT |
|  | |  | n41 | 100 | -84.6+TT | -84.6 -2.7+TT |
| CA\_n3A-n77A | 1 | | n3 | 5 | -97+TT | -97-2.7+TT |
|  |  | | n77 | 10 | -95.3+23.9+TT | -95.3+23.9+TT |
|  | 2 | | n3 | 10 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n77 | 100 | -85+13.8+TT | -85+13.8+TT |
|  | 3 | | n3 | 5 | -97+TT | -97-2.7+TT |
|  |  | | n77 | 10 | -95.3+1.1+TT | -95.3+1.1+TT |
|  | 4 | | n3 | 5 | -97.0 +26.0 +TT | -97.0 +26 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2+TT |
|  | 5 | | n3 | 5 | -97.0 +8.0 +TT | -97.0+8 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2+TT |
| CA\_n3A-n78A | 1 | | n3 | 5 | -97+TT | -97-2.7+TT |
|  |  | | n78 | 10 | -95.8+23.9+TT | -95.8+23.9+TT |
|  | 2 | | n3 | 10 | -93.8+TT | -93.8-2.7+TT |
|  |  | | n78 | 100 | -85.5+13.8+TT | -85.5+13.8+TT |
|  | 3 | | n3 | 5 | -97+TT | -97-2.7+TT |
|  |  | | n78 | 10 | -95.8+1.1+TT | -95.8+1.1+TT |
|  | 4 | | n3 | 5 | -97+26+TT | -97+26+TT |
|  |  | | n78 | 10 | -95.8+TT | -95.8-2.2+TT |
|  | 5 | | n3 | 5 | -97+8+TT | -97+8+TT |
|  |  | | n78 | 10 | -95.8+TT | -95.8-2.2+TT |
| CA\_n5A-n66A | 1 | | n5 | 5 | -98.0 +30+TT | - |
|  |  | | n66 | 5 | -99.5+TT | -102.2+TT |
| CA\_n5A-n77A | 1 | | n5 | 5 | -98+TT | - |
|  |  | | n77 | 10 | -95.3+10.5+TT | -95.3+10.5+TT |
|  | 2 | | n5 | 5 | -98+TT | - |
|  |  | | n77 | 100 | -85+1.4+TT | -85+1.4+TT |
|  | 3 | | n5 | 5 | -98+TT | - |
|  |  | | n77 | 10 | -95.3+10.4+TT | -95.3+10.4+TT |
|  | 4 | | n5 | 5 | -98+TT | - |
|  |  | | n77 | 100 | -85+0.7+TT | -85+0.7+TT |
|  | 5 | | n5 | 20 | -90.8 +2.7+TT | - |
|  |  | | n77 | 20 | -92.2+TT | -94.4+TT |
|  | 6 | | n5 | 5 | -98.0 +5.7+TT | - |
|  |  | | n77 | 10 | -95.3+TT | -97.5+TT |
|  | 7 | | n5 | 5 | -98.0 +8.3+TT | - |
|  |  | | n77 | 10 | -95.3+TT | -97.5+TT |
|  | 8 | | n5 | 5 | -98.0 +5.5+TT | - |
|  |  | | n77 | 10 | -95.3+TT | -97.5+TT |
| CA\_n5A-n78A | 1 | | n5 | 5 | -98+TT | - |
|  |  | | n78 | 10 | -95.8+10.5+TT | -95.8+10.5+TT |
|  | 2 | | n5 | 5 | -98+TT | - |
|  |  | | n78 | 100 | -85.5+1.4+TT | -85.5+1.4+TT |
| CA\_n7A-n78A | 1 | | n7 | 5 | -98+4.5+TT | -98+4.5+TT |
|  |  | | n78 | 100 | -85.5+TT | -85.5-2.2+TT |
| CA\_n8A-n78A | 1 | | n8 | 5 | -97+TT | -97-2.76+TT |
|  |  | | n78 | 10 | -95.8+10.8+TT | -95.8+10.8+TT |
|  | 2 | | n8 | 5 | -97+TT | -97-2.76+TT |
|  |  | | n78 | 100 | -85.5+1.4+TT | -85.5+1.4+TT |
|  | 3 | | n8 | 5 | -97+8.3+TT | -97+8.3+TT |
|  |  | | n78 | 10 | -95.8+TT | -95.8+TT |
| CA\_n14A-n77A | 1 | | n14 | 5 | -97.0 +TT | - |
|  |  | | n77 | 10 | -95.3 +10.4 +TT | -95.3+10.4 +TT |
|  | 2 | | n14 | 5 | -97.0 +TT | - |
|  |  | | n77 | 100 | -85.1 +0.7+TT | -85.1 +0.7+TT |
|  | 3 | | n14 | 5 | -97.0 + 5.5 +TT | - |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2 +TT |
|  | 4 | | n14 | 5 | -97.0 + 31 +TT | - |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2 +TT |
|  | 5 | | n14 | 10 | -93.8 + 28 +TT | - |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2 +TT |
| CA\_n20A-n78A | 1 | | n20 | 5 | -97.0+TT | - |
|  |  | | n78 | 10 | -95.8+10.8+TT | -95.8+10.8+TT |
|  | 2 | | n20 | 5 | -97.0+TT | - |
|  |  | | n78 | 100 | -85.5+1.4+TT | -85.5+1.4+TT |
|  | 3 | | n20 | 5 | -97.0 + 11 +TT | - |
|  |  | | n78 | 10 | -95.8 +TT | -95.8 -2.2 +TT |
| CA\_n25A-n66A | 1 | | n66 | 5 | -99.5+TT | -99.5-2.7+TT |
| n25 | 5 | -96.5+20+TT | - |
| 2 | | n66 | 5 | -99.5+23+TT | -99.5+23+TT |
| n25 | 5 | -96.5+TT | - |
| 3 | | n66 | 5 | -99.5+4+TT | -99.5+4+TT |
| n25 | 5 | -96.5+TT | - |
| CA\_n25A-n77A | 1 | | n25 | 5 | -96.5+26+TT | - |
| n77 | 10 | -95.3+TT | -95.3-2.2+TT |
| 2 | | n25 | 5 | -96.5+8+TT | - |
| n77 | 10 | -95.3+TT | -95.3-2.2+TT |
| 3 | | n25 | 5 | -96.5+5+TT | - |
| n77 | 10 | -95.3+TT | -95.3-2.2+TT |
| CA\_n25A-n78A | 1 | | n25 | 5 | -96.5+26+TT | - |
| n78 | 10 | -95.8+TT | -95.3-2.2+TT |
| CA\_n26A-n66A | 1 | | n26 | 5 | -97.55 + 30 +TT | - |
|  |  | | n66 | 5 | -99.5 +TT | -99.5-2.7 +TT |
| CA\_n26A-n70A | | 1 | n26 | 5 | -97.55 + 30 +TT | - |
|  | |  | n70 | 5 | -92.7 + TT | -92.7 - 2.7 +TT |
| CA\_n28A-n77A | 1 | | n28 | 5 | -98.5 +TT | -98.5-2.76+TT |
|  |  | | n77 | 10 | -95.3 +10.4 +TT | -95.3+10.4 +TT |
|  | 2 | | n28 | 5 | -98.5 +TT | -98.5 -2.76+TT |
|  |  | | n77 | 100 | -85.4 +0.7 +TT | -85.4+0.7 +TT |
|  | 3 | | n28 | 5 | -85.4 +0.7 +TT | -85.4+0.7 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -95.3-2.2 +TT |
| CA\_n28A-n78A | 1 | | n28 | 5 | -98.5 +TT | -98.5 -2.76 +TT |
|  |  | | n78 | 10 | -95.8 +10.4 +TT | -95.8+10.4 +TT |
|  | 2 | | n28 | 5 | -98.5 +TT | -98.5-2.76 +TT |
|  |  | | n78 | 100 | -85.5 +0.7 +TT | -85.5 +0.7 +TT |
|  | 3 | | n28 | 5 | -98.5 + 31 +TT | -98.5 + 31 +TT |
|  |  | | n78 | 10 | -95.8 +TT | -92.7 -2.2 +TT |
| CA\_n29A-n71A | 1 | | n29 | 5 | -97.0 + 17.5 + TT | - |
|  |  | | n71 | 20 | -86.0 + TT | -86.0-2.76 + TT |
| CA\_n41A-n66A | 1 | | n41 | 100 | -84.6+TT | -84.6-2.7+TT |
|  |  | | n66 | 5 | -99.5+10.5+TT | -99.5+10.5+TT |
| CA\_n41A-n71A | 1 | | n41 | 10 | -94,8 + 10.8 + TT | -94,8+ 10.8 + TT |
|  |  | | n71 | 5 | -97.2 + TT | -97.2-2.76 + TT |
|  | 2 | | n41 | 100 | -84.6 + 1.4 + TT | -84.6+ 1.4 + TT |
|  |  | | n71 | 5 | -97.2 +TT | -97.2 -2.76+ TT |
| CA\_n41A-n77A | 1 | | n41 | 10 | -94.8+10.4+TT | -94.8+10.4+TT |
|  |  | | n77 | 20 | -95.3+TT | -95.3-2.2+TT |
|  | 2 | | n41 | 100 | -94.8+6.3+TT | -94.8+6.3+TT |
|  |  | | n77 | 20 | -95.3+TT | -95.3-2.2+TT |
|  | 3 | | n41 | 60 | -94.8+TT | -94.8-2.7+TT |
|  |  | | n77 | 10 | -95.3+2.7+TT | -95.3+2.7+TT |
|  | 4 | | n41 | 100 | -94.8+TT | -94.8-2.7+TT |
|  |  | | n77 | 10 | -95.3+2.7+TT | -95.3+2.7+TT |
|  | 5 | | n41 | 100 | -94.8+TT | -94.8-2.7+TT |
|  |  | | n77 | 10 | -95.3+8.3+TT | -95.3+8.3+TT |
|  | 6 | | n41 | 10 | -94.8+4.5+TT | -94.8+4.5+TT |
|  |  | | n77 | 100 | -95.3+TT | -95.3-2.2+TT |
|  | 7 | | n41 | 100 | -94.8+4.5+TT | -94.8+4.5+TT |
|  |  | | n77 | 100 | -95.3+TT | -95.3-2.2+TT |
| CA\_n48A-n66A | 1 | | n48 | 5 | -99.0 + TT | -99.0 -2.2+ TT |
|  |  | | n66 | 5 | -99.5 + 5.0 + TT | -99.5 +5.0+TT |
|  | 2 | | n48 | 5 | -99.0+27.1 + TT | -99.0+ 27.1+TT |
|  |  | | n66 | 5 | -99.5 +TT | -99.5 -2.7 +TT |
|  | 3 | | n48 | 100 | -85.5 + 13.8 +TT | -85.5-2.2 + 13.8 +TT |
|  |  | | n66 | 40 | -90.1 +TT | -90.1 -2.7 +TT |
|  | 4 | | n48 | 10 | -95.8 + 1.9+ TT | -95.8+ 1.9 + TT |
|  |  | | n66 | 5 | -99.5 +TT | -99.5 -2.7 +TT |
| CA\_n48A-n70A | 1 | | n48 | 10 | -95.8 + TT | -95.8-2.2 + TT |
|  |  | | n70 | 15 MHz UL /25 MHz DL | -92.7 +26 +TT | -92.7 +26 +TT |
| CA\_n66A-n71A | 1 | | n66 | 5 | -99.5 +5 +TT | -99.5+5 +TT |
|  |  | | n71 | 5 | -97.2 +TT | -97.2-2.76 +TT |
| CA\_n66A-n77A | 1 | | n66 | 5 | -99.5+TT | -102.2+TT |
|  |  | | n77 | 10 | -95.3 +23.9+TT | -95.3 +23.9+TT |
|  | 2 | | n66 | 20 | -93.3+TT | -96.0+TT |
|  |  | | n77 | 100 | -85.1 +13.8+TT | -85.1+13.8+TT |
|  | 3 | | n66 | 5 | -99.5+TT | -102.2+TT |
|  |  | | n77 | 10 | -95.3 +1.1+TT | -95.3+1.1+TT |
|  | 4 | | n66 | 5 | -99.5 +31 +TT | -99.5+31 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -97.5+TT |
|  | 5 | | n66 | 5 | -99.5 +5 +TT | -99.5+5 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -97.5+TT |
| CA\_n66A-n78A | 1 | | n66 | 5 | -99.5+5+TT | -99.5+5+TT |
|  |  | | n78 | 10 | -95.8+TT | -95.8-2.2+TT |
| CA\_n70A-n71A | 1 | | n70 | 25 | -92.7 +4.1 +TT | -92.7+4.1 +TT |
|  |  | | n71 | 5 | -94.0 +TT | -94.0-2.76 +TT |
|  | 2 | | n70 | 5 | -100.0 +9.9 +TT | -100.0+9.9 +TT |
|  |  | | n71 | 5 | -97.2 +TT | -97.2-2.76 +TT |
|  | 3 | | n70 | 5 | -100.0 +5 +TT | -100.0+5 +TT |
|  |  | | n71 | 5 | -97.2 +TT | -97.2-2.76 +TT |
| CA\_n71A-n77A | 1 | | n71 | 5 | -97.2 +5.5 +TT | -97.2+5.5 +TT |
|  |  | | n77 | 10 | -95.3 +TT | -95.3 -2.2 +TT |
| CA\_n71A-n78A | 1 | | n71 | 5 | -97.2 +TT | -99.9 +TT |
|  |  | | n78 | 10 | -95.8 +10.4 +TT | -95.8 +10.4 +TT |
|  | 2 | | n71 | 5 | -97.2 +5.5 +TT | -97.2 +5.5 +TT |
|  |  | | n78 | 10 | -95.8 +TT | -95.8 -2.2 +TT |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)  Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.  Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.  Note 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  Note 5: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.  Note 6: 4 Rx operation is targeted for FWA form factor | | | | | | |

Table 7.3A.1\_1.5-1a: Reference sensitivity requirement for inter band CA with PC2 single UL carrier or PC2 2UL CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| CA configuration | Test ID | NR band | CBW | REFSENS test requirement of NR band (dBm) | |
|  |  |  | (MHz) | 2Rx | 4Rx |
| CA\_n1A-n78A | 1 | n1 | 5 | -100 +17.8+TT | -100 +17.8+TT |
|  |  | n78 | 10 | -95.8 +TT | -95.8 -2.2 +TT |
| CA\_n2A-n77A | 4 | n2 | 5 | -98+9.1+TT | -98+9.1+TT |
|  |  | n774 | 10 | -95.3+TT | -95.3-2.2+TT |
|  | 5 | n2 | 5 | -91.8+6.7+TT | -91.8+6.7+TT |
|  |  | n774 | 10 | -92.2+TT | -92.2-2.2+TT |
|  | 6 | n2 | 5 | -98.0+32.1+TT | -98.0 +32.1+TT |
|  |  | n774 | 10 | -95.3+TT | -95.3+TT |
|  | 7 | n2 | 5 | -98.0 +19.1+TT | -98.0 +19.1+TT |
|  |  | n774 | 10 | -95.3+TT | -97.5+TT |
|  | 9 | n2 | 5 | -98.0 +1.0 +TT | -98.0+1.0 +TT |
|  |  | n774 | 100 | -85.1 +TT | -87.3 +TT |
| CA\_n3A-n41A | 1 | n3 | 5 | -97.0+18.4+TT | -97.0 +18.4+TT |
|  |  | n41 | 10 | -94.9 +TT | -94.9 -2.7 +TT |
|  | 2 | n3 | 5 | -97.0+2.3+TT | -97.0+2.3+TT |
|  |  | n41 | 100 | -84.6+TT | -84.6 -2.7+TT |
| CA\_n3A-n78A | 6 | n3 | 5 | -97.0 + 8.1 +TT | -97.0 +8.1 +TT |
|  |  | n78 | 5 | -97.0 +TT | -97.0 -2.7 +TT |
|  | 7 | n3 | 40 | -89.4 + 1.0 +TT | -89.4 + 1.0+TT |
|  |  | n78 | 40 | -89.4 +TT | -89.4 -2.7 +TT |
| CA\_n5A-n77A | 5 | n5 | 20 | -90.8 +4.3+TT | - |
|  |  | n77 | 20 | -92.2+TT | -94.4+TT |
|  | 6 | n5 | 10 | -98.0 +8.1+TT | - |
|  |  | n77 | 10 | -95.3+TT | -97.5+TT |
|  | 7 | n5 | 5 | -98.0 +18.6+TT | - |
|  |  | n77 | 10 | -95.3+TT | -97.5+TT |
| CA\_n14A\_n77A | 4 | n14 | 5 | -97.0 + 34 +TT | - |
|  |  | n77 | 10 | -95.3+TT | -97.5+TT |
|  | 5 | n14 | 10 | -93.8 + 31 +TT | - |
|  |  | n77 | 10 | -95.3+TT | -97.5+TT |
| CA\_n41A-n79A | 1 | n41 | 100 | -84.6+TT | -84.6 -2.7 +TT |
|  |  | n79 | 10 | -98.9+3.1+TT | -98.9+3.1+TT |
|  | 2 | n41 | 10 | -94.8+3.5+TT | -94.8+3.5+TT |
|  |  | n79 | 100 | -85.6+TT | -85.6 -2.2+TT |
| CA\_n66A-n77A | 4 | n66 | 5 | -99.5 +34.33 +TT | -99.5 +34.33 +TT |
|  |  | n77 | 10 | -95.3 +TT | -97.5+TT |
|  | 5 | n66 | 5 | -99.5 +11.27 +TT | -99.5+11.27 +TT |
|  |  | n77 | 10 | -95.3 +TT | -97.5+TT |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)  Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.  Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.  Note 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  Note 5: Values are modified by -0.5dB when carrier channel BW is between 865MHz and 894MHz.  Note 6: 4 Rx operation is targeted for FWA form factor | | | | | |

Table 7.3A.1\_1.5-2: Reference sensitivity requirement for intraband non-contiguous CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA configuration | Test ID | NR band | SCS kHz | Channel Bandwidth | | | | | | | | | | | | |
| 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | 25 MHz (dBm) | 30 MHz (dBm) | 40 MHz (dBm) | 50 MHz (dBm) | 60 MHz (dBm) | 70 MHz (dBm) | 80 MHz (dBm) | 90 MHz (dBm) | 100 MHz (dBm) |
| CA\_n71(2A) | 1 | n71 | 15 | -97.2 +TT for PCC  -97.2 + 4.0 +TT for SCC |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 | n71 | 15 |  | -94.0 +22.2 +TT | -91.6 +TT |  |  |  |  |  |  |  |  |  |  |
| 3 | n71 | 15 |  | -94.0 +5.2 +TT | -91.6 +TT |  |  |  |  |  |  |  |  |  |  |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)  Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.  Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | | | | | | | | | | | | | |

### 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 n77  CA\_n2-n77: UL and DL Mid in band n2 and band n77 at 3850MHz  CA\_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 8  CA\_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\_01  Unless 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 | - |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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) | 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 | - |
| **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 tested  Note 7: The W**gap** is defined to be widest possible on band based on the PCC and SCC configuration for Intra-band non-contiguous  Note 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 tested  Note 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 differs  Note 10: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx 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. | | | | | | | | | | | | | | | | | |

Table 7.3A.2.4.1-2: Void

Table 7.3A.2.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.3A.2.1.4.1-1.

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 7.3A.2.1.4.3*.*

7.3A.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 7.3A.2.1.4.3.

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 Tables 7.3A.1.4.1-1 on both PCC and SCC. 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 7.3A.2.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1 and 7.3.2.5-2 as appropriate. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.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.

7.3A.2.5 Test requirement

For 3DL carrier aggregation, test parameters are specified in table 7.3A.2.4.1-1. For the CA configurations listed in table 7.3A.2.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with reference power level specified in table 7.3.2.5-1 for each non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for each non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

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.

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by ΔRIB,c defined in clause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

For intra-band non-contiguous CA with one uplink carrier and two or more downlink sub-blocks, the test requirement for SCC(s) shall be increased by ΔRIBNC given in Table 7.3A.0.2.2-1. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS\_01 (Table 6.2.3.1-1) configured.

Table 7.3A.2.5-1: Reference sensitivity requirement for 3DL CA

|  |  |  |
| --- | --- | --- |
| Carrier aggregation type | DL CA configuration | UL CA configuration |
| Intra-band non-contiguous 3DL CA | CA\_n48(3A) | - |
|  | CA\_n66(3A) | - |
| Inter-band 3DL CA | CA\_n1A-n78C |  |
| CA\_n1A-n78(2A) | - |
| CA\_n1A-n8A-n78A |  |
| CA\_n1A-n28A-n78A | - |
| CA\_n1A-n78A-n79A | - |
| CA\_n1A-n3A-n28A | - |
| CA\_n1A-n3A-n77A |  |
| CA\_n1A-n3A-n78A | - |
| CA\_n1A-n28A-n77A |  |
| CA\_n1A-n28A-n78A | - |
| CA\_n1A-n41A-n77A |  |
| CA\_n2A-n5A-n48A |  |
| CA\_n2A-n5A-n77A |  |
| CA\_n2A-n48A-n66A |  |
| CA\_n2A-n48A-n77A |  |
| CA\_n2A-n66A-n77A |  |
| CA\_n2A-n48(2A) |  |
| CA\_n2A-n48B |  |
| CA\_n2A-n77C |  |
| CA\_n3A-n28A-n41A |  |
| CA\_n3A-n28A-n77A |  |
| CA\_n3A-n28A-n78A | - |
| CA\_n3A-n41A-n77A |  |
| CA\_n3A-n77(2A) |  |
| CA\_n5A-n48A-n66A |  |
| CA\_n5A-n48A-n77A |  |
| CA\_n5A-n66A-n77A |  |
| CA\_n5A-n48(2A) |  |
| CA\_n5A-n48B |  |
| CA\_n5A-n77C |  |
| CA\_n25A-n66A-n77A | - |
| CA\_n25A-n66A-n78A | - |
| CA\_n26A-n66-n70A |  |
| CA\_n26A-n66(2A) |  |
| CA\_n28A-n41A-n79A | - |
| CA\_n28A-n77(2A) |  |
| CA\_n41A-n66A-n71A |  |
| CA\_n48A-n66(2A) |  |
| CA\_n48A-n71(2A) |  |
| CA\_n48A-n77C |  |
| CA\_n48B-n66A |  |
| CA\_n48B-n70A |  |
| CA\_n48B-n71A |  |
| CA\_n48B-n77A |  |
| CA\_n48(2A)-n66A |  |
| CA\_n48(2A)-n70A |  |
| CA\_n48(2A)-n71A |  |
| CA\_n48(2A)-n77A |  |
| CA\_n48A-n66A-n70A |  |
| CA\_n48A-n66A-n71A |  |
| CA\_n48A-n66A-n77A |  |
| CA\_n48A-n70A-n71A |  |
| CA\_n66A-n70A-n71A | - |
| CA\_n66A-n71A-n77A | - |
| CA\_n66A-n71A-n78A | - |
| CA\_n66A-n71(2A) |  |
| CA\_n66(2A)-n70A | - |
| CA\_n66(2A)-n71A | - |
| CA\_n66B-n70A | - |
| CA\_n66B-n71A | - |
| CA\_n66A-n77C |  |
| CA\_n70A-n71A(2A) |  |
| SDL configuration | CA\_n29A-n66A-n70A | - |
| CA\_n29A-n66B | - |
| CA\_n29A-n66(2A) | - |

### 7.3A.2\_1 Reference sensitivity power level for 3DL CA exceptions

7.3A.2\_1.1 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 when CA exceptions are allowed.

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

7.3A.2\_1.2 Test applicability

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

7.3A.2\_1.3 Minimum requirements

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

7.3A.2\_1.4 Test description

7.3A.2\_1.4.1 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 7.3A.2\_1.4.1-1. 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\_1.4.1-1: Test Configuration Table for inter-band 3DL CA 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. | | | | | | | | | |
| Test CC Combination setting (CBW) as specified in subclause Table 5.5A.3.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | | | | | Refer to “NRB\_PCC”and “NRB\_SCC” columns | | | | | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | Lowest | | | | | | | | | |
| Network signalling value | | | | | | | NS\_01  Unless 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 (Note 2) | | |
| CA configuration | | | | | | PCC | SCC1 | SCC2 | CC Mod | PCC & SCC RB allocation | | | CC Mod | PCC, SCC1 or SCC2 RB allocation | |
| PCC | | SCC1 | | SCC2 | |  |  |  |  | PCC | SCC1 | SCC2 |  |  |  |
| Band | Range | Band | Range | Band | Range |
| Default Test Settings for a DL\_n1A-n3A-n77A\_UL\_n1A-n3A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1950/ DL 2140 | n3 | UL 1750/ DL 1845 | n77 | 3700 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n3A-n77A\_UL\_n3A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1775/ DL 1870 | n77 | 3915 | n1 | DL 2140 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n3A-n78A\_UL\_n1A-n3A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1950/ DL 2140 | n3 | UL 1750/ DL 1845 | n78 | 3700 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n1 | UL 1950/ DL 2140 | n3 | UL 1770/ DL 1865 | n78 | 3360 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n3A-n78A\_UL\_n1A-n78A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1950/ DL 2140 | n78 | 3780 | n3 | UL 1770/ DL 1865 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n8A-n78A\_UL\_n1A-n8A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1945/ DL 2135 | n8 | UL 900/ DL 945 | n78 | DL 3745 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n8A-n78A\_UL\_n1A-n78A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1940/ DL 2130 | n78 | 3380 | n8 | DL 940 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n28A-n77A\_UL\_n28A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 740/ DL 795 | n77 | 3630 | n1 | DL 2150 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n41A-n77A\_UL\_n1A-n41A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1970/ DL 2160 | n41 | 2650 | n77 | 3330 | 5MHz | 10MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n41A-n77A\_UL\_n41A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n41 | 2640 | n77 | 3710 | n1 | DL 2140 | 10MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n28A-n78A\_UL\_n1A-n28A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1950/ DL 2140 | n28 | UL 733/ DL 788 | n78 | 3416 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n28A-n78A\_UL\_n1A-n78A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n1 | UL 1970/ DL 2160 | n78 | 3352 | n28 | DL 794 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n1A-n28A-n78A\_UL\_n28A-n78A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 740/ DL 795 | n78 | 3630 | n1 | DL 2150 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n5A-n48A\_UL\_n5A-n48A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n5 | UL 839/ DL 884 | n48 | 3640 | n2 | DL 1962 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n5A-n48A\_UL\_n2A-n5A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n2 | UL 1905/ DL 1985 | n5 | UL 844/ DL 1889 | n48 | DL 3593 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n5A-n77A\_UL\_n2A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n2 | UL 1907.5/ DL 1987.5 | n77 | 3305 | n5 | DL 887.5 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n5A-n77A\_UL\_n5A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n5 | UL 846.5/ DL 891.5 | n77 | 3680 | n2 | DL 1987 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n5A-n77A\_UL\_n2A-n5A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 14 | n2 | UL 1880/ DL 1960 | n5 | UL 830/ DL 875 | n77 | DL 3540 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n48A-n66A\_UL\_n2A-n66A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n2 | UL 1855/ DL 1935 | n66 | UL 1770/ DL 2190 | n48 | DL 3625 | 5MHz | 10Mhz | 5Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n48A-n66A\_UL\_n2A-n48A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n2 | UL 1905/ DL 1985 | n48 | 3560 | n66 | DL 2155 | 5MHz | 10Mhz | 5Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n48A-n66A\_UL\_n48A-n66A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n66 | UL 1735/ DL 2135 | n48 | 3695 | n2 | DL 1960 | 5MHz | 10Mhz | 5Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n66A-n77A\_UL\_n2A-n66A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 14 | n2 | UL 1880/ DL 1960 | n66 | UL 1740/ DL 2140 | n77 | DL 3620 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 24 | n2 | UL 1880/ DL 1960 | n66 | UL 1740/ DL 2140 | n77 | DL 3900 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n66A-n77A\_UL\_n2A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n2 | UL 1855/ DL 1935 | n77 | 3970 | n66 | DL 2115 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 24 | n2 | UL 1880/ DL 1960 | n77 | 3500 | n66 | DL 2140 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 34 | n2 | UL 1885/ DL 1965 | n77 | 3915 | n66 | DL 2175 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n2A-n66A-n77A\_UL\_n66A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n66 | UL 1760/ DL 2160 | n77 | 3720 | n2 | DL 1960 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 24 | n66 | UL 1760/ DL 2160 | n77 | 3350 | n2 | DL 1960 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 34 | n66 | UL 1760/ DL 2160 | n77 | 3620 | n2 | DL 1960 | 5Mhz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n41A\_UL\_n3A-n28A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1715/ DL 1810 | n28 | UL 743/ DL 798 | n41 | 2518 | 5MHz | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n3 | UL 1715/ DL 1810 | n28 | UL 743/ DL 798 | n41 | 2687 | 5MHz | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n41A\_UL\_n3A-n41A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1720/ DL 1815 | n41 | 2510 | n28 | UL 735/ DL 790 | 5MHz | 5MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n41A\_UL\_n28A-n41A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 710.5/ DL 765.5 | n41 | 2543 | n3 | UL 1737.5/ DL 1832.5 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n77A\_UL\_n3A-n28A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1720/ DL 1815 | n28 | UL 733/ DL 788 | n77 | 4173 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n77A\_UL\_n28A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 735/ DL 790 | n77 | 3320 | n3 | UL 1755/ DL 1850 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n77A\_UL\_n3A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1712.5/ DL 1807.5 | n77 | 4195 | n28 | UL 715/ DL 770 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n28A-n78A\_UL\_n3A-n28A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1755/ DL 1850 | n28 | UL 735/ DL 790 | n78 | 3320 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 2 | n3 | UL 1750/ DL 1845 | n28 | UL 743/ DL 798 | n78 | 3764 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n41A-n77A\_UL\_n3A-n41A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1720/ DL 1815 | n41 | 2580 | n77 | 3440 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n41A-n77A\_UL\_n41A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n41 | 2620 | n77 | 3400 | n3 | DL 1840 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n3A-n41A-n77A\_UL\_n3A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n3 | UL 1720/ DL 1815 | n77 | 3900 | n41 | 2640 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n5A-n48A-n66A\_UL\_n5A-n66A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n5 | UL 829/ DL 874 | n66 | UL 1760/ DL 2160 | n48 | DL 3622 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n5A-n66A-n77A\_UL\_n5A-n66A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 14 | n5 | UL 845/ DL 890 | n66 | UL 1775/ DL 2175 | n77 | DL 3465 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 24 | n5 | UL 826.5/ DL 871.5 | n66 | UL 1712.5/ DL 2112.5 | n77 | DL 4192 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| 34 | n5 | UL 835/ DL 880 | n66 | UL 1735/ DL 2135 | n77 | DL 3535 | 5MHz | 5Mhz | 10Mhz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n5A-n66A-n77A\_UL\_n5A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n5 | UL 826.5/ DL 871.5 | n77 | 3795 | n66 | DL 2142 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n28A-n41A-n79A\_UL\_n41A-n79A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n41 | 2600 | n28 | UL 725/ DL780 | n79 | 4600 | 10MHz | 5 MHz | 40 MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n28A-n41A-n79A\_UL\_n28A-n41A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 720/ DL 780 | n41 | 2600 | n79 | 4600 | 5MHz | 10 MHz | 40 MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n28A-n41A-n79A\_UL\_n28A-n79A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n28 | UL 735/ DL 790 | n41 | 2645 | n79 | 4850 | 5MHz | 10 MHz | 40 MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n66A-n71A-n77A\_UL\_n66A-n71A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n66 | UL 1720/ DL 2120 | n71 | UL 668/  DL 622 | n77 | 4108 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n66A-n71A-n77A\_UL\_n66A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n66 | UL 1720/ DL 2120 | n77 | 4080 | n71 | DL 640 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n66A-n71A-n77A\_UL\_n71A-n77A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n71 | UL 690/ DL 644 | n77 | 3530 | n66 | DL 2150 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n66A-n71A-n78A\_UL\_n66A-n71A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n66 | UL 1720/ DL 2120 | n71 | UL 668/  DL 622 | n78 | 3724 | 5MHz | 5MHz | 10MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Default Test Settings for a DL\_n66A-n71A-n78A\_UL\_n71A-n78A Configuration (Inter-band) | | | | | | | | | | | | | | | | |
| 1 | n71 | UL 693/ DL 647 | n78 | 3546 | n66 | DL 2160 | 5MHz | 10MHz | 5MHz | CP-OFDM QPSK | Full RB | | | DFT-s-OFDM QPSK | REFSENS\_CA\_3 | REFSENS\_CA\_3 |
| Note 1: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  Note 2: REFSENS refers to the PCC bands and PCC NRB ‘s single carrier Uplink RB allocation for reference sensitivity according to Table 7.3.2.4.1-3. REFSENS\_CA\_3 refers to the Uplink RB allocation for reference sensitivity exceptions due to intermodulation interference of 3DL/2UL according to Table 7.3A.0.5-2 for PC3.  Note 3: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.  Note 4: This step can be skipped for PC2 since no corresponding exceptions are defined for PC2 cases in Table 7.3A.0.5-2a | | | | | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.3A.2\_1.4.1-1.

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 7.3A.1\_1.4.3*.*

7.3A.2\_1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.3A.1\_1.4.3.

3. SS activates SCC 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 Tables 7.3A.2\_1.4.1-1on 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 6.2A.1.1.4.1-1 on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3A.2\_1.5-1 for PC3 CA. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.2\_1.4.3 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 and following exception:

For test points with “REFSENS\_CA\_3” UL configuration in table 7.3A.2\_1.4.1-1, message exception in table 7.3A.1\_1.4.3-1 applies.

7.3A.2\_1.5 Test requirement

For inter-band carrier aggregation the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2.2 ans A.2.3 with parameters specified in Table 7.3A.2\_1.5-1 for PC3.

Table 7.3A.2\_1.5-1: Reference sensitivity requirement for PC3 interband 3DL CA

| CA configuration | | Test ID | NR band | SCS kHz | | Channel Bandwidth | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 MHz (dBm) | | | 10 MHz (dBm) | | 15 MHz (dBm) | | 20 MHz (dBm) | | 25 MHz (dBm) | | 30 MHz (dBm) | | 40 MHz (dBm) |
| DL\_n1A-n3A-n77A\_UL\_n1A-n3A | | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  | |  | |  | |  |
| -102.7+TT4 | | |
| 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
| 1 | n77 | 15 | |  | | | -95.3+28.4+TT | |  | |  | |  | |  | |  |
| -95.3+28.4+TT4 | |
| DL\_n1A-n3A-n77A\_UL\_n3A-n77A | | 1 | n1 | 15 | | -100.0+31.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.0+31.0+TT4 | | |
| 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
| 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n1A-n3A-n78A\_UL\_n1A-n3A | | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  | |  | |  | |  |
| -102.7+TT4 | | |
| 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
| 1 | n78 | 15 | |  | | | -95.8+28.4+TT | |  | |  | |  | |  | |  |
| -98.0+28.4+TT4 | |
| 2 | n1 | 15 | | -100.0+TT | | |  | |  | |  | |  | |  | |  |
| -102.7+TT4 | | |
| 2 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
| 2 | n78 | 15 | |  | | | -95.8+11.2+TT | |  | |  | |  | |  | |  |
| -98.0+11.2+TT | |
| DL\_n1A-n3A-n78A\_UL\_n1A-n78A | | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  | |  | |  | |  |
| -102.7+TT4 | | |
| 1 | n3 | 15 | | -97.0+27.9+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+27.9+TT4 | | |
| 1 | n78 | 15 | |  | | | -95.8+TT | |  | |  | |  | |  | |  |
| -98.0+TT | |
| DL\_n1A-n8A-n78A\_UL\_n1A-n8A | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  |  | | |  |  | |
| -102.7+TT4 | | |
|  | 1 | n8 | 15 | | -97.0 +TT | | |  | |  | |  |  | | |  |  | |
| -99.7 +TT4 | | |
|  | 1 | n78 | 15 | |  | | | -95.8+14.9+TT | |  | |  |  | | |  |  | |
| -98.0+14.9+TT4 | |
| DL\_n1A-n8A-n78A\_UL\_n1A-n78A | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  |  | | |  |  | |
| -102.7+TT4 | | |
|  | 1 | n8 | 15 | | -97.0 +3.3+TT | | |  | |  | |  |  | | |  |  | |
| -99.7 +3.3+TT4 | | |
|  | 1 | n78 | 15 | |  | | | -95.8+TT | |  | |  |  | | |  |  | |
| -98.0+TT4 | |
| DL\_n1A-n28A-n78A\_UL\_n1A-n28A | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  |  | | |  |  | |
| -102.7+TT4 | | |
|  | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  |  | | |  |  | |
| -98.5-2.7+TT4 | | |
|  | 1 | n78 | 15 | |  | | | -95.8+15.7+TT | |  | |  |  | | |  |  | |
| -98.0+15.7+TT4 | |
| DL\_n1A-n28A-n78A\_UL\_n1A-n78A | 1 | n1 | 15 | | -100.0+TT | | |  | |  | |  |  | | |  |  | |
| -102.7+TT4 | | |
|  | 1 | n28 | 15 | | -98.5+4.2+TT | | |  | |  | |  |  | | |  |  | |
| -98.5-2.75+4.2+TT4 | | |
|  | 1 | n78 | 15 | |  | | | -95.8+TT | |  | |  |  | | |  |  | |
| -98.0+TT4 | |
| DL\_n1A-n28A-n78A\_UL\_n28A-n78A | 1 | n1 | 15 | | -100.0+15.7+TT | | |  | |  | |  |  | | |  |  | |
| -102.7+15.7+TT4 | | |
|  | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  |  | | |  |  | |
| -98.5-2.7+TT4 | | |
|  | 1 | n78 | 15 | |  | | | -95.8+TT | |  | |  |  | | |  |  | |
| -98.0+TT4 | |
| DL\_n1A-n28A-n77A\_UL\_n28A-n77A | | 1 | n1 | 15 | | -100.0+15.7+TT | |  | | |  | |  | |  | |  | |  |
| -100.0+15.7+TT4 | |
| 1 | n28 | 15 | | -98.5+TT | |  | | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | |
| 1 | n77 | 15 | |  | | -95.3+TT | | |  | |  | |  | |  | |  |
| -97.5+TT4 | | |
| DL\_n1A-n41A-n77A\_UL\_n1A-n41A | | 1 | n1 | 15 | | -100.0+TT | |  | | |  | |  | |  | |  | |  |
| -102.7+TT4 | |
| 1 | n41 | 15 | |  | | -94.8+TT | | |  | |  | |  | |  | |  |
| -97.5+TT4 | | |
| 1 | n77 | 15 | |  | | -95.3+19.6+TT | | |  | |  | |  | |  | |  |
| -95.3+19.6+TT4 | | |
| DL\_n1A-n41A-n77A\_UL\_n41A-n77A | | 1 | n1 | 15 | | -100.0+9.3+TT | |  | | |  | |  | |  | |  | |  |
| -100.0+9.3+TT4 | |
| 1 | n41 | 15 | |  | | -94.8+TT | | |  | |  | |  | |  | |  |
| -97.5+TT4 | | |
| 1 | n77 | 15 | |  | | -95.3+TT | | |  | |  | |  | |  | |  |
| -97.5+TT4 | | |
| DL\_n2A-n5A-n48A\_UL\_n5A-n48A | | 1 | n2 | 15 | | -98.0+15.6+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+15.6+TT4 | | |
|  | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n48 | 15 | | -99.0+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+TT4 | | |
| DL\_n2A-n5A-n48A\_UL\_n2A-n5A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n48 | 15 | | -99.0+16.6+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+16.6+TT4 | | |
| DL\_n2A-n5A-n77A\_UL\_n2A-n77A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n5 | 15 | | -98.0 +3.8+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n2A-n5A-n77A\_UL\_n5A-n77A | | 1 | n2 | 15 | | -98.0+16.5+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+16.5+TT4 | | |
|  | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n2A-n5A-n77A\_UL\_n2A-n5A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n77 | 15 | |  | | | -95.3+16.0 +TT | |  | |  | |  | |  | |  |
| -97.5+16.0 +TT4 | |
| DL\_n2A-n48A-n66A\_UL\_n2A-n66A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n48 | 15 | | -99.0+32+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+32+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
| DL\_n2A-n48A-n66A\_UL\_n2A-n48A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n48 | 15 | | -99.0+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+12.1+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+12.1+TT4 | | |
| DL\_n2A-n48A-n66A\_UL\_n48A-n66A | | 1 | n2 | 15 | | -98.0+28.3+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+28.3+TT4 | | |
|  | | 1 | n48 | 15 | | -99.0+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
| DL\_n2A-n66A-n77A\_UL\_n2A-n66A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+29.4 +TT | |  | |  | |  | |  | |  |
| -97.5+29.4 +TT4 | |
|  | | 2 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 2 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 2 | n77 | 15 | |  | | | -95.3+8.9 +TT | |  | |  | |  | |  | |  |
| -97.5+8.9 +TT4 | |
| DL\_n2A-n66A-n77A\_UL\_n2A-n77A | | 1 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+29.2+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+29.2+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
|  | | 2 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 2 | n66 | 15 | | -99.5+10.4+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+10.4+TT4 | | |
|  | | 2 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
|  | | 3 | n2 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+TT4 | | |
|  | | 3 | n66 | 15 | | -99.5+4.0+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+4.0+TT4 | | |
|  | | 3 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n2A-n66A-n77A\_UL\_n66A-n77A | | 1 | n2 | 15 | | -98.0+32.1+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+32.1+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
|  | | 2 | n2 | 15 | | -98.0+9.1+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+9.1+TT4 | | |
|  | | 2 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 2 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
|  | | 3 | n2 | 15 | | -98.0+2.1+TT | | |  | |  | |  | |  | |  | |  |
| -100.7+2.1+TT4 | | |
|  | | 3 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 3 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n3A-n28A-n78A\_UL\_n3A-n28A | | | 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  |  | |
| -99.7+TT4 | | |
|  | | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  |  | |
| -98.5-2.7+TT4 | | |
|  | | | 1 | n78 | 15 | |  | | | -95.8+17.3+TT | |  | |  | |  | |  |  | |
| -98.0+17.3+TT4 | |
|  | | | 2 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  |  | |
| -99.7+TT4 | | |
|  | | | 2 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  |  | |
| -98.5-2.7+TT4 | | |
|  | | | 2 | n78 | 15 | |  | | | -95.8+4.5+TT | |  | |  | |  | |  |  | |
| -98.0+4.5+TT4 | |
| DL\_n3A-n28A-n41A\_UL\_n3A-n28A | | 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | | |
|  | | 1 | n41 | 15 | | -94.8+27.4+TT | | |  | |  | |  | |  | |  | |  |
| -97.5+27.4+TT4 | | |
|  | | 2 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
|  | | 2 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | | |
|  | | 2 | n41 | 15 | | -94.8+15.9+TT | | |  | |  | |  | |  | |  | |  |
| -97.5+15.9+TT4 | | |
| DL\_n3A-n28A-n41A\_UL\_n3A-n41A | | 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+26.0+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+26.0+TT4 | | |
|  | | 1 | n41 | 15 | | -94.8+TT | | |  | |  | |  | |  | |  | |  |
| -97.5+TT4 | | |
| DL\_n3A-n28A-n41A\_UL\_n28A-n41A | | 1 | n3 | 15 | | -97.0+26.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+26.0+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | | |
|  | | 1 | n41 | 15 | |  | | | -94.8+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n3A-n28A-n77A\_UL\_n3A-n28A | | 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+15.9+ TT | |  | |  | |  | |  | |  |
| -97.5+15.9+ TT4 | |
| DL\_n3A-n28A-n77A\_UL\_n28A-n77A | | 1 | n3 | 15 | | -97.0+17.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+17.0+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n3A-n28A-n77A\_UL\_n3A-n77A | | 1 | n3 | 15 | | -97.0+TT | | |  | |  | |  | |  | |  | |  |
| -99.7+TT4 | | |
|  | | 1 | n28 | 15 | | -98.5+15.3+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+15.3+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -97.5+TT4 | |
| DL\_n3A-n41A-n77A\_UL\_n3A-n41A | | 1 | n3 | 15 | -97.0+TT | |  | | |  | |  | |  | |  | |  | |
| -99.7+TT4 | |
| 1 | n41 | 15 | -94.8+TT | |  | | |  | |  | |  | |  | |  | |
| -97.5+TT4 | |
| 1 | n77 | 15 |  | | -95.3+16.8+TT | | |  | |  | |  | |  | |  | |
| -95.3+16.8+TT4 | | |
| DL\_n3A-n41A-n77A\_UL\_n41A-n77A | | 1 | n3 | 15 | -97.0+16.4+TT | |  | | |  | |  | |  | |  | |  | |
| -97.0+16.4+TT4 | |
| 1 | n41 | 15 | -94.8+TT | |  | | |  | |  | |  | |  | |  | |
| -97.5+TT4 | |
| 1 | n77 | 15 |  | | -95.3+TT | | |  | |  | |  | |  | |  | |
| -97.5+TT4 | | |
| DL\_n3A-n41A-n77A\_UL\_n3A-n77A | | 1 | n3 | 15 | -97.0+TT | |  | | |  | |  | |  | |  | |  | |
| -99.7+TT4 | |
| 1 | n41 | 15 | -94.8+5,3+TT | |  | | |  | |  | |  | |  | |  | |
| -94.8+5.3+TT4 | |
| 1 | n77 | 15 |  | | -95.3+TT | | |  | |  | |  | |  | |  | |
| -97.5+TT4 | | |
|  | |  |  |  | |  | | |  | |  | |  | |  | |  | |  |
| DL\_n5A-n48A-n66A\_UL\_n5A-n66A | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n48 | 15 | | -99.0+3.6+TT | | |  | |  | |  | |  | |  | |  |
| -101.2+3.6+TT4 | | |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
| DL\_n5A-n66A-n77A\_UL\_n5A-n66A | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+16.1+ TT | |  | |  | |  | |  | |  |
| -97.5+16.1+ TT4 | |
|  | | 2 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 2 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 2 | n77 | 15 | |  | | | -95.3+8.2+ TT | |  | |  | |  | |  | |  |
| -97.5+8.2+ TT4 | |
|  | | 3 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 3 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+TT4 | | |
|  | | 3 | n77 | 15 | |  | | | -95.3+3.3+ TT | |  | |  | |  | |  | |  |
| -97.5+3.3+ TT4 | |
| DL\_n5A-n66A-n77A\_UL\_n5A-n77A | | 1 | n5 | 15 | | -98.0+TT | | |  | |  | |  | |  | |  | |  |
|  | | 1 | n66 | 15 | | -99.5+13.2+TT | | |  | |  | |  | |  | |  | |  |
| -102.2+13.2TT4 | | |
|  | | 1 | n77 | 15 | |  | | | -95.3+ TT | |  | |  | |  | |  | |  |
| -97.5+ TT4 | |
| DL\_n28A-n41A-n79A\_UL\_n41A-n79A | | 1 | n28 | 15 | | -98.5+13+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+13+TT | | |
|  | | 1 | n41 | 15 | |  | | | -94.9+TT | |  | |  | |  | |  | |  |
| -94.9-2.7+TT | |
|  | | 1 | n79 | 15 | |  | | |  | |  | |  | |  | |  | | -89.6+TT |
| -89.6-2.2+TT |
| DL\_n28A-n41A-n79A\_UL\_n28A-n41A | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT | | |
|  | | 1 | n41 | 15 | |  | | | -94.9+TT | |  | |  | |  | |  | |  |
| -94.9-2.7+TT | |
|  | | 1 | n79 | 15 | |  | | |  | |  | |  | |  | |  | | -89.6+10.1+TT |
| -89.6-2.2+10.1+TT |
| DL\_n28A-n41A-n79A\_UL\_n28A-n79A | | 1 | n28 | 15 | | -98.5+TT | | |  | |  | |  | |  | |  | |  |
| -98.5-2.75+TT | | |
|  | | 1 | n41 | 15 | |  | | | -94.9+10.4+TT | |  | |  | |  | |  | |  |
| -94.9-2.7+10.4+TT | |
|  | | 1 | n79 | 15 | |  | | |  | |  | |  | |  | |  | | -89.6+TT |
| -89.6-2.2+TT |
| DL\_n66A-n71A-n77A\_UL\_n66A-n71A | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -99.5-2.7+TT4 | | |
| 1 | n71 | 15 | | -97.2+TT | | |  | |  | |  | |  | |  | |  |
| -97.2-2.7+TT4 | | |
| 1 | n77 | 15 | |  | | | -95.3+15.9+TT | |  | |  | |  | |  | |  |
| -95.3+15.9+TT4 | |
| DL\_n66A-n71A-n77A\_UL\_n66A-n77A | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -99.5-2.7+TT4 | | |
| 1 | n71 | 15 | | -97.2+15.3+TT | | |  | |  | |  | |  | |  | |  |
| -97.2 +15.3+TT4 | | |
| 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -95.3-2.2+TT4 | |
| DL\_n66A-n71A-n77A\_UL\_n71A-n77A | | 1 | n66 | 15 | | -99.5+15.5+TT | | |  | |  | |  | |  | |  | |  |
| -99.5+15.5+TT4 | | |
| 1 | n71 | 15 | | -97.2+TT | | |  | |  | |  | |  | |  | |  |
| -97.2-2.7+TT4 | | |
| 1 | n77 | 15 | |  | | | -95.3+TT | |  | |  | |  | |  | |  |
| -95.3-2.2+TT4 | |
| DL\_n66A-n71A-n78A\_UL\_n66A-n71A | | 1 | n66 | 15 | | -99.5+TT | | |  | |  | |  | |  | |  | |  |
| -99.5-2.7+TT4 | | |
|  | | 1 | n71 | 15 | | -97.2+TT | | |  | |  | |  | |  | |  | |  |
| -97.2-2.7+TT4 | | |
|  | | 1 | n78 | 15 | |  | | | -95.8+9+TT | |  | |  | |  | |  | |  |
| -95.8+9+TT4 | |
| DL\_n66A-n71A-n78A\_UL\_n71A-n78A | | 1 | n66 | 15 | | -99.5+15.5+TT | | |  | |  | |  | |  | |  | |  |
| -99.5+15.5+TT4 | | |
|  | | 1 | n71 | 15 | | -97.2+TT | | |  | |  | |  | |  | |  | |  |
| -97.2-2.7+TT4 | | |
|  | | 1 | n78 | 15 | |  | | | -95.8+TT | |  | |  | |  | |  | |  |
| -95.8-2.2+TT4 | |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)  Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.  Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.  Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured.  Note 5: 4 Rx operation is targeted for FWA form factor. | | | | | | | | | | | | | | | | | | | |

Table 7.3A.2\_1.5-1a: Reference sensitivity requirement for PC2 interband 3DL CA

| CA configuration | Test ID | NR band | SCS kHz | Channel Bandwidth | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | 25 MHz (dBm) | 30 MHz (dBm) | 40 MHz (dBm) |
| DL\_n2A-n5A-n77A\_UL\_n2A-n77A | 1 | n2 | 15 | -98.0+TT |  |  |  |  |  |  |
| -100.7+TT4 |
|  | 1 | n5 | 15 | -98.0 +13.6+TT |  |  |  |  |  |  |
|  | 1 | n77 | 15 |  | -95.3+TT |  |  |  |  |  |
| -97.5+TT4 |
| DL\_n2A-n5A-n77A\_UL\_n5A-n77A | 1 | n2 | 15 | -98.0+24.8+TT |  |  |  |  |  |  |
| -100.7+24.8+TT4 |
|  | 1 | n5 | 15 | -98.0+TT |  |  |  |  |  |  |
|  | 1 | n77 | 15 |  | -95.3+TT |  |  |  |  |  |
| -97.5+TT4 |
| DL\_n2A-n66A-n77A\_UL\_n2A-n77A | 1 | n2 | 15 | -98.0+TT |  |  |  |  |  |  |
| -100.7+TT4 |
|  | 1 | n66 | 15 | -99.5+34.7+TT |  |  |  |  |  |  |
| -102.2+34.7+TT4 |
|  | 1 | n77 | 15 |  | -95.3+TT |  |  |  |  |  |
| -97.5+TT4 |
| DL\_n2A-n66A-n77A\_UL\_n66A-n77A | 1 | n2 | 15 | -98.0+37.6+TT |  |  |  |  |  |  |
| -100.7+37.6+TT4 |
|  | 1 | n66 | 15 | -99.5+TT |  |  |  |  |  |  |
| -102.2+TT4 |
|  | 1 | n77 | 15 |  | -95.3+TT |  |  |  |  |  |
| -97.5+TT4 |
| DL\_n5A-n66A-n77A\_UL\_n5A-n77A | 1 | n5 | 15 | -98.0+TT |  |  |  |  |  |  |
|  | 1 | n66 | 15 | -99.5+22.2+TT |  |  |  |  |  |  |
| -102.2+22.2TT4 |
|  | 1 | n77 | 15 |  | -95.3+ TT |  |  |  |  |  |
| -97.5+ TT4 |
| Note 1: The transmitter shall be set to maximum output power level (Table 7.3A.3.5-2)  Note 2: The reference measurement channel is specified in Annexe A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.  Note 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3.  Note 4: Applicable only if operation with 4 antenna ports is supported in the band with carrier aggregation configured. | | | | | | | | | | |

### 7.3A.3 Reference sensitivity power level for 4DL CA

NOTE: Intraband contiguous 4DL CA is FFS

7.3A.3.1 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.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support NR 4DL CA.

7.3A.3.3 Minimum requirements

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

7.3A.3.4 Test description

7.3A.3.4.1 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 7.3A.3.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A2.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3A.3.4.1-1: Test Configuration Table for 4DL CA

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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-nRA: Mid range for PCC and SCC with exceptions  CA\_nX(2A)-nYA-nZA: For nY and nZ bands, Mid range for PCC and SCC with exceptions.  CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA : Low range, High Range for nXC and nXB, mid range for nYA for PCC and SCC with exceptions.  Exceptions for CA configurations containing the following band combinations:  CA\_n1-n77: Mid in band n1 and Low in band n77  CA\_n2-n77: UL and DL Mid in band n2 and band n77 at 3850MHz  CA\_n3-n77: TBD in band n3 and TBD in band n77.  CA\_n3-n78: Mid in band n3 and High in band n78.  CA\_n8-nX: Low range for PCC in Band n8  CA\_n70-n71: High range for PCC in band n71  These exceptions apply only for nY and nZ bands in the case of CA\_nX(2A)-nYA-nZA. | | | | | | | | | |
| 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 “PCC NRB”and “SCC NRB ” columns | | | | | | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | | | | | | | | | | Lowest | | | | | | | | | |
| Network signalling value | | | | | | | | | | | | | NS\_01  Unless 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) | | |
| CA configuration | | | | | | | | | | | PCC NRB | | SCC1 NRB | SCC2 NRB | SCC3 NRB | CC Mod | PCC & SCC RB allocation | | CC Mod | PCC & SCC RB allocation | |
| PCC | | Wgap1 | SCC1 | | Wgap2 | SCC2 | | Wgap3 | SCC3 | | PCC | SCC |
| Band | Range | Band | Range | Band | Range | Band | Range |
| Default Test Settings for a CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band) | | | | | | | | | | | | | | | | | | | | | | |
| 1 | nX | default | N/A | nX | default | N/A | nY | default | N/A | nZ | default | Highest NRB\_agg | | Highest NRB\_agg | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | N/A | nX | default | N/A | nX | default | N/A | nZ | default | Highest (NOTE 11) | | Highest NRB\_agg | Highest NRB\_agg | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 3 | nZ | default | N/A | nX | default | N/A | nX | default | N/A | nY | default | Highest (NOTE 11) | | Highest NRB\_agg | Highest NRB\_agg | Highest | 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) | | |
| CA configuration | | | | | | | | | | | PCC NRB | SCC1 NRB | SCC2 NRB | SCC3 NRB | CC Mod | PCC & SCC RB allocation | | CC Mod | PCC & SCC RB allocation | |
| PCC | | Wgap1 | SCC1 | | Wgap2 | SCC2 | | Wgap3 | SCC3 | | PCC | SCC |
| Band | Range | Band | Range | Band | Range | Band | Range |
| Default Test Settings for a CA\_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band) | | | | | | | | | | | | | | | | | | | | | |
| 1 | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | nY | N/A | N/A | nZ | default | Highest NRB\_agg (NOTE 6) | Highest NRB\_agg (NOTE 6) | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | N/A | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | nZ | default | Highest (NOTE 11) | Highest NRB\_agg | Highest NRB\_agg | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 3 | nZ | default | N/A | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | Ny | default | Highest (NOTE 11) | Highest NRB\_agg | Highest NRB\_agg | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| **Default Test Settings for a CA\_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | nX | CC1 | Max (NOTE 7) | nX | CC2 | N/A | nY | CC1 | Max (NOTE 7) | nY | CC2 | Highest NRB\_agg (NOTE 6) | 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 | - |
| 2 | nY | CC1 | Max (NOTE 7) | nY | CC2 | N/A | nX | CC1 | Max (NOTE 7) | nX | CC2 | Highest NRB\_agg (NOTE 6) | 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 | - |
| **Default Test Settings for CA\_nXA-nYA-nZA-nRA Configurations (Inter-band)** | | | | | | | | | | | | | | | | | | | | | |
| 1 | nX | default | N/A | nY | default | N/A | nZ | default | N/A | nR | default | Highest (NOTE 11) | Highest | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 2 | nY | default | N/A | nX | default | N/A | nZ | default | N/A | nR | default | Highest (NOTE 11) | Highest | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 3 | nZ | default | N/A | nX | default | N/A | nY | default | N/A | nR | default | Highest (NOTE 11) | Highest | Highest | Highest | CP-OFDM QPSK | Full RB | | DFT-s-OFDM QPSK | REFSENS | - |
| 4 | nR | default | N/A | nX | default | N/A | nY | default | N/A | nZ | default | Highest (NOTE 11) | Highest | Highest | Highest | 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, nR correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n28A-n78A, nX=n1, nY=n3, nZ=n28, nR=n78.  Note 4: **Intra-band contiguous + Inter-band: n**X,nY,nZ correspond to the different bands in the CA Configuration, e.g. for CA\_n1C-n3A-n8A, nX=n1, nY=n3, nZ = n8  Note 5: **Intra-band non-contiguous + Inter-band:** nX, nY and nZ correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n1A-n8A-n28A, nX=n1, nY =8, nZ = 28.  Note 6: 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 7: The Wgap is defined to be widest possible on band based on the PCC and SCC configuration for Intra-band non-contiguous  Note 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 tested  Note 9: The fallback configurations including CA\_nXA-nYA for 4CA configurations nXC-nYA-nZA and nXB-nYA-nZA do not need to be tested even if the test frequency differs. 7.3A.1\_1 shall be tested for all nXA-nYA combinations including exceptions.  Note 10: In a band where UE supports 4Rx, the test needs to be performed only with 4Rx antennas connected.  Note 12: Each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.3. DL channel bandwidth shall be selected first. | | | | | | | | | | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 for PCC 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 UL and Reference Measurement Channel is set according to Table 7.3A.3.4.1-1.

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 7.3A.2.1.4.3*.*

7.3A.3.4.2 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 7.3A.3.1.4.3.

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 7.3A.3.4.1-1 on both PCC and SCC. 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 7.3A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3.2.5-1 and 7.3.2.5-2 as appropriate. Send continuously uplink power control "up" commands in every uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the throughput measurement. Allow at least 200ms starting from the first TPC command in this step for the UE to reach PUMAX level.

7. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

7.3A.3.4.3 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.

7.3A.3.5 Test requirement

For 4DL carrier aggregation, test parameters are specified in table 7.3A.3.4.1-1. For the CA configurations listed in table 7.3A.3.5-1, the throughput of each component carrier shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with reference sensitivity power level specified in table 7.3.2.5-1 for each non-SDL carrier for 2 Rx antenna port, in table 7.3.2.5-2 for each non-SDL carrier for 4 Rx antenna port and in table 7.3A.1.5-2 for SDL carrier with following additional requirements:

For the UE which supports inter-band carrier aggregation, the test requirement for reference sensitivity shall be increased by the amount given by ΔRIB,c defined in clause 7.3A.0.3.2 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

For intra-band non-contiguous CA with one uplink carrier and two or more downlink sub-blocks, the test requirement for SCC(s) shall be increased by ΔRIBNC given in Table 7.3A.0.2.2-1. Unless given by Table 7.3.2.3-4, the reference sensitivity requirements shall be verified with the network signalling value NS\_01 (Table 6.2.3.1-1) configured.

Table 7.3A.3.5-1: Reference sensitivity requirement for 4DL CA

|  |  |  |
| --- | --- | --- |
| Carrier aggregation type | DL CA configuration | UL CA configuration |
| Inter-band 4DL CA | CA\_n1A-n3A-n28A-n78A | - |
| CA\_n2A-n5A-n77C |  |
| CA\_n2A-n48A-n77C |  |
| CA\_n2A-n66A-n77C |  |
| CA\_n5A-n48A-n77C |  |
| CA\_n5A-n66A-n77C |  |
| CA\_n26A-n66(2A)-n70A | - |
| CA\_n48A-n66A-n71(2A) | - |
| CA\_n48A-n66A-n77C |  |
| CA\_n48A-n66(2A)-n70A | - |
| CA\_n48A-n66(2A)-n71A | - |
| CA\_n48A-n70A-n71(2A) | - |
| CA\_n48B-n66A-n70A | - |
| CA\_n48B-n66A-n71A | - |
| CA\_n48B-n70A-n71A | - |
| CA\_n48(2A)-n66A-n70A | - |
| CA\_n48(2A)-n66A-n71A | - |
| CA\_n48(2A)-n66(2A) | - |
| CA\_n48(2A)-n70A-n71A | - |
| CA\_n48(2A)-n71(2A) | - |
| CA\_n66A-n70A-n71(2A) | - |
| CA\_n66B-n70A-n71A | - |
| CA\_n66(2A)-n70A-n71A | - |
| CA\_n66(2A)-n71(2A) | - |
|  | CA\_n2A-n5A-n48A-n66A | - |
|  | CA\_n2A-n5A-n48A-n77A | - |
|  | CA\_n2A-n5A-n66A-n77A | - |
|  | CA\_n2A-n48A-n66A-n77A | - |
|  | CA\_n5A-n48A-n66A-n77A | - |
|  | CA\_n66A-n71A-n77(2A) | - |
|  | CA\_n66A-n71A-n78(2A) | - |
| SDL configuration | CA\_n29A-n66B-n70A | - |
|  | CA\_n29A-n66(2A)-n70 | - |

### 7.3A.4 Reference sensitivity power level for 5DL CA

FFS

## 7.3B Reference sensitivity for NR-DC

For inter-band NR-DC configurations, the reference sensitivity for the corresponding inter-band CA configuration as specified in clause 7.3A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.3A.

## 7.3C Reference sensitivity for SUL

### 7.3C.0 Minimum conformance requirements

#### 7.3C.0.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel. For operations with 4 Rx antenna ports, the MSD in the applicable bands shall be increased by the absolute value of ΔRIB,4R in Table 7.3.2-2 when MSD > 0.

#### 7.3C.0.2 Minimum conformance requirements for Reference sensitivity power level

For SUL operation, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in Table 7.3.2.3-1 and 7.3.2.3-2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-1 or supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.0.2-1 with reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, 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), unless sensitivity degradation is allowed in this section of this specification. These exceptions also apply to any higher order CA or DC combination containing one of the exception combinations in this section as subset.

For SUL operation with downlink CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.2-3 or supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.2-1 with reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, 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), unless sensitivity degradation is allowed in this clause of this specification. These exceptions also apply to any higher order CA or DC combination containing one of the exception combinations in this clause as subset.

Table 7.3C.0.2-1: Supplementary uplink configuration for reference sensitivity

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DL band | UL band | SCS of UL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHZ | 80 MHz | 90 MHz | 100 MHz |
| n41 | n83 | 15 |  | 100 | 100 | 100 |  | 100 | 100 | 100 | 100 |  | 100 | 100 | 100 |
| 30 |  | 50 | 50 | 50 |  | 50 | 50 | 50 | 50 |  | 50 | 50 | 50 |
| n78 | n80 | 15 | 25 | 100 | 100 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n78 | n81 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n78 | n82 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n78 | n83 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n78 | n84 | 15 | 25 | 50 | 75 | 100 | 100 | 100 | 100 | 100 |  | 100 |  |  |  |
| n78 | n86 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n79 | n80 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n79 | n81 | 15 | 25 | 50 | 75 | 100 |  |  | 100 | 100 |  |  |  |  |  |
| n79 | n83 | 15 |  |  |  |  |  |  | 100 | 100 | 100 |  | 100 |  | 100 |
| 30 |  |  |  |  |  |  | 50 | 50 | 50 |  | 50 |  | 50 |

For the UE that supports any of the SUL operation given in Table 7.3C.0.2-2, exceptions to the requirements specified in Table7.3.2.3-1 are allowed when the uplink is active in a lower frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3C.0.2-2. For these exceptions, the UE shall meet the requirements specified in Table 7.3C.0.2-2 and Supplementary Uplink configuration (exceptions due to harmonic issue given in Table 7.3C.0.2-3.

Table 7.3C.0.2-2: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n80 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n80 | n78 | 10 | 15 | 50 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n80 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| n81 | n78 | 5 | 15 | 16 (RBstart=4) | 10 | 10.8 | NOTE 4 | UL4/DL1  direct-hit |
| n81 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 1.4 | NOTE 4 | UL4/DL1  direct-hit |
| n81 | n79 | 5 | 15 | 25 (RBstart=0) | 40 | 6.8 | NOTE 5 | UL5/DL1  direct-hit |
| n81 | n79 | 5 | 15 | 25 (RBstart=0) | 100 | 4.4 | NOTE 5 | UL5/DL1  direct-hit |
| n82 | n78 | 5 | 15 | 16 (RBstart=4) | 10 | 10.8 | NOTE 4 | UL4/DL1  direct-hit |
| n82 | n78 | 5 | 15 | 20 (RBstart=2) | 100 | 1.0 | NOTE 4 | UL4/DL1  direct-hit |
| n83 | n78 | 5 | 15 | 10 (RBstart=8) | 10 | 10.4 | NOTE 5 | UL5/DL1  direct-hit |
| n83 | n78 | 5 | 15 | 25 (RBstart=0) | 100 | 0.7 | NOTE 5 | UL5/DL1  direct-hit |
| n86 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 23.9 | NOTE 2 | UL2/DL1  direct-hit |
| n86 | n78 | 10 | 15 | 100 (RBstart=0) | 100 | 13.8 | NOTE 2 | UL2/DL1  direct-hit |
| n86 | n78 | 5 | 15 | 25 (RBstart=0) | 10 | 1.1 | NOTE 6 | UL2/DL1  near-miss |
| NOTE 1: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd / 3rd / 4th / 5th transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band.  NOTE 2: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the lower band.  NOTE 3: The requirements should be verified for UL NR ARFCN of the aggressor (lower) band (superscript LB) such that  in MHz and  with the carrier frequency in the victim (higher) band in MHz and the channel bandwidth configured in the low band.  NOTE 4: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band.  NOTE 6: The requirements are only applicable to channel bandwidths no larger than 20 MHz and with a carrier frequency at  MHz offset from  in the victim (higher band) with , whereandare the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively. | | | | | | | | |

Table 7.3C.0.2-3: Void

#### 7.3C.0.3 ΔRIB,c for SUL

7.3C.0.3.1 General

For a UE supporting a SUL configuration, the ΔRIB,c applies for both SC and SUL operation.

7.3C.0.3.2 SUL band combination

For the UE which supports SUL band combination, the minimum requirement for reference sensitivity in subclause 7.3C.0 shall be increased by the amount given in ΔRIB,c defined in subclause 7.3C.0.3 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

- When the operating band frequency range is ≤ 1 GHz, the applicable additional ΔRIB,c shall be the average value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ΔRIB,c among the different supported band combinations involving such band shall be applied

- When the operating band frequency range is > 1 GHz, the applicable additional ΔRIB,c shall be the maximum value for all band combinations defined in subclause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.521-3 [14] for the applicable operating bands.

7.3C.0.3.2.1 ΔRIB,c for two bands

Table 7.3C.0.3.2.1-1: ΔRIB,c due to SUL (two bands)

|  |  |  |
| --- | --- | --- |
| Band combination for SUL | NR Band | ΔRIB,c (dB) |
| SUL\_n78-n80 | n78 | 0.5 |
| SUL\_n78-n81 | n78 | 0.5 |
| SUL\_n78-n82 | n78 | 0.5 |
| SUL\_n78-n83 | n78 | 0.5 |
| SUL\_n78-n84 | n78 | 0.5 |
| SUL\_n78-n86 | n78 | 0.5 |
| SUL\_n79-n83 | n79 | 0.5 |

7.3C.0.3.2.2 ΔRIB,c for three bands

Table 7.3C.0.3.2.2-1: ΔRIB,c due to SUL (three bands)

|  |  |  |
| --- | --- | --- |
| Band combination for SUL | NR Band | ΔRIB,c (dB) |
| CA\_n1\_n78-n80 | n1 | 0.2 |
| n78 | 0.5 |
| CA\_n1\_n78-n84 | n1 | 0.2 |
| n78 | 0.5 |
| CA\_n3\_n78-n80 | n3 | 0.2 |
| n78 | 0.5 |
| CA\_n28\_n41-n83 | n28 | 0.2 |
| CA\_n28\_n79-n83 | n28 | 0.2 |
| n79 | 0.5 |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3C.2 and 7.3C.3.

### 7.3C.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

For reference sensitivity exception test points where the specified carrier frequency does not correspond to a valid NR-ARFCN, the closest NR-ARFCN as specified in clause 5.4.2 applies.

### 7.3C.2 Reference sensitivity power level for SUL

Editor’s Note: The following aspects are either missing or not yet determined:

- Exceptional test points for configurations except SUL\_n78-n80 and SUL\_n78-n81 is FFS

7.3C.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under SUL operation and conditions of low signal level, ideal propagation and no added noise.

7.3C.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports SUL operation on the SUL bands.

7.3C.2.3 Minimum conformance requirement

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

7.3C.2.4 Test description

7.3C.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 7.3C.2.4.1-1 and 7.3C.2.4.1-2. 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 7.3C.2.4.1-1: Test Configuration Table for SUL 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 | | | | Mid range for SUL carrier.  Low, Mid, High range for non-SUL carrier  With following exceptions:  SUL\_n78-n80: High in band n78  SUL\_n78-n81: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n81: 20 MHz  n82: 20 MHz  n83: 20 MHz  n84: 20 MHz  n86: 40 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.5C-1 | | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | | |
| Test ID | Downlink Configuration | | UL Configuration | | SUL Configuration | |
|  | Modulation | RB allocation | Modulation | RB allocation (NOTE 2) |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) | N/A | | DFT-s-OFDM QPSK | REFSENS  (NOTE 2) |
| 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 Table 7.3C.2.4.1-1a which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band.  NOTE 3: In a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated. | | | | | | |

Table 7.3C.2.4.1-1a: SUL configuration for reference sensitivity, LCRB @ RBstart format (without exception)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band / SCS of SUL band / Channel bandwidth of the DL band / LCRB@RBStart of SUL band | | | | | | | | | | | | | | |
| DL band | SUL band | SCS of SUL band  (kHz) | 5  MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n41 | n80 | 15 |  | 160@0 | 160@0 | 160@0 |  |  | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 |
| n41 | n81 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n41 | n83 | 15 |  | 100@0 | 100@0 | 100@0 |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| 30 |  | 50@0 | 50@0 | 50@0 |  | 50@0 | 50@0 | 50@0 | 50@0 | 50@0 | 50@0 | 50@0 |
| n41 | n95 | 15 |  | 75@0 | 75@0 | 75@0 |  | 75@0 | 75@0 | 75@0 | 75@0 | 75@0 | 75@0 | 75@0 |
| n77 | n80 | 15 |  | 160@0 | 160@0 | 160@0 |  |  | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 |
| n77 | n84 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n78 | n80 | 15 |  | 160@0 | 160@0 | 160@0 |  |  | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 | 160@0 |
| n78 | n81 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n78 | n82 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n78 | n83 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n78 | n84 | 15 |  | 100@0 | 100@0 | 100@0 |  |  | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 | 100@0 |
| n78 | n86 | 15 |  | 216@0 | 216@0 | 216@0 |  |  | 216@0 | 216@0 | 216@0 | 216@0 | 216@0 | 216@0 |
| n79 | n83 | 15 |  |  |  |  |  |  | 100@0 | 100@0 | 100@0 | 100@0 |  | 100@0 |
| 30 |  |  |  |  |  |  | 50@0 | 50@0 | 50@0 | 50@0 |  | 50@0 |
| n79 | n80 | 15 |  |  |  |  |  |  | 160@0 | 160@0 | 160@0 | 160@0 |  | 160@0 |
| n79 | n81 | 15 |  |  |  |  |  |  | 100@0 | 100@0 | 100@0 | 100@0 |  | 100@0 |
| n79 | n84 | 15 |  |  |  |  |  |  | 100@0 | 100@0 | 100@0 | 100@0 |  | 100@0 |
| n79 | n95 | 15 |  |  |  |  |  |  | 75@0 | 75@0 | 75@0 | 75@0 |  | 75@0 |

Table 7.3C.2.4.1-2: Test configurations table for SUL operation exceptions due to UL harmonic issue

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | | | | | | | See range column for each CC | | | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | | | | See CBW column for each CC | | | | | |
| Test SCS as specified in Table 5.5C-1 | | | | | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | | | | |
| Test Parameters | | | | | | | | | | | | |
| ID | Downlink Configuration | | | | | UL Configuration | | SUL Configuration | | | | |
| Band | Range | CBW | Mod | RB alloc  (NOTE 1) | Band | Range | CBW | Mod | RB alloc (LCBR@RBstart) |
| Test settings for SUL\_n78A-n80A | | | | | | | | | | | | |
| 1 | n78 | 3560 | 100MHz | CP-OFDM QPSK | Full RB | N/A | | n80 | High | 10 MHz | DFT-s-OFDM QPSK | 50@0 |
| 2 | n78 | 3565 | 10 MHz | CP-OFDM QPSK | Full RB | N/A | | n80 | High | 5 MHz | DFT-s-OFDM QPSK | 25@0 |
| 3 | n78 | 3540 | 10 MHz | CP-OFDM QPSK | Full RB | N/A | | n80 | High | 5 MHz | DFT-s-OFDM QPSK | 25@0 |
| Test settings for SUL\_n78A-n81A | | | | | | | | | | | | |
| 1 | n78 | 3590 | 10 MHz | CP-OFDM QPSK | Full RB | N/A | | n81 | Mid | 5 MHz | DFT-s-OFDM QPSK | 16@4 |
| 2 | n78 | 3590 | 100 MHz | CP-OFDM QPSK | Full RB | N/A | | n81 | Mid | 5 MHz | DFT-s-OFDM QPSK | 25@0 |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3.2.4.1-2. | | | | | | | | | | | | |
|  |  | | | | |  | |  | | | | |
|  |  |  |  |  |  |  |  |  |  |
|  | | | | | | | | | | | | |
|  |  |  |  |  |  |  | |  |  |  |  |  |
|  |  |  |  |  |  |  | |  |  |  |  |  |
|  | | | | | | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.4 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 C0, C.1, C.2, C3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.0 with consideration of supplementary uplink physical channels.

4. The UL and DL Reference Measurement Channel shall be set according to Table 7.3C.2.4.1-1 or 7.3C.2.4.1-2.

5. The UL Reference Measurement Channel shall be set according to Table 7.3C.2.4.1-1for REFSENS without exceptions and Table 7.3C.2.4.1-2 when testing is performed with SUL/DL band combination listed in Table 7.3C.0.2-2 for exceptions due to harmonic issue.

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 7.3C.2.4.3

7.3C.2.4.2 Test procedure

1 SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.3C.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0\_1 for C\_RNTI to schedule the UL RMC on SUL band according to Tables 7.3C.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3C.2.5-1 for 2Rx and table 7.3C.2.5-2 for 4Rx. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

5. For configurations listed in table 7.3C.2.4.1-2, repeat step 1-4 with table 7.3C.2.4.1-2 replacing table 7.3C.2.4.1-1 in step1 and step 2, table 7.3C.2.5.1-1 replacing 7.3C.2.5-1 and table 7.3C.2.5-2 in step 3.

7.3C.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, additionally the following exception shown in Table 7.3C.2.4.3-1 is considered.

Table 7.3C.2.4.3-1: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

7.3C.2.5 Test requirement

The throughput measured in step 4 shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 for REFSENS without exception testing with receive power level specified in Tables 7.3C.2.5-1 for 2Rx antenna port and Tables 7.3C.2.5-2 for 4 Rx antenna port, and parameters specified in table 7.3C.2.4.1-1.

Table 7.3C.2.5-0: Test Tolerance (TT) for RX sensitivity level

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0 GHz |
| 0.7 dB | 1.0 dB |

Table 7.3C.2.5-1: Reference sensitivity QPSK PREFSENS for 2Rx

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n1 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7  +TT | -91.9  +TT | -90.6 +TT | -89.6 +TT |  |  |  |  | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT | -92.0 +TT | -90.7 +TT | -89.7 +TT |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT | -92.1 +TT | -90.9 +TT | -89.7 +TT |  |  |  |  |
| n2 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |  |  |  |  |  |  |  |  |
| n3 | 15 | -97.0 +TT | -93.8 +TT | -92.0 +TT | -90.8 +TT | -89.7 +TT | -88.9 +TT | -87.6 +TT |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -92.1 +TT | -91.0 +TT | -89.8 +TT | -89.0 +TT | -87.7 +TT |  |  |  |  |  |
| 60 |  | -94.5 +TT | -92.4 +TT | -91.2 +TT | -90.0 +TT | -89.1 +TT | -87.9 +TT |  |  |  |  |  |
| n5 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -90.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -91.0 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n71 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |  |  |  |  |  |  |  |  |
| n8 | 15 | -97.0 +TT | -93.8 +TT | -92.0 +TT | -90.0 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -92.1 +TT | -90.2 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n12 | 15 | -97.0 +TT | -93.8 +TT | -84.0 +TT |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -84.1 +TT |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | -97.0 +TT | -93.8 +TT |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | -97.0 +TT | -93.8 +TT | -91.0 +TT | -89.8 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.1 +TT | -91.1 +TT | -90.0 +TT |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 | -96.5 +TT | -93.3 +TT | -91.5 +TT | -90.3 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -93.6 +TT | -91.6 +TT | -90.5 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -94.0 +TT | -91.9 +TT | -90.7 +TT |  |  |  |  |  |  |  |  |
| n26 | 15 | -97.5 +TT | -94.5 +TT | -92.7 +TT | -87.6 +TT |  |  |  |  |  |  |  |  |  |
| 30 |  | -94.8 +TT | -92.7 +TT | -87.7 +TT |  |  |  |  |  |  |  |  |
| n28 | 15 | -98.5 +TT | -95.5 +TT | -93.5 +TT | -90.8 +TT |  | -78.5 +TT |  |  |  |  |  |  | FDD |
| 30 |  | -95.6 +TT | -93.6 +TT | -91.0 +TT |  | -78.6 +TT |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | -99.0 +TT | -95.8 +TT |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.1 +TT |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n34 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 +TT | -95.1 +TT |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT |  |  |  |  |  |  |  |  |  |
| n38 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT |  |  | -90.6 +TT |  |  |  |  |  | TDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT |  |  | -90.7 +TT |  |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |  |  | -90.9 +TT |  |  |  |  |  |
| n39 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7 +TT | -91.9 +TT | -90.6 +TT |  |  |  |  |  | TDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT | -92.0 +TT | -90.7 +TT |  |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT | -92.1 +TT | -90.9 +TT |  |  |  |  |  |
| n40 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7 +TT | -91.9 +TT | -90.6 +TT | -89.6 +TT |  |  |  |  | TDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT | -92.0 +TT | -90.7 +TT | -89.7 +TT | -88.9 +TT | -87.6 +TT |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT | -92.1 +TT | -90.9 +TT | -89.8 +TT | -89.1 +TT | -87.6 +TT |  |  |
| n411 | 15 |  | -94.8 +TT | -93.0 +TT | -91.8 +TT |  | -89.9 +TT | -88.6 +TT | -87.6 +TT |  |  |  |  | TDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |  | -90.0 +TT | -88.7 +TT | -87.7 +TT | -86.9 +TT | -85.6 +TT | -85.1 +TT | -84.7 +TT |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |  | -90.1 +TT | -88.9 +TT | -87.8 +TT | -87.1 +TT | -85.6 +TT | -85.1 +TT | -84.7 +TT |
| n481 | 15 | -99.0 +TT | -95.8 +TT | -94.0 +TT | -92.7 +TT |  |  | -89.6 +TT | -88.65 +TT |  |  |  |  | TDD |
| 30 |  | -96.1 +TT | -94.1 +TT | -92.9 +TT |  |  | -89.7 +TT | -88.75 +TT | -87.95 +TT | -86.65 +TT | -86.15 +TT | -85.65 +TT |
| 60 |  | -96.5 +TT | -94.4 +TT | -93.1 +TT |  |  | -89.9 +TT | -88.85 +TT | -88.05 +TT | -86.75 +TT | -86.25 +TT | -85.75 +TT |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n50 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT |  | -91.9 +TT | -90.6 +TT | -89.6 +TT |  |  |  |  | TDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT |  | -92.0 +TT | -90.7 +TT | -89.7 +TT | -88.9 +TT | -87.6 +TT |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |  | -92.1 +TT | -90.9 +TT | -89.8 +TT | -89.1 +TT | -87.6 +TT |  |  |
| n51 | 15 | -100.0 +TT |  |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | 15 | -100.0 +TT | -96.8 +TT |  |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | -97.1 +TT |  |  |  |  |  |  |  |  |  |  |
| 60 |  | -97.5 +TT |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | -99.5+TT | -96.3+TT | -94.5+TT | -93.3+TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.6+TT | -94.6+TT | -93.5+TT |  |  |  |  |  |  |  |  |
| 60 |  | -97.0+TT | -94.9+TT | -93.7+TT |  |  |  |  |  |  |  |  |
| n66 | 15 | -99.5 +TT | -96.3 +TT | -94.5 +TT | -93.3 +TT | -92.2 +TT | -91.4 +TT | -90.1 +TT |  |  |  |  |  | FDD |
| 30 |  | -96.6 +TT | -94.6 +TT | -93.5 +TT | -92.3 +TT | -91.5 +TT | -90.2 +TT |  |  |  |  |  |
| 60 |  | -97.0 +TT | -94.9 +TT | -93.7 +TT | -92.5 +TT | -91.6 +TT | -90.4 +TT |  |  |  |  |  |
| n70 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | -92.7 +TT |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT | -92.8 +TT |  |  |  |  |  |  |  |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT | -93.0 +TT |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n71 | 15 | -97.2 +TT | -94.0 +TT | -91.6 +TT | -86.0 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -94.3 +TT | -91.9 +TT | -87.4 +TT |  |  |  |  |  |  |  |  |
| 60 | - |  |  |  |  |  |  |  |  |  |  |  |
| n74 | 15 | -99.53 +TT | -96.33 +TT | -94.53 +TT | -93.33 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -96.63 +TT | -94.63 +TT | -93.53 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -97.03 +TT | -94.93 +TT | -93.73 +TT |  |  |  |  |  |  |  |  |
| n771,4 | 15 |  | -95.3 +TT | -93.5 +TT | -92.2 +TT |  |  | -89.1 +TT | -88.1 +TT |  |  |  |  | TDD |
| 30 |  | -95.6 +TT | -93.6 +TT | -92.4 +TT |  |  | -89.2 +TT | -88.2 +TT | -87.4 +TT | -86.1 +TT | -85.6 +TT | -85.1 +TT |
| 60 | - | -96.0 +TT | -93.9 +TT | -92.6 +TT |  |  | -89.4 +TT | -88.3 +TT | -87.5 +TT | -86.2 +TT | -85.7 +TT | -85.2 +TT |
| n781 | 15 |  | -95.8 +TT | -94.0 +TT | -92.7 +TT |  |  | -89.6 +TT | -88.6 +TT |  |  |  |  | TDD |
| 30 |  | -96.1 +TT | -94.1 +TT | -92.9 +TT |  |  | -89.7 +TT | -88.7 +TT | -87.9 +TT | -86.6 +TT | -86.1 +TT | -85.6 +TT |
| 60 |  | -96.5 +TT | -94.4 +TT | -93.1 +TT |  |  | -89.9 +TT | -88.8 +TT | -88.0 +TT | -86.7 +TT | -86.2 +TT | -85.7 +TT |
| n791 | 15 |  |  |  |  |  |  | -89.6 +TT | -88.6 +TT |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  | -89.7 +TT | -88.7 +TT | -87.9 +TT | -86.6 +TT |  | -85.6 +TT |
| 60 |  |  |  |  |  |  | -89.9 +TT | -88.8 +TT | -88.0 +TT | -86.7 +TT |  | -85.7 +TT |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.  NOTE 2: The transmitter shall be set to PUMAX as defined in subclause 6.2C.1  NOTE 3: 3 indicates that the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 6: TT for each frequency and channel bandwidth is specified in Table 7.3C.2.5-0. | | | | | | | | | | | | | | |

Table 7.3C.2.5-2: Reference sensitivity QPSK PREFSENS forFour Rx antenna ports

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n1 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4  +TT | -94.6 +TT | -93.3 +TT | -92.3 +TT |  |  |  |  | FDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT | -94.7 +TT | -93.4 +TT | -92.4 +TT |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT | -94.8 +TT | -93.6 +TT | -92.4 +TT |  |  |  |  |
| n2 | 15 | -100.7 +TT | -97.5 +TT | -95.7 +TT | -94.5 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.7 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -98.2 +TT | -96.1 +TT | -94.9 +TT |  |  |  |  |  |  |  |  |
| n3 | 15 | -99.7 +TT | -96.5 +TT | -94.7 +TT | -93.5 +TT | -92.4 +TT | -91.6 +TT | -90.3 +TT |  |  |  |  |  | FDD |
| 30 |  | -96.8 +TT | -94.8 +TT | -93.7 +TT | -92.5 +TT | -91.7 +TT | -90.4 +TT |  |  |  |  |  |
| 60 |  | -97.2 +TT | -95.1 +TT | -93.9 +TT | -92.7 +TT | -91.8 +TT | -90.6 +TT |  |  |  |  |  |
| n7 | 15 | -100.7 +TT | -97.5 +TT | -95.7 +TT | -94.5 +TT |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.7 +TT |  |  |  |  |  |  |  |  |
| 60 |  | -98.2 +TT | -97.1 +TT | -94.9 +TT |  |  |  |  |  |  |  |  |
| n30 | 15 | -101.7 +TT | -98.5 +TT |  |  |  |  |  |  |  |  |  |  | FDD |
| 30 |  | -98.8 +TT |  |  |  |  |  |  |  |  |  |  |
| 60 |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT |  |  |  |  |  |  |  |  |  | TDD |
| 30 |  | -99.8 +TT | -97.8 +TT |  |  |  |  |  |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n38 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT |  |  | -93.3 +TT |  |  |  |  |  | TDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT |  |  | -93.4 +TT |  |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT |  |  | -93.6 +TT |  |  |  |  |  |
| n39 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4 +TT | -94.6 +TT | -93.3 +TT |  |  |  |  |  | TDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT | -94.7 +TT | -93.4 +TT |  |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT | -94.8 +TT | -93.6 +TT |  |  |  |  |  |
| n40 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4 +TT | -94.6 +TT | -93.3 +TT | -92.3 +TT |  |  |  |  | TDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT | -94.7 +TT | -93.4 +TT | -92.4 +TT | -91.6 +TT | -90.3 +TT |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT | -94.8 +TT | -93.6 +TT | -92.5 +TT | -91.8 +TT | -90.3 +TT |  |  |
| n41 | 15 |  | -97.5 +TT | -95.7 +TT | -94.5 +TT |  | -92.6 +TT | -91.3 +TT | -90.3 +TT |  |  |  |  | TDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.7 +TT |  | -92.7 +TT | -91.4 +TT | -90.4 +TT | -89.6 +TT | -88.3 +TT | -87.8 +TT | -87.4 +TT |
| 60 |  | -98.2 +TT | -96.1 +TT | -94.9 +TT |  | -92.8 +TT | -91.6 +TT | -90.5 +TT | -89.8 +TT | -88.3 +TT | -87.8 +TT | -87.4 +TT |
| n48 | 15 | -101.2 +TT | -98.0 +TT | -96.2 +TT | -94.9 +TT |  |  | -91.8 +TT | -90.83 +TT |  |  |  |  | TDD |
| 30 |  | -98.3 +TT | -96.3 +TT | -95.1 +TT |  |  | -91.9 +TT | -90.93 +TT | -90.13 +TT | -88.83 +TT | -88.33 +TT | -87.83 +TT |
| 60 |  | -98.7 +TT | -96.6 +TT | -95.3 +TT |  |  | -92.1 +TT | -91.03 +TT | -90.23 +TT | -88.93 +TT | -88.43 +TT | -87.93 +TT |
| n66 | 15 | -102.2 +TT | -99.0 +TT | -97.2 +TT | -96.0 +TT | -94.9 +TT | -94.1 +TT | -92.8 +TT |  |  |  |  |  | FDD |
| 30 |  | -99.3 +TT | -97.3 +TT | -96.2 +TT | -95.0 +TT | -94.2 +TT | -92.9 +TT |  |  |  |  |  |
| 60 |  | -99.7 +TT | -97.6 +TT | -96.4 +TT | -95.2 +TT | -94.3 +TT | -93.1 +TT |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | | | | | |
| Operating Band | SCS kHz | 5  MHz (dBm) | 10  MHz (dBm) | 15  MHz (dBm) | 20  MHz (dBm) | 25  MHz (dBm) | 30 MHz (dBm) | 40  MHz (dBm) | 50  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | 90  MHz (dBm) | 100 MHz (dBm) | Duplex Mode |
| n70 | 15 | -102.7 +TT | -99.5 +TT | -97.7 +TT | -96.5 +TT | -95.4 +TT |  |  |  |  |  |  |  | FDD |
| 30 |  | -99.8 +TT | -97.8 +TT | -96.7 +TT | -95.5 +TT |  |  |  |  |  |  |  |
| 60 |  | -100.2 +TT | -98.1 +TT | -96.9 +TT | -95.7 +TT |  |  |  |  |  |  |  |
| n774 | 15 |  | -97.5 +TT | -95.7 +TT | -94.4 +TT |  |  | -91.3 +TT | -90.3 +TT |  |  |  |  | TDD |
| 30 |  | -97.8 +TT | -95.8 +TT | -94.6 +TT |  |  | -91.4 +TT | -90.4 +TT | -89.6 +TT | -88.3 +TT | -87.8 +TT | -87.3 +TT |
| 60 | - | -98.2 +TT | -96.1 +TT | -94.8 +TT |  |  | -91.6 +TT | -90.5 +TT | -89.7 +TT | -88.4 +TT | -87.9 +TT | -87.4 +TT |
| n78 | 15 |  | -98.0 +TT | -96.2 +TT | -94.9 +TT |  |  | -91.8 +TT | -90.8 +TT |  |  |  |  | TDD |
| 30 |  | -98.3 +TT | -96.3 +TT | -95.1 +TT |  |  | -91.9 +TT | -90.9 +TT | -90.1 +TT | -88.8 +TT | -88.3 +TT | -87.8 +TT |
| 60 |  | -98.7 +TT | -96.6 +TT | -95.3 +TT |  |  | -92.1 +TT | -91.0 +TT | -90.2 +TT | -88.9 +TT | -88.4 +TT | -87.9 +TT |
| n79 | 15 |  |  |  |  |  |  | -91.8 +TT | -90.8 +TT |  |  |  |  | TDD |
| 30 |  |  |  |  |  |  | -91.9 +TT | -90.9 +TT | -90.1 +TT | -88.8 +TT |  | -87.8 +TT |
| 60 |  |  |  |  |  |  | -92.1 +TT | -91.0 +TT | -90.2 +TT | -88.9 +TT |  | -87.9 +TT |  |
| NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE.  NOTE 2 The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 3: For these bandwidths, the minimum requirements are restricted to operation when carrier is configured as a downlink carrier part of CA configuration.  NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3C.2.5-0.  NOTE 5: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz. | | | | | | | | | | | | | | |

For the UE that supports any of the SUL operation given in Table 7.3C.0.2-2, exceptions to the requirements specified in Table 7.3C.2.5-1 or Table 7.3C.2.5-2 are allowed when the uplink is active in a lower frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3C.0.2-2. For these exceptions, the UE shall meet the requirements specified in clause 7.3C.2.5.1.

7.3C.2.5.1 Reference sensitivity exceptions due to harmonic issue

For SUL operation with DL band listed in Table 7.3C.0.2.3-2 with supplementary uplink transmission bandwidth less than or equal to that specified in Table 7.3C.0.2.3-1, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in Table 7.3C.2.5.1-1 due to harmonic exceptions.

Table 7.3C.2.5.1-1: Reference sensitivity for SUL operation (exceptions due to harmonic issue)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SUL band | DL band | Test ID | CBW for DL band  (MHz) | REFSENS test requirement of DL band (dBm) |
| n80 | n781 | 1 | 100 | -85.6+23.9+TT |
|  |  | 2 | 10 | -95.8+13.8+TT |
|  |  | 3 | 10 | -95.8+1.1+TT |
| n81 | n781 | 1 | 10 | -95.8+10.8+TT |
|  |  | 2 | 100 | -85.6+1.4+TT |
| NOTE 1: Four Rx antenna ports shall be the baseline for this operating band except for two Rx vehicular UE.  NOTE 2: The transmitter shall be set to PUMAX as defined in subclause 6.2C.1 | | | | |

Table 7.3C.2.5.1-2: Void

For the UE which supports SUL band combination, the test requirement for reference sensitivity in Tables 7.3C.2.5-1, 7.3C.2.5-2 and 7.3C.2.5.1-1, 7.3C.2.3-1 shall be increased by the amount given in ΔRIB,c defined in subclause 7.3C.0.3.

### 7.3C.3 Reference sensitivity power level for SUL (3CC)

Editor’s Note:

* No test points defined for Reference sensitivity power level testing for SUL with DL CA. This test case is covered by 7.3.2 and 7.3C.2.

7.3C.3.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under SUL and 2 DL CA operation and conditions of low signal level, ideal propagation and no added noise.

7.3C.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports SUL operation on the SUL bands with 2DL CA.

7.3C.3.3 Minimum conformance requirement

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

7.3C.3.4 Test description

NOTE: No testing needs to be performed since the testing has been covered in test case 7.3.2 and 7.3C.2.

For band combination CA\_nX\_nY-nZ, test the REFSENS of SUL configuration or NR band as listed in table 7.3C.3.4-1.

Table 7.3C.3.4-1: Test band combinations and configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Band configuration | Verifying REFSENS of SUL configurations/ NR band | Subtest case | Table with test parameters to select |
| CA\_n1A\_n78A-n80A | SUL\_n78A-n80A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| n1 | 7.3.2 | Table 7.3.2.4.1-1 |
| CA\_n1A\_n78A-n84A | SUL\_n78A-n84A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| n1 | 7.3.2 | Table 7.3.2.4.1-1 |
| CA\_n3A\_n78A-n80A | SUL\_n78A-n80A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| n3 | 7.3.2 | Table 7.3.2.4.1-1 |
| CA\_n28A\_n41A-n83A | SUL\_n41A-n83A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| n28 | 7.3.2 | Table 7.3.2.4.1-1 |
| CA\_n79C-n83A | SUL\_n79A-n83A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| CA\_n28A\_n79A-n83A | SUL\_n79A-n83A | 7.3C.2 | Table 7.3C.2.4.1-1 |
| n28 | 7.3.2 | Table 7.3.2.4.1-1 |

7.3C.3.5 Test requirement

Same test requirement as clause 7.3.2 and 7.3C.2 for each band or band combinations listed in table 7.3C.3.4-1.

## 7.3D Reference sensitivity for UL MIMO

### 7.3D.1 General

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PUMAX is the total transmitter power over the two transmits power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D

### 7.3D.2 Reference sensitivity power level for UL MIMO

7.3D.2.1 Test purpose

The test purpose is to verify the ability of the UE 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.

7.3D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.3D.2.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PUMAX is the total transmitter power over the two transmits power over the two transmit antenna connectors

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D and 7.3.

7.3D.2.4 Test description

7.3D.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 7.3D.2.4.1-1, Table 7.3D.2.4.1-2, and Table 7.3D.2.4.1-3. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3D.2.4.1-1: Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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] subclause4.3.1 | | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | | Uplink Configuration | |
|  | Modulation | RB allocation | Modulation | RB allocation |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) | CP-OFDM QPSK | REFSENS (NOTE 2) |
| 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 Table 7.3.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.1.2 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 UL and DL Reference Measurement Channel is set according to Table 7.3D.2.4.1-1, Table 7.3.2.4.1-2, and Table 7.3.2.4.1-3.

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 7.3D.2.4.3*.*

7.3D.2.4.2 Test procedure

Same test procedure as specified in 7.3.2.4.2 with the following exception:

Step 2: 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 7.3D.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

7.3D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO and exceptions listed in clause 7.3.2.4.3

7.3D.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3.2.5-1 and parameters specified Tables 7.3D.2.4.1-1, Tables 7.3.2.4.1-2 and Tables 7.3.2.4.1-3.

### 7.3D.2\_1 Reference sensitivity power level for SUL with UL MIMO

7.3D.2\_1.1 Test purpose

Same test purpose as in clause 7.3D.2.1.

7.3D.2\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.3D.2\_1.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3C shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PUMAX is the total transmitter power over the two transmits power over the two transmit antenna connectors

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D and 7.3C.

7.3D.2\_1.4 Test description

7.3D.2\_1.4.1 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 7.3D.2\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexe A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3D.2\_1.4.1: Test Configuration Table for SUL 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 | | | | Mid range for SUL carrier.  Low, Mid, High range for non-SUL carrier  With following exceptions:  SUL\_n78-n80: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.5C-1 | | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | | |
| Test ID | Downlink Configuration | | UL Configuration | | SUL Configuration | |
|  | Modulation | RB allocation | Modulation | RB allocation (NOTE 2) |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) | N/A | | CP-OFDM QPSK | REFSENS  (NOTE 2) |
| 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 Table 7.3C.2.4.1-1a which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band.  NOTE 3: In a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.3D.2\_1.4.1.

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 7.3D.2\_1.4.3.

7.3D.2\_1.4.2 Test procedure

1 SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.3D.2\_1.4.1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.3D.2\_1.4.1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3C.2.5-1 for 2Rx and table 7.3C.2.5-2 for 4Rx. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

7.3D.2\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.3D.2\_1.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3C.2.5-1 and parameters specified Tables 7.3D.2\_1.4.1.

### 7.3D.2\_2 Reference sensitivity power level for SUL with UL MIMO (3CC)

Editor’s Note:

* No test points defined for Reference sensitivity power level testing for UL MIMO on SUL with DL CA. This test case is covered by 7.3D.2 and 7.3D.2\_1.

7.3D.2\_2.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under SUL and 2 DL CA operation and conditions of low signal level, ideal propagation and no added noise.

7.3D.2\_2.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands..

7.3D.2\_2.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.3C shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PUMAX is the total transmitter power over the two transmits power over the two transmit antenna connectors

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3D and 7.3C.

7.3D.2\_2.4 Test description

NOTE: No testing needs to be performed since the testing has been covered in test case 7.3D.2 and 7.3D.2\_1.

For band combination CA\_nX\_SUL\_nY-nZ, test the REFSENS of SUL configuration or NR band as listed in table 7.3C.3.4-1.

Table 7.3D.2\_2.4-1: Test band combinations and configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Band configuration | Verifying REFSENS of SUL configurations/ NR band | Subtest case | Table with test parameters to select |
| CA\_n1A\_SUL\_n78A-n80A | SUL\_n78A-n80A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| n1 | 7.3D.2 | Table 7.3D.2.4.1-1 |
| CA\_n1A\_SUL\_n78A-n84A | SUL\_n78A-n84A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| n1 | 7.3D.2 | Table 7.3D.2.4.1-1 |
| CA\_n3A\_SUL\_n78A-n80A | SUL\_n78A-n80A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| n3 | 7.3D.2 | Table 7.3D.2.4.1-1 |
| CA\_n28A\_SUL\_n41A-n83A | SUL\_n41A-n83A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| n28 | 7.3D.2 | Table 7.3D.2.4.1-1 |
| SUL\_n79C-n83A | SUL\_n79A-n83A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| CA\_n28A\_SUL\_n79A-n83A | SUL\_n79A-n83A | 7.3D.2\_1 | Table 7.3D.2\_1.4.1 |
| n28 | 7.3D.2 | Table 7.3D.2.4.1-1 |

7.3D.2\_2.5 Test requirement

Same test requirement as clause 7.3D.2 and 7.3D.2\_1 for each band or band combinations listed in table 7.3D.2\_2.4-1.

## 7.3E Reference sensitivity for V2X

### 7.3E.1 General

The reference sensitivity power level PREFSENS\_V2X is the minimum mean power applied to each one of the UE antenna ports for V2X UE, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

### 7.3E.2 Reference sensitivity for V2X / non-concurrent operation

Editor’s Note: The following aspects are not yet determined:

- TP analysis is FFS

7.3E.2.1 Test purpose

The test purpose is to verify the ability of the UE to receive V2X physical channel data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

7.3E.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR V2X sidelink communication.

7.3E.2.3 Minimum conformance requirements

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.3E.2.3-1.

Table 7.3E.2.3-1: Reference sensitivity of NR V2X Bands (PC5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR V2X Band | SCS (kHz) | Channel bandwidth / PREFSENS\_V2X(dBm) | | | | |
| 10 MHz | 20 MHz | 30 MHz | 40 MHz | Duplex Mode |
| n38 | 15 | -96.5 | -93.2 | -91.4 | -90.1 | HD |
| 30 | -96.1 | -93.4 | -91.7 | -90.2 |
| 60 | -96.9 | -93.1 | -91.9 | -90.4 |
| n47 | 15 | -92.5 | -89.2 | -87.4 | -86.1 | HD |
| 30 | -92.1 | -89.4 | -87.7 | -86.2 |
| 60 | -92.9 | -89.1 | -87.9 | -86.4 |
| NOTE 1: Reference measurement channel is defined in A.7.2.  NOTE 2: The signal power is specified per antenna port.  NOTE 3: Void. | | | | | | |

Table 7.3E.2.3-2: Sidelink TX configuration for reference sensitivity of NR V2X Bands (PC5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR V2X Band / SCS / Channel bandwidth / Duplex mode | | | | | | |
| NR V2X Band | SCS  (kHz) | 10 MHz | 20 MHz | 30 MHz | 40 MHz | Duplex Mode |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| n38 | 15 | 50 | 105 | 160 | 216 | HD |
| 30 | 24 | 50 | 75 | 105 |
| 60 | 102 | 24 | 36 | 50 |
| n47 | 15 | 50 | 105 | 160 | 216 | HD |
| 30 | 24 | 50 | 75 | 105 |
| 60 | 102 | 24 | 36 | 50 |
| NOTE 1: The sidelink allocated RB (LCRB) size could be adjusted according to resource pool configuration in [6].  NOTE 2: For the case, 11 RB is allowed for S-SSB Block. | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.3E.2.

7.3E.2.4 Test description

7.3E.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 5.2E.1-1 and Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3E.2.4.1-1. The details of the V2X reference measurement channels (RMCs) are specified in Annexe A.7.2 and the GNSS configuration in TS 38.508-1 [5] subclause 4.11.

Table 7.3E.2.4.1-1: Test Configuration Table

|  |  |  |
| --- | --- | --- |
| 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] subclause4.3.1 | | [Mid range] |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | [Lowest, Highest] |
| Test SCS as specified in Table 5.3.5-1 | | [Lowest] |
| Test Parameters | | |
| Test ID | V2X Configuration to receive | |
|  | Modulation | RB allocation |
| 1 | [CP-OFDM QPSK] | [Full RB (NOTE 1)] |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3E.2.4.1-2. | | |

Table 7.3E.2.4.1-2: PSSCH Configuration for REFSENS

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth | SCS(kHz) | LCRBmax | Outer RB allocation / Normal RB allocation |
| 10MHz | 15 | 52 | 50@0 |
| 30 | 24 | 24@0 |
| 60 | 11 | 10@0 |
| 20MHz | 15 | 106 | 105@0 |
| 30 | 51 | 50@0 |
| 60 | 24 | 24@0 |
| 30MHz | 15 | 160 | 160@0 |
| 30 | 78 | 75@0 |
| 60 | 38 | 36@0 |
| 40MHz | 15 | 216 | 216@0 |
| 30 | 106 | 105@0 |
| 60 | 51 | 50@0 |
| NOTE 1: Test Channel Bandwidths are checked separately for each NR V2X band, the applicable channel bandwidths are specified in Table 5.3.5-1. | | | |

1. Connect the SS to the UE antenna connectors and connect the GNSS simulator to the UE GNSS RX antenna connector as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.9.1 for TE diagram and section A.3.2.7 for UE diagram.

2. The parameter settings for the NR sidelink transmission over PC5 are pre-configured according to TS 38.508-1 [5] subclause 4.10. Message content exceptions are defined in clause 7.3E.2.4.3.

3. The V2X Reference Measurement Channel is set according to Table 6.2E.1.1.4.1-1.

4. The GNSS simulator is configured for Scenario #1: static in Geographical area #1, as defined in TS 38.508-1 [5] Table 4.11.2-2. Geographical area #1 is also pre-configured in the UE.

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

6. Ensure the UE is in State Out\_of\_Coverage with generic procedure parameters Sidelink *On*, Test Loop Function *On* with UE test loop mode E closed for *Transmit Mode* according to TS 38.508-1 [5] clause 4.5*.*

7. Trigger the UE to reset UTC time. (NOTE: The UTC time reset may be performed by MMI or AT command (+CUTCR).)

8. The GNSS simulator is triggered to start step 1 of Scenario #1 to simulate a location in the centre of Geographicalarea #1. Wait for the UE to acquire the GNSS signal and start to transmit.

7.3E.2.4.2 Test procedure

1. The UE starts to perform the NR V2X sidelink communication according to SL-V2X-Preconfiguration and to schedule the V2X RMC according to Table 7.3G.1.4.1-1.

2. Set the signal level of V2X to the appropriate REFSENS value defined in Table 7.3G.1.3-1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.3E.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 and 5.4.

7.3E.2.5 Test requirement

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E-1, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.3E.2.5-1.

Table 7.3E.2.5-1: Reference sensitivity of NR V2X Bands (PC5)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR V2X Band | SCS (kHz) | Channel bandwidth / PREFSENS\_V2X(dBm) | | | | |
| 10 MHz | 20 MHz | 30 MHz | 40 MHz | Duplex Mode |
| n38 | 15 | -96.5+TT | -93.2+TT | -91.4+TT | -90.1+TT | HD |
| 30 | -96.1+TT | -93.4+TT | -91.7+TT | -90.2+TT |
| 60 | -96.9+TT | -93.1+TT | -91.9+TT | -90.4+TT |
| n47 | 15 | -92.5+TT | -89.2+TT | -87.4+TT | -86.1+TT | HD |
| 30 | -92.1+TT | -89.4+TT | -87.7+TT | -86.2+TT |
| 60 | -92.9+TT | -89.1+TT | -87.9+TT | -86.4+TT |
| NOTE 1: Reference measurement channel is defined in A.7.2.  NOTE 2: The signal power is specified per antenna port.  NOTE 3: TT for each frequency and channel bandwidth is specified in Table 7.3.2.5-3. | | | | | | |

## 7.3F Reference sensitivity for shared spectrum channel access

### 7.3F.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

In later clauses of Clause 7 where the value of REFSENS is used as a reference to set the corresponding requirement, the UE shall be verified against those requirements by applying the REFSENS value in Table 7.3G.2-1 with 2 Rx antenna ports tested.

### 7.3F.2 Reference sensitivity power level

Editor’s Note: The following aspects are not yet determined:

- Message content for NS\_53 is FFS

- MU and TT for >6GHz (band n96) are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available.

7.3F.2.1 Test purpose

The test purpose is to verify the ability of the UE 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.

7.3F.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.3F.2.3 Minimum conformance requirements

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, 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 7.3F.2.3-1, Table 7.3F.2.3-2, and Table 7.3F.2.3-3.

Table 7.3F.2.3-1: Two antenna port reference sensitivity QPSK PREFSENS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth | | | | | |
| Operating Band | SCS kHz | 20 MHz (dBm) | 40 MHz (dBm) | 60 MHz (dBm) | 80 MHz (dBm) |
| n46 | 15 | -89.7 | -86.6 |  |  |
|  | 30 | -89.9 | -86.7 | -84.8 | -83.6 |
|  | 60 | -90.1 | -86.9 | -85.0 | -83.6 |
| n96 | 15 | -89.2 | -86.1 |  |  |
|  | 30 | -89.4 | -86.2 | -84.3 | -83.1 |
|  | 60 | -89.6 | -86.4 | -84.5 | -83.1 |

For UE(s) equipped with 4 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3F.2.3-1 shall be modified by the amount given in ΔRIB,4R in Table 7.3F.2.3-2 for the applicable operating bands.

Table 7.3F.2.3-2: Four antenna port reference sensitivity allowance ΔRIB,4R

|  |  |
| --- | --- |
| Operating band | ΔRIB,4R (dB) |
| n46, n96 | -2.2 |

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3F.2.3-1 and Table 7.3F.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3F.2.3-3.

Table 7.3F.2.3-3: Uplink configuration for reference sensitivity

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth | | | | | |
| Operating Band | SCS kHz | 20 MHz (dBm) | 40 MHz (dBm) | 60 MHz (dBm) | 80 MHz (dBm) |
| n46 | 15 | 100 | 216 |  |  |
|  | 30 | 50 | 100 | 162 | 216 |
|  | 60 | 24 | 50 | 75 | 100 |
| n96 | 15 | 100 | 216 |  |  |
|  | 30 | 50 | 100 | 162 | 216 |
|  | 60 | 24 | 50 | 75 | 100 |

Unless given by Table 7.3F.2.3-4, the minimum requirements specified in Tables 7.3F.2.3-1 and 7.3F.2.3-2 shall be verified with the network signalling value NS\_01 (Table 6.2F.3.1-1) configured.

Table 7.3F.2.3-4: Network signalling value for reference sensitivity

|  |  |
| --- | --- |
| Operating band | Network Signalling value |
| n46 | NS\_01 |
| n96 | NS\_53 |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3F.2.

7.3F.2.4 Test description

7.3F.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 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 7.3F.2.4.1-1, Table 7.3F.2.4.1-2, and Table 7.3F.2.4.1-3 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 7.3F.2.4.1-1: Test Configuration Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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] subclause4.3.1 | | | Low range, Mid range, High range | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | |
| Test Parameters | | | | |
| Test ID | Downlink Configuration | | Uplink Configuration | |
|  | Modulation | RB allocation | Modulation | RB allocation |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) | DFT-s-OFDM QPSK | REFSENS (NOTE 2) |
| NOTE 1: Full RB allocation shall be used per each SCS and channel BW as specified in Table 7.3F.2.4.1-2.  NOTE 2: REFSENS refers to Table 7.3F.2.4.1-3 which defines uplink RB configuration and start RB location for each SCS, channel BW and NR band.  NOTE 3: For a band where UE supports 4Rx, the test needs to be repeated with only 2Rx antennas connected and the other antennas terminated. | | | | |

Table 7.3F.2.4.1-2: Downlink Configuration of each RB allocation

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth | SCS(kHz) | LCRBmax | Outer RB allocation / Normal RB allocation |
| 20MHz | 15 | 106 | 106@0 |
| 30 | 51 | 51@0 |
| 60 | 24 | 24@0 |
| 40MHz | 15 | 216 | 216@0 |
| 30 | 106 | 106@0 |
| 60 | 51 | 51@0 |
| 60MHz | 15 | N/A | N/A |
| 30 | 162 | 162@0 |
| 60 | 79 | 79@0 |
| 80MHz | 15 | N/A | N/A |
| 30 | 217 | 217@0 |
| 60 | 107 | 107@0 |
| NOTE 1: Test Channel Bandwidths are checked separately for each NR band, the applicable channel bandwidths are specified in Table 5.3.5-1. | | | |

Table 7.3F.2.4.1-3: Uplink configuration for reference sensitivity, LCRB @ RBstart format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth | | | | | |  |
| Operating Band | SCS kHz | 20 MHz (dBm) | 40 MHz (dBm) | 60 MHz (dBm) | 80 MHz (dBm) | Duplex Mode |
| n46 | 15 | 100@0 | 216@0 |  |  | TDD |
| 30 | 50@0 | 100@0 | 162@0 | 216@0 |
| 60 | 24@0 | 50@0 | 75@0 | 100@0 |
| n96 | 15 | 100@0 | 216@0 |  |  | TDD |
| 30 | 50@0 | 100@0 | 162@0 | 216@0 |
| 60 | 24@0 | 50@0 | 75@0 | 100@0 |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 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 UL and Reference Measurement Channel is set according to Table 7.3F.2.4.1-1, Table 7.3F.2.4.1-2, and Table 7.3F.2.4.1-3.

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 7.3F.2.4.3*.*

7.3F.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.3F.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.3F.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3F.2.5-1 if 2Rx antennas connected or Table 7.3F.2.5-2 if 4Rx antennas connected. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits PUMAX level for at least the duration of the Throughput measurement.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

7.3F.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED for NR band.

Message contents are according to TS 38.508-1[5] subclause 4.6 with the following exceptions for each network signalling value.

7.3F.2.4.3.1 Message contents exceptions (network signalled value "NS\_01")

Message contents according to TS 38.508-1 [5] subclause 4.6 can be used without exceptions.

7.3F.2.4.3.2 Message contents exceptions (network signalled value "NS\_53")

FFS

7.3F.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Tables 7.3F.2.5-1 for 2 Rx antenna port, Tables 7.3F.2.5-2 for 4 Rx antenna port, and parameters specified Tables 7.3F.2.4.1-1, Tables 7.3F.2.4.1-2 and Tables 7.3F.2.4.1-3.

Table 7.3F.2.5-1: Reference sensitivity QPSK PREFSENS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | |
| Operating Band | SCS kHz | 20  MHz (dBm) | 40  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | Duplex Mode |
| n46 | 15 | -89.7+TT | -86.6+TT |  |  | TDD |
| 30 | -89.9+TT | -86.7+TT | -84.8+TT | -83.6+TT |
| 60 | -90.1+TT | -86.9+TT | -85.0+TT | -83.6+TT |
| n96 | 15 | -89.2+TT | -86.1+TT |  |  | TDD |
| 30 | -89.4+TT | -86.2+TT | -84.3+TT | -83.1+TT |
| 60 | -89.6+TT | -86.4+TT | -84.5+TT | -83.1+TT |
| NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2F.4  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3F.2.5-3. | | | | | | |

Table 7.3F.2.5-2: Reference sensitivity QPSK PREFSENS forFour Rx antenna ports

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | |
| Operating Band | SCS kHz | 20  MHz (dBm) | 40  MHz (dBm) | 60  MHz (dBm) | 80  MHz (dBm) | Duplex Mode |
| n46 | 15 | -91.9+TT | -88.8+TT |  |  | TDD |
| 30 | -92.1+TT | -88.9+TT | -87.0+TT | -85.8+TT |
| 60 | -92.3+TT | -89.1+TT | -87.2+TT | -85.8+TT |
| n96 | 15 | -91.4+TT | -88.3+TT |  |  | TDD |
| 30 | -91.6+TT | -88.4+TT | -86.5+TT | -85.3+TT |
| 60 | -91.8+TT | -88.6+TT | -86.7+TT | -85.3+TT |
| NOTE 1: Four Rx antenna ports shall be the baseline for above listed operating band except for two Rx vehicular UE.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3F.2.5-3. | | | | | | |

Table 7.3F.2.5-3: Test Tolerance (TT) for RX sensitivity level

|  |  |  |
| --- | --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0 GHz | 5.925GHz < f ≤ 7.125GHz |
| 0.7 dB | 1.0 dB | 1.0 dB |

For the UE which supports inter-band carrier aggregation, the minimum requirement for reference sensitivity in Table 7.3F.2.5-1 shall be increased by the amount given in ΔRIB,c defined in subclause 7.3F.3 for the applicable operating bands.

### 7.3F.3 ΔRIB,c

For a UE supporting CA or DC band combination, the minimum requirement for reference sensitivity in Table 7.3F.2.3-1 shall be increased by the amount given by ΔRIB,c defined in Table 7.3F.3-1. Unless otherwise stated, ΔRIB,c is set to zero.

Table 7.3F.3-1: ΔRIB,c due to CA (two bands)

|  |  |  |
| --- | --- | --- |
| Inter-band CA combination | Operating Band | ΔRIB,c (dB) |
| CA\_n46-n48 | n46 | 0 |
|  | n48 | 0.5 |

In case the UE supports more than one of band combinations for CA or DC, and an operating band belongs to more than one band combinations then the applicable additional ΔRIB,c shall be the maximum value for all band combinations defined in clause 7.3A and 7.3F.3 in this specification and 7.3A, 7.3B in TS 38.101-3 [4] for the applicable operating bands.

## 7.3G Reference sensitivity for Tx Diversity

For UE supporting Tx diversity, the minimum requirements specified in Table 7.3.2.3-1b and Table 7.3.2.3-1d shall be met with Tx diversity configuration described in clause 6.2G.1.3. For Tx diversity, the parameter PUMAX is defined in clause 6.2G.4.3 with the sum of the output power from both UE antenna connectors.

## 7.3I Reference sensitivity for RedCap

### 7.3I.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

### 7.3I.2 Reference sensitivity power level for RedCap

7.3I.2.1 Test purpose

The test purpose is to verify the ability of the UE 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.

7.3I.2.2 Test applicability

This test case applies to all types of NR UE release 17 and forward that support NR RedCap.

7.3I.2.3 Minimum conformance requirements

For a RedCap UE equipped with 2 Rx antenna ports, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A3.2 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 7.3.2.3-1a and Table 7.3.2.3-1b for the applicable operating bands. The reference sensitivity (REFSENS) requirement specified for a RedCap UE equipped with 2 Rx antenna ports shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3 and, for FDD bands, with the Tx-Rx separation as defined in clause 5.4.4 for the applicable band and UE channel bandwidth.

For a RedCap UE equipped with 1 Rx antenna ports, reference sensitivity for 2Rx antenna ports in Table 7.3.2.3-1a and in Table 7.3.2.3-1b shall be modified by the amount given in ΔR1R in Table 7.3I.2.3-1 for the applicable operating bands. The reference sensitivity (REFSENS) requirement specified for a RedCap UE equipped with 1 Rx antenna ports shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.3-3 and, for FDD bands, with the Tx-Rx separation as defined in clause 5.4.4 for the applicable band and UE channel bandwidth.

Table 7.3I.2.3-1: Single antenna port reference sensitivity allowance ΔR1R

|  |  |  |
| --- | --- | --- |
| Operating band | Channel bandwidth (MHz) | ΔR1R (dB) |
| TDD band | 5, 10, 15, 20 | 2.5 |
| FDD band | 5 | 2.5 |
| FDD band | 10, 15, 20 | 3 |

For a RedCap UE equipped with 2 Rx antenna ports operating in HD-FDD mode, reference sensitivity for 2Rx antenna ports in Table 7.3I.2.3-2 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3I.2.3-4.

Table 7.3I.2.3-2: HD-FDD RedCap UE with 2 Rx antenna port reference sensitivity

| Operating band / SCS / Channel bandwidth | | | | | |
| --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| n1 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| 60 |  | -97.5 | -95.4 | -94.2 |
| n2 | 15 | -98.8 | -95.6 | -93.8 | -92.5 |
| 30 |  | -96.0 | -94.0 | -92.7 |
| 60 |  | -96.3 | -94.2 | -93.0 |
| n3 | 15 | -97.8 | -94.6 | -92.8 | -91.5 |
| 30 |  | -95.0 | -93.0 | -91.7 |
| 60 |  | -95.3 | -93.2 | -92.0 |
| n5 | 15 | -98.8 | -95.6 | -93.8 | -92.5 |
| 30 |  | -96.0 | -94.0 | -92.7 |
| n7 | 15 | -98.8 | -95.6 | -93.8 | -92.5 |
| 30 |  | -96.0 | -94.0 | -92.7 |
| 60 |  | -96.3 | -94.2 | -93.0 |
| n8 | 15 | -97.8 | -94.6 | -92.8 | -91.5 |
| 30 |  | -95.0 | -93.0 | -91.7 |
| n12 | 15 | -97.8 | -94.6 | -92.8 |  |
| 30 |  | -95.0 | -93.0 |  |
| n13 | 15 | -97.8 | -94.6 |  |  |
| 30 |  | -95.0 |  |  |
| n14 | 15 | -97.8 | -94.6 |  |  |
| 30 |  | -95.0 |  |  |
| n18 | 15 | -100.0 | -96.8 | -95.0 |  |
| 30 |  | -97.2 | -95.2 |  |
| n20 | 15 | -97.8 | -94.6 | -92.8 | -91.5 |
| 30 |  | -95.0 | -93.0 | -91.7 |
| n24 | 15 | -100.0 | -96.8 |  |  |
| 30 |  | -97.2 |  |  |
| 60 |  | -97.5 |  |  |
| n25 | 15 | -97.3 | -94.1 | -92.3 | -91.0 |
| 30 |  | -94.5 | -92.5 | -91.2 |
| 60 |  | -94.8 | -92.7 | -91.5 |
| n26 | 15 | -98.3 | -95.1 | -93.3 | -92.0 |
| 30 |  | -95.5 | -93.5 | -92.2 |
| n28 | 15 | -99.3 | -96.1 | -94.3 | -93.0 |
| 30 |  | -96.5 | -94.5 | -93.2 |
| n30 | 15 | -99.5 | -96.3 |  |  |
| 30 |  | -96.7 |  |  |
| n65 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| 60 |  | -97.5 | -95.4 | -94.2 |
| n66 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| 60 |  | -97.5 | -95.4 | -94.2 |
| n70 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| 60 |  | -97.5 | -95.4 | -94.2 |
| n71 | 15 | -98.0 | -94.8 | -93.0 | -91.7 |
| 30 |  | -95.2 | -93.2 | -91.9 |
| n74 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| 60 |  | -97.5 | -95.4 | -94.2 |
| n91 | 15 | -100.0 |  |  |  |
| n92 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |
| n93 | 15 | -100.0 |  |  |  |
| n94 | 15 | -100.0 | -96.8 | -95.0 | -93.7 |
| 30 |  | -97.2 | -95.2 | -93.9 |

For a RedCap UE equipped with 1 Rx antenna ports and operating in HD-FDD mode, reference sensitivity for 1Rx antenna ports in Table 7.3I.2.3-3 shall be met with uplink transmission bandwidth less than or equal to that specified in Table 7.3I.2.3-4.

Table 7.3I.2.3-3: HD-FDD RedCap UE with 1 Rx antenna port reference sensitivity

| Operating band / SCS / Channel bandwidth | | | | | |
| --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) |
| n1 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| 60 |  | -95.0 | -92.9 | -91.7 |
| n2 | 15 | -96.3 | -93.1 | -91.3 | -90.0 |
| 30 |  | -93.5 | -91.5 | -90.2 |
| 60 |  | -93.8 | -91.7 | -90.5 |
| n3 | 15 | -95.3 | -92.1 | -90.3 | -89.0 |
| 30 |  | -92.5 | -90.5 | -89.2 |
| 60 |  | -92.8 | -90.7 | -89.5 |
| n5 | 15 | -96.3 | -93.1 | -91.3 | -90.0 |
| 30 |  | -93.5 | -91.5 | -90.2 |
| n7 | 15 | -96.3 | -93.1 | -91.3 | -90.0 |
| 30 |  | -93.5 | -91.5 | -90.2 |
| 60 |  | -93.8 | -91.7 | -90.5 |
| n8 | 15 | -95.3 | -92.1 | -90.3 | -89.0 |
| 30 |  | -92.5 | -90.5 | -89.2 |
| n12 | 15 | -95.3 | -92.1 | -90.3 |  |
| 30 |  | -92.5 | -90.5 |  |
| n13 | 15 | -95.3 | -92.1 |  |  |
| 30 |  | -92.5 |  |  |
| n14 | 15 | -95.3 | -92.1 |  |  |
| 30 |  | -92.5 |  |  |
| n18 | 15 | -97.5 | -94.3 | -92.5 |  |
| 30 |  | -94.7 | -92.7 |  |
| n20 | 15 | -95.3 | -92.1 | -90.3 | -89.0 |
| 30 |  | -92.5 | -90.5 | -89.2 |
| n24 | 15 | -97.5 | -94.3 |  |  |
| 30 |  | -94.7 |  |  |
| 60 |  | -95.0 |  |  |
| n25 | 15 | -94.8 | -91.6 | -89.8 | -88.5 |
| 30 |  | -92.0 | -90.0 | -88.7 |
| 60 |  | -92.3 | -90.2 | -89.0 |
| n26 | 15 | -95.8 | -92.6 | -90.8 | -89.5 |
| 30 |  | -93.0 | -91.0 | -89.7 |
| n28 | 15 | -96.8 | -93.6 | -91.8 | -90.5 |
| 30 |  | -94.0 | -92.0 | -90.7 |
| n30 | 15 | -97.0 | -93.8 |  |  |
| 30 |  | -94.2 |  |  |
| n65 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| 60 |  | -95.0 | -92.9 | -91.7 |
| n66 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| 60 |  | -95.0 | -92.9 | -91.7 |
| n70 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| 60 |  | -95.0 | -92.9 | -91.7 |
| n71 | 15 | -95.5 | -92.3 | -90.5 | -89.2 |
| 30 |  | -92.7 | -90.7 | -89.4 |
| n74 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| 60 |  | -95.0 | -92.9 | -91.7 |
| n91 | 15 | -97.5 |  |  |  |
| n92 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |
| n93 | 15 | -97.5 |  |  |  |
| n94 | 15 | -97.5 | -94.3 | -92.5 | -91.2 |
| 30 |  | -94.7 | -92.7 | -91.4 |

Table 7.3I.2.3-4: Uplink configuration for HD-FDD reference sensitivity

| Operating band / SCS / Channel bandwidth | | | | | |
| --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |
| n1 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n2 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n3 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n5 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n7 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n8 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n12 | 15 | 25 | 50 | 75 |  |
| 30 |  | 24 | 36 |  |
| n13 | 15 | 25 | 50 |  |  |
| 30 |  | 24 |  |  |
| n14 | 15 | 25 | 50 |  |  |
| 30 |  | 24 |  |  |
| n18 | 15 | 25 | 50 | 75 |  |
| 30 |  | 24 | 36 |  |
| n20 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n24 | 15 | 25 | 50 |  |  |
| 30 |  | 24 |  |  |
| 60 |  | 10 |  |  |
| n25 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n26 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n28 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n30 | 15 | 25 | 50 |  |  |
| 30 |  | 24 |  |  |
| n65 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n66 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n70 | 15 | 25 | 50 | 75 | NOTE 1 |
| 30 |  | 24 | 36 | NOTE 1 |
| 60 |  | 10 | 18 | NOTE 1 |
| n71 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n74 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| 60 |  | 10 | 18 | 24 |
| n91 | 15 | 25 |  |  |  |
| n92 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| n93 | 15 | 25 |  |  |  |
| n94 | 15 | 25 | 50 | 75 | 100 |
| 30 |  | 24 | 36 | 50 |
| NOTE 1: For DL channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest TX-RX separation (Table 5.4.4-1) shall be used unless otherwise specified. | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.3I.2.

7.3I.2.4 Test description

7.3I.2.4.1 Initial conditions

For RedCap UE with 1Rx or 2 Rx antenna ports, same initial conditions as in 7.3.2.4.1 with following exception:

- The test channel bandwidth are specified in TS 38.508-1 [5] subclause 4.3.1 for RedCap.

For HD-FDD RedCap UE with 1 Rx or 2 Rx antenna ports, same initial conditions as in 7.3.2.4.1 with following exception:

- The test channel bandwidth are specified in TS 38.508-1 [5] subclause 4.3.1 for RedCap.

- The RB allocation for uplink configuration in Table 7.3.2.4.1-1 refers to Table 7.3I.2.4.1-1 for each SCS, channel BW and NR band.

Table 7.3I.2.4.1-1: Uplink configuration for reference sensitivity of HD-FDD RedCap UE, LCRB @ RBstart format

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating  Band | SCS  kHz | 5  MHz | 10  MHz | 15  MHz | 20  MHz | Duplex  Mode |
| n1 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n2 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n3 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n5 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n7 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n8 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n12 | 15 | 25@0 | 50@2 | 75@4 |  | HD-FDD |
| 30 |  | 24@0 | 36@2 |  |
| n14 | 15 | 25@0 | 50@0 |  |  | HD-FDD |
| 30 |  | 24@0 |  |  |
| n20 | 15 | 25@0 | 50@0 | 75@0 | 100@0 | HD-FDD |
| 30 |  | 24@0 | 36@0 | 50@0 |
| n24 | 15 | 25@0 | 50@0 |  |  | HD-FDD |
| 30 |  | 24@0 |  |  |
| 60 |  | 10@0 |  |  |
| n25 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n26 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n28 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n30 | 15 | 25@0 | 50@2 |  |  | HD-FDD |
| 30 |  | 24@0 |  |  |
| n65 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n66 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n70 | 15 | 25@0 | 50@2 | 75@4 | NOTE 1 | HD-FDD |
| 30 |  | 24@0 | 36@2 | NOTE 1 |
| 60 |  | 10@1 | 18@0 | NOTE 1 |
| n71 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n74 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| 60 |  | 10@1 | 18@0 | 24@0 |
| n91 | 15 | 25@0 |  |  |  | HD-FDD |
| n92 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| n93 | 15 | 25@0 |  |  |  | HD-FDD |
| n94 | 15 | 25@0 | 50@2 | 75@4 | 100@6 | HD-FDD |
| 30 |  | 24@0 | 36@2 | 50@1 |
| NOTE 1: For DL channel bandwidths that do not have symmetric UL channel bandwidth, highest valid UL configuration with lowest TX-RX separation (Table 5.4.4-1) shall be used unless otherwise specified. | | | | | | |

7.3I.2.4.2 Test procedure

Same test procedure as steps 1~4 of clause 7.3.2.4.2 with the following exceptions of step 3.

- Set the Downlink signal level to the appropriate REFSENS value defined in Tables 7.3I.2.5-1, 7.3I.2.5-2 and 7.3I.2.5-5 if 2Rx antennas connected or Tables 7.3I.2.5-3, 7.3I.2.5-4 and 7.3I.2.5-6 if 1Rx antennas connected.

7.3I.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED for NR band.

7.3I.2.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A3.2 with reference receive power level specified in Table 7.3I.2.5-1 and Table 7.3I.2.5-2 for RedCap UE with 2 Rx antenna port, Tables 7.3I.2.5-3 and Table 7.3I.2.5-4 for RedCap UE with single antenna port, Table 7.3I.2.5-5 for HD-FDD RedCap UE with 2 Rx antenna port, Table 7.3I.2.5-6 for HD-FDD RedCap UE single antenna port, and parameters specified Table 7.3.2.4.1-1, Table 7.3.2.4.1-2 and Table 7.3I.2.4.1-1.

Table 7.3I.2.5-1: Two antenna port Reference sensitivity QPSK PREFSENS for FDD bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS / Duplex Mode | | | | | | |
| Operating  Band | SCS  kHz | 5  MHz | 10  MHz | 15  MHz | 20  MHz | Duplex  Mode |
| n1 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n2 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |
| n3 | 15 | -97.0 +TT | -93.8 +TT | -92.0 +TT | -90.8 +TT | FDD |
| 30 |  | -94.1 +TT | -92.1 +TT | -91.0 +TT |
| 60 |  | -94.5 +TT | -92.4 +TT | -91.2 +TT |
| n5 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -86.8 +TT | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -88.6 +TT |
| n7 | 15 | -98.0 +TT | -94.8 +TT | -93.0 +TT | -91.8 +TT | FDD |
| 30 |  | -95.1 +TT | -93.1 +TT | -92.0 +TT |
| 60 |  | -95.5 +TT | -93.4 +TT | -92.2 +TT |
| n8 | 15 | -97.0 +TT | -93.8 +TT | -91.4 +TT | -85.8 +TT | FDD |
| 30 |  | -94.1 +TT | -91.7 +TT | -87.2 +TT |
| n12 | 15 | -97.0 +TT | -93.8 +TT | -84.0 +TT |  | FDD |
| 30 |  | -94.1 +TT | -84.1 +TT |  |
| n14 | 15 | -97.0 +TT | -93.8 +TT |  |  | FDD |
| 30 |  | -94.1 +TT |  |  |
| n20 | 15 | -97.0 +TT | -93.8 +TT | -91.0 +TT | -89.8 +TT | FDD |
| 30 |  | -94.1 +TT | -91.1 +TT | -90.0 +TT |
| n24 | 15 | -100.0 +TT | -96.8 +TT |  |  | FDD |
| 30 |  | -97.1 +TT |  |  |
| 60 |  | -97.5 +TT |  |  |
| n25 | 15 | -96.5 +TT | -93.3 +TT | -91.5 +TT | -90.3 +TT | FDD |
| 30 |  | -93.6 +TT | -91.6 +TT | -90.5 +TT |
| 60 |  | -94.0 +TT | -91.9 +TT | -90.7 +TT |
| n26 | 15 | -97.5 +TT | -94.5 +TT | -92.7 +TT | -87.6 +TT | FDD |
| 30 |  | -94.8 +TT | -92.7 +TT | -87.7 +TT |
| n28 | 15 | -98.5 +TT | -95.5 +TT | -93.5 +TT | -90.8 +TT | FDD |
| 30 |  | -95.6 +TT | -93.6 +TT | -91.0 +TT |
| n30 | 15 | -99.0 +TT | -95.8 +TT |  |  | FDD |
| 30 |  | -96.1 +TT |  |  |
| n65 | 15 | -99.5+TT | -96.3+TT | -94.5+TT | -93.3+TT | FDD |
| 30 |  | -96.6+TT | -94.6+TT | -93.5+TT |
| 60 |  | -97.0+TT | -94.9+TT | -93.7+TT |
| n66 | 15 | -99.5 +TT | -96.3 +TT | -94.5 +TT | -93.3 +TT | FDD |
| 30 |  | -96.6 +TT | -94.6 +TT | -93.5 +TT |
| 60 |  | -97.0 +TT | -94.9 +TT | -93.7 +TT |
| n70 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.8 +TT | FDD |
| 30 |  | -97.1 +TT | -95.1 +TT | -94.0 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n71 | 15 | -97.2 +TT | -94.0 +TT | -91.6 +TT | -86.0 +TT | FDD |
| 30 |  | -94.3 +TT | -91.9 +TT | -87.4 +TT |
| n74 | 15 | -99.53 +TT | -96.33 +TT | -94.53 +TT | -89.33 +TT | FDD |
| 30 |  | -96.63 +TT | -94.63 +TT | -89.53 +TT |
| 60 |  | -97.03 +TT | -94.93 +TT | -89.63 +TT |
| NOTE 1: Void  NOTE 2: The transmitter shall be set to PUMAX as defined in subclause 6.2.4  NOTE 3: The requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.  NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | | | |

Table 7.3I.2.5-2: Two antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS / Duplex Mode | | | | |
| Operating band | SCS  kHz | Channel bandwidth (MHz) | REFSENS (dBm)8 | Duplex Mode |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11)+TT |
| n381 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11)+TT |
| n39 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20, | -97.5 + 10log10(NRB/11)+TT |
| n40 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11)+TT |
| n411 | 15 | 5, 10, 15, 20 | -94.8 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 15, 20 | -95.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20 | -95.5 + 10log10(NRB/11)+TT |
| n481 | 15 | 5, 10, 15, 20, | -99 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20, | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 15, 20, | -96.5 + 10log10(NRB/11)+TT |
| n50 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11)+TT |
| n51 | 15 | 5 | -100+TT | TDD |
| n53 | 15 | 5, 10 | -100 + 10log10(NRB/25)+TT | TDD |
| 30 | 10 | -97.1+TT |
| 60 | 10 | -97.5+TT |
| n771,4 | 15 | 10, 15, 20 | -95.3 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 15, 20 | -95.6 + 10log10(NRB/24)+TT |
| 60 | 10, 15, 20 | -96.0 + 10log10(NRB/11)+TT |
| n781 | 15 | 10, 15, 20 | -95.8 + 10log10(NRB/52) +TT | TDD |
| 30 | 10, 15, 20 | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 15, 20 | -96.5 + 10log10(NRB/11)+TT |
| n791 | 15 | 10, 20, | -95.8 + 10log10(NRB/52)+TT | TDD |
| 30 | 10, 20, | -96.1 + 10log10(NRB/24) +TT |
| 60 | 10, 20 | -96.5 + 10log10(NRB/11) +TT |
| n91 | 15 | 5 | -100+TT | FDD |
| n92 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25)+TT | FDD |
| 30 | 10,15,20 | -97.1 + 10log10(NRB/24) |
| n93 | 15 | 5 | -100+TT | FDD |
| n94 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25)+TT | FDD |
|  | 30 | 10,15,20 | -97.1 + 10log10(NRB/24)+TT |
| n101 | 15 | 5, 10 | -100 + 10log10(NRB/25) | TDD |
|  | 30 | 10 | -97.1 + 10log10(NRB/24) |  |
| NOTE 1: Void.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: Void  NOTE 6: Void  NOTE 7: Void  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.  NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | |

Table 7.3I.2.5-3: Single antenna port Reference sensitivity QPSK PREFSENS for FDD bands

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / Duplex-mode | | | | | | | | | | |
| Operating  Band | SCS  kHz | 5  MHz | 10  MHz | | 15  MHz | | 20  MHz | | Duplex  Mode | |
| n1 | 15 | -100.0+2.5 +TT | | -96.8 +3 +TT | | -95.0 +3 +TT | | -93.8 +3 +TT | | FDD | |
| 30 |  | | -97.1 +3 +TT | | -95.1 +3 +TT | | -94.0 +3 +TT | |  | |
| 60 |  | | -97.5 +TT | | -95.4 +TT | | -94.2 +TT | |  | |
| n2 | 15 | -98.0 +2.5+TT | | -94.8 +3 +TT | | -93.0 +3 +TT | | -91.8 +3 +TT | | FDD | |
| 30 |  | | -95.1 +3 +TT | | -93.1 +3 +TT | | -92.0 +3 +TT | |  | |
| 60 |  | | -95.5 +3 +TT | | -93.4 +3 +TT | | -92.2 +3 +TT | |  | |
| n3 | 15 | -97.0+2.5 +TT | | -93.8 +3 +TT | | -92.0 +3 +TT | | -90.8 +3 +TT | | FDD | |
| 30 |  | | -94.1 +3 +TT | | -92.1 +3 +TT | | -91.0 +3 +TT | |  | |
| 60 |  | | -94.5 +3 +TT | | -92.4 +3 +TT | | -91.2 +3 +TT | |  | |
| n5 | 15 | -98.0+2.5 +TT | | -94.8 +3 +TT | | -93.0 +3 +TT | | -86.8 +3 +TT | | FDD | |
| 30 |  | | -95.1 +3 +TT | | -93.1 +3 +TT | | -88.6 +3 +TT | |  | |
| n7 | 15 | -98.0+2.5 +TT | | -94.8 +3 +TT | | -93.0 +3 +TT | | -91.8 +3 +TT | | FDD | |
| 30 |  | | -95.1 +3 +TT | | -93.1 +3 +TT | | -92.0 +3 +TT | |  | |
| 60 |  | | -95.5 +3 +TT | | -93.4 +3 +TT | | -92.2 +3 +TT | |  | |
| n8 | 15 | -97.0+2.5 +TT | | -93.8 +3 +TT | | -91.4 +3 +TT | | -85.8 +3 +TT | | FDD | |
| 30 |  | | -94.1 +3 +TT | | -91.7 +3 +TT | | -87.2 +3 +TT | |  | |
| n12 | 15 | -97.0 +2.5+TT | | -93.8 +3 +TT | | -84.0 +3 +TT | |  | | FDD | |
| 30 |  | | -94.1 +3 +TT | | -84.1 +3 +TT | |  | |  | |
| n14 | 15 | -97.0+2.5 +TT | | -93.8 +3 +TT | |  | |  | | FDD | |
| 30 |  | | -94.1 +3 +TT | |  | |  | |  | |
| n20 | 15 | -97.0 +2.5+TT | | -93.8 +3 +TT | | -91.0 +3 +TT | | -89.8 +3 +TT | | FDD | |
| 30 |  | | -94.1 +3 +TT | | -91.1 +3 +TT | | -90.0 +3 +TT | |  | |
| n24 | 15 | -100.0 +2.5+TT | | -96.8 +3 +TT | |  | |  | | FDD | |
| 30 |  | | -97.1 +3 +TT | |  | |  | |  | |
| 60 |  | | -97.5 +3 +TT | |  | |  | |  | |
| n25 | 15 | -96.5 +2.5+TT | | -93.3 +3 +TT | | -91.5 +3 +TT | | -90.3 +3 +TT | | FDD | |
| 30 |  | | -93.6 +3 +TT | | -91.6 +3 +TT | | -90.5 +3 +TT | |  | |
| 60 |  | | -94.0 +3 +TT | | -91.9 +3 +TT | | -90.7 +3 +TT | |  | |
| n26 | 15 | -97.5+2.5 +TT | | -94.5 +3 +TT | | -92.7 +3 +TT | | -87.6 +3 +TT | | FDD | |
| 30 |  | | -94.8 +3 +TT | | -92.7 +3 +TT | | -87.7 +3 +TT | |  | |
| n28 | 15 | -98.5 +2.5+TT | | -95.5 +3 +TT | | -93.5 +3 +TT | | -90.8 +3 +TT | | FDD | |
| 30 |  | | -95.6 +3 +TT | | -93.6 +3 +TT | | -91.0 +3 +TT | |  | |
| n30 | 15 | -99.0 +2.5+TT | | -95.8 +3 +TT | |  | |  | | FDD | |
| 30 |  | | -96.1 +3 +TT | |  | |  | |  | |
| n65 | 15 | -99.5 +2.5+TT | | -96.3 +3+TT | | -94.5 +3+TT | | -93.3 +3+TT | | FDD | |
| 30 |  | | -96.6 +3 +TT | | -94.6 +3 +TT | | -93.5 +3 +TT | |  | |
| 60 |  | | -97.0 +3+TT | | -94.9 +3+TT | | -93.7 +3+TT | |  | |
| n66 | 15 | -99.5 +2.5+TT | | -96.3 +3+TT | | -94.5 +3 +TT | | -93.3 +3 +TT | | FDD | |
| 30 |  | | -96.6 +3 +TT | | -94.6 +3 +TT | | -93.5 +3+TT | |  | |
| 60 |  | | -97.0 +3 +TT | | -94.9 +3 +TT | | -93.7 +3 +TT | |  | |
| n70 | 15 | -100.0 +2.5 +TT | | -96.8 +3 +TT | | -95.0 +3+TT | | -93.8 +3 +TT | | FDD | |
| 30 |  | | -97.1 +3 +TT | | -95.1 +3 +TT | | -94.0 +3 +TT | |  | |
| 60 |  | | -97.5 +3 +TT | | -95.4 +3 +TT | | -94.2 +3 +TT | |  | |
| n71 | 15 | -97.2+2.5 +TT | | -94.0 +3 +TT | | -91.6 +3 +TT | | -86.0 +3 +TT | | FDD | |
| 30 |  | | -94.3 +3 +TT | | -91.9 +3 +TT | | -87.4 +3 +TT | |  | |
| n74 | 15 | -99.53 +2.5 +TT | | -96.33 +3+TT | | -94.53 +3+TT | | -89.33  +3+TT | | FDD | |
| 30 |  | | -96.63 +3+TT | | -94.63 +3+TT | | -89.53 +3+TT | |  | |
| 60 |  | | -97.03 +3+TT | | -94.93 +3+TT | | -89.63  +3+TT | |  | |
| NOTE 1: Void  NOTE 2: The transmitter shall be set to PUMAX as defined in subclause 6.2.4  NOTE 3: That the requirement is modified by -0.5 dB when the assigned NR channel bandwidth is confined within 1475.9-1510.9 MHz.  NOTE 4: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | | | | | | | |

Table 7.3I.2.5-4: Single antenna port reference sensitivity QPSK PREFSENS for TDD, SDL and FDD with variable duplex operation bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth / REFSENS/Duplex Mode | | | | |
| Operating band | SCS  kHz | Channel bandwidth (MHz) | REFSENS (dBm)8 | Duplex Mode |
| n34 | 15 | 5, 10, 15 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15 | -97.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15 | -97.5 + 10log10(NRB/11) +2.5+TT |
| n381 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11) +2.5+TT |
| n39 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11) +2.5+TT |
| n40 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11) +2.5+TT |
| n411 | 15 | 10, 15, 20 | -94.8 + 10log10(NRB/52) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -95.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -95.5 + 10log10(NRB/11) +2.5+TT |
| n481 | 15 | 5, 10, 15, 20 | -99 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -96.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -96.5 + 10log10(NRB/11) +2.5+TT |
| n50 | 15 | 5, 10, 15, 20 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -97.5 + 10log10(NRB/11) +2.5+TT |
| n51 | 15 | 5 | -100 +2.5+TT | TDD |
| n53 | 15 | 5, 10 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
| 30 | 10 | -97.1 +2.5+TT |
| 60 | 10 | -97.5 +2.5+TT |
| n771,4 | 15 | 10, 15, 20 | -95.3 + 10log10(NRB/52) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -95.6 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -96.0 + 10log10(NRB/11) +2.5+TT |
| n781 | 15 | 10, 15, 20 | -95.8 + 10log10(NRB/52) +2.5+TT | TDD |
| 30 | 10, 15, 20 | -96.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 15, 20 | -96.5 + 10log10(NRB/11) +2.5+TT |
| n791 | 15 | 10, 20, | -95.8 + 10log10(NRB/52) +2.5+TT | TDD |
| 30 | 10, 20, | -96.1 + 10log10(NRB/24) +2.5+TT |
| 60 | 10, 20 | -96.5 + 10log10(NRB/11) +2.5+TT |
| n91 | 15 | 5 | -100+2.5+TT | FDD |
| n92 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25) +2.5+TT | FDD |
| 30 | 10,15,20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| n93 | 15 | 5 | -100 +2.5+TT | FDD |
| n94 | 15 | 5,10,15,20 | -100 + 10log10(NRB/25) +2.5+TT | FDD |
|  | 30 | 10,15,20 | -97.1 + 10log10(NRB/24) +2.5+TT |
| n101 | 15 | 5, 10 | -100 + 10log10(NRB/25) +2.5+TT | TDD |
|  | 30 | 10 | -97.1 + 10log10(NRB/24) +2.5+TT |  |
| NOTE 1: Void.  NOTE 2: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 3: Void  NOTE 4: The requirement is modified by -0.5 dB when the assigned UE channel bandwidth is confined within 3300 - 3800 MHz.  NOTE 5: Void  NOTE 6: Void  NOTE 7: Void  NOTE 8: The REFSENS value is rounded to the nearest number down to one decimal point. “NRB” in REFSENS formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1.  NOTE 9: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | |

Table 7.3I.2.5-5: Two antenna port reference sensitivity QPSK PREFSENS for HD-FDD operation

| Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| n1 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n2 | 15 | -98.8 +TT | -95.6 +TT | -93.8 +TT | -92.5 +TT | HD-FDD |
| 30 |  | -96.0 +TT | -94.0 +TT | -92.7 +TT |
| 60 |  | -96.3 +TT | -94.2 +TT | -93.0 +TT |
| n3 | 15 | -97.8 +TT | -94.6 +TT | -92.8 +TT | -91.5 +TT | HD-FDD |
| 30 |  | -95.0 +TT | -93.0 +TT | -91.7 +TT |
| 60 |  | -95.3 +TT | -93.2 +TT | -92.0 +TT |
| n5 | 15 | -98.8 +TT | -95.6 +TT | -93.8 +TT | -92.5 +TT | HD-FDD |
| 30 |  | -96.0 +TT | -94.0 +TT | -92.7 +TT |
| n7 | 15 | -98.8 +TT | -95.6 +TT | -93.8 +TT | -92.5 +TT | HD-FDD |
| 30 |  | -96.0 +TT | -94.0 +TT | -92.7 +TT |
| 60 |  | -96.3 +TT | -94.2 +TT | -93.0 +TT |
| n8 | 15 | -97.8 +TT | -94.6 +TT | -92.8 +TT | -91.5 +TT | HD-FDD |
| 30 |  | -95.0 +TT | -93.0 +TT | -91.7 +TT |
| n12 | 15 | -97.8 +TT | -94.6 +TT | -92.8 +TT |  | HD-FDD |
| 30 |  | -95.0 +TT | -93.0 +TT |  |
| n13 | 15 | -97.8 +TT | -94.6 +TT |  |  | HD-FDD |
| 30 |  | -95.0 +TT |  |  |
| n14 | 15 | -97.8 +TT | -94.6 +TT |  |  | HD-FDD |
| 30 |  | -95.0 +TT |  |  |
| n18 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT |  | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT |  |
| n20 | 15 | -97.8 +TT | -94.6 +TT | -92.8 +TT | -91.5 +TT | HD-FDD |
| 30 |  | -95.0 +TT | -93.0 +TT | -91.7 +TT |
| n24 | 15 | -100.0 +TT | -96.8 +TT |  |  | HD-FDD |
| 30 |  | -97.2 +TT |  |  |
| 60 |  | -97.5 +TT |  |  |
| n25 | 15 | -97.3 +TT | -94.1 +TT | -92.3 +TT | -91.0 +TT | HD-FDD |
| 30 |  | -94.5 +TT | -92.5 +TT | -91.2 +TT |
| 60 |  | -94.8 +TT | -92.7 +TT | -91.5 +TT |
| n26 | 15 | -98.3 +TT | -95.1 +TT | -93.3 +TT | -92.0 +TT | HD-FDD |
| 30 |  | -95.5 +TT | -93.5 +TT | -92.2 +TT |
| n28 | 15 | -99.3 +TT | -96.1 +TT | -94.3 +TT | -93.0 +TT | HD-FDD |
| 30 |  | -96.5 +TT | -94.5 +TT | -93.2 +TT |
| n30 | 15 | -99.5 +TT | -96.3 +TT |  |  | HD-FDD |
| 30 |  | -96.7 +TT |  |  |
| n65 | 15 | -100.0 +TT | -96.8+TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n66 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n70 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n71 | 15 | -98.0 +TT | -94.8 | -93.0 +TT | -91.7 +TT | HD-FDD |
| 30 |  | -95.2 +TT | -93.2 +TT | -91.9 +TT |
| n74 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| 60 |  | -97.5 +TT | -95.4 +TT | -94.2 +TT |
| n91 | 15 | -100.0 +TT |  |  |  | HD-FDD |
| n92 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| n93 | 15 | -100.0 +TT |  |  |  | HD-FDD |
| n94 | 15 | -100.0 +TT | -96.8 +TT | -95.0 +TT | -93.7 +TT | HD-FDD |
| 30 |  | -97.2 +TT | -95.2 +TT | -93.9 +TT |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | | | |

Table 7.3I.2.5-6: Single antenna port Reference sensitivity QPSK PREFSENS for HD-FDD operation

| Operating band / SCS / Channel bandwidth/ REFSENS / Duplex Mode | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Band | SCS kHz | 5 MHz (dBm) | 10 MHz (dBm) | 15 MHz (dBm) | 20 MHz (dBm) | Duplex Mode |
| n1 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| 60 |  | -95.0 +TT | -92.9 +TT | -91.7 +TT |
| n2 | 15 | -96.3 +TT | -93.1 +TT | -91.3 +TT | -90.0 +TT | HD-FDD |
| 30 |  | -93.5 +TT | -91.5 | -90.2 |
| 60 |  | -93.8 +TT | -91.7 +TT | -90.5 +TT |
| n3 | 15 | -95.3 +TT | -92.1 +TT | -90.3 +TT | -89.0 +TT | HD-FDD |
| 30 |  | -92.5 +TT | -90.5 +TT | -89.2 +TT |
| 60 |  | -92.8 +TT | -90.7 +TT | -89.5 +TT |
| n5 | 15 | -96.3 +TT | -93.1 +TT | -91.3 +TT | -90.0 +TT | HD-FDD |
| 30 |  | -93.5 +TT | -91.5 +TT | -90.2 +TT |
| n7 | 15 | -96.3 +TT | -93.1 +TT | -91.3 +TT | -90.0 +TT | HD-FDD |
| 30 |  | -93.5 +TT | -91.5 +TT | -90.2 +TT |
| 60 |  | -93.8 +TT | -91.7 +TT | -90.5 +TT |
| n8 | 15 | -95.3 +TT | -92.1 +TT | -90.3 +TT | -89.0 +TT | HD-FDD |
| 30 |  | -92.5 +TT | -90.5 +TT | -89.2 +TT |
| n12 | 15 | -95.3 +TT | -92.1 +TT | -90.3 +TT |  | HD-FDD |
| 30 |  | -92.5 +TT | -90.5 +TT |  |
| n13 | 15 | -95.3 +TT | -92.1 +TT |  |  | HD-FDD |
| 30 |  | -92.5 +TT |  |  |
| n14 | 15 | -95.3 +TT | -92.1 +TT |  |  | HD-FDD |
| 30 |  | -92.5 +TT |  |  |
| n18 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT |  | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT |  |
| n20 | 15 | -95.3 +TT | -92.1 +TT | -90.3 +TT | -89.0 +TT | HD-FDD |
| 30 |  | -92.5 +TT | -90.5 +TT | -89.2 +TT |
| n24 | 15 | -97.5 +TT | -94.3 +TT |  |  | HD-FDD |
| 30 |  | -94.7 +TT |  |  |
| 60 |  | -95.0 +TT |  |  |
| n25 | 15 | -94.8 +TT | -91.6 +TT | -89.8 +TT | -88.5 +TT | HD-FDD |
| 30 |  | -92.0 +TT | -90.0 +TT | -88.7 +TT |
| 60 |  | -92.3 +TT | -90.2 +TT | -89.0 +TT |
| n26 | 15 | -95.8 +TT | -92.6 +TT | -90.8 +TT | -89.5 +TT | HD-FDD |
| 30 |  | -93.0 +TT | -91.0 +TT | -89.7 +TT |
| n28 | 15 | -96.8 +TT | -93.6 +TT | -91.8 +TT | -90.5 +TT | HD-FDD |
| 30 |  | -94.0 +TT | -92.0 +TT | -90.7 +TT |
| n30 | 15 | -97.0 +TT | -93.8 +TT |  |  | HD-FDD |
| 30 |  | -94.2 +TT |  |  |
| n65 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| 60 |  | -95.0 +TT | -92.9 +TT | -91.7 +TT |
| n66 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| 60 |  | -95.0 +TT | -92.9 +TT | -91.7 +TT |
| n70 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| 60 |  | -95.0 +TT | -92.9 +TT | -91.7 +TT |
| n71 | 15 | -95.5 +TT | -92.3 +TT | -90.5 +TT | -89.2 +TT | HD-FDD |
| 30 |  | -92.7 +TT | -90.7 +TT | -89.4 +TT |
| n74 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| 60 |  | -95.0 +TT | -92.9 +TT | -91.7 |
| n91 | 15 | -97.5 +TT |  |  |  | HD-FDD |
| n92 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| n93 | 15 | -97.5 +TT |  |  |  | HD-FDD |
| n94 | 15 | -97.5 +TT | -94.3 +TT | -92.5 +TT | -91.2 +TT | HD-FDD |
| 30 |  | -94.7 +TT | -92.7 +TT | -91.4 +TT |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4.  NOTE 2: TT for each frequency and channel bandwidth is specified in Table 7.3I.2.5-7. | | | | | | |

Table 7.3I.2.5-7: Test Tolerance (TT) for RX sensitivity level for RedCap UE

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤ 6.0 GHz |
| 0.7 dB | 1.0 dB |

## 7.3J Reference sensitivity for ATG

### 7.3J.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the ATG UE antenna ports, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

## 7.4 Maximum input level

7.4.1 Test purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to a g-NodeB.

7.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.4.3 Minimum conformance requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel. The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.3-1.

Table 7.4.3-1: Maximum input level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10, 15, 20 | 25, 30, 35, 40, 45, 50 | 60, 70, 80, 90, 100 |
| Power in Transmission Bandwidth Configuration4 | dBm | -252 | -25 + 10log10(BWChannel /20)Note 2 | -202 |
|  |  | -273,5 | -27 + 10log10(BWChannel /20)Note 3,5 | -223,5 |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: 10log10(x) is rounded to the nearest 0.5dB value.  NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM. | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4.

7.4.4 Test description

7.4.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.4.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial 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 (NOTE 5) | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 4) | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters for Channel Bandwidths | | | |
| Downlink Configuration | | Uplink Configuration | |
| Modulation | RB allocation | Modulation | RB allocation |
| CP-OFDM 64 QAM | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| CP-OFDM 256 QAM | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| CP-OFDM 1024 QAM | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2.  NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected.  NOTE 4: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 5: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 6: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 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 7.4.4.1-1.

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 7.4.4.3*.*

7.4.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.4.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.4.5-1. 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 7.4.5-1 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.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

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.

7.4.4.3 Message contents

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

The following exception applies to 1024QAM testing:

Table 7.4.4.3-1: PDSCH-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 Table 5.4.2.0-26 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| mcs-Table-r17 | qam1024 |  |  |
| } |  |  |  |

7.4.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.4.5-1.

Table 7.4.5-1: Maximum input level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10, 15, 20 | 25, 30, 35, 40, 45, 50 | 60, 70, 80, 90, 100 |
| Power in Transmission Bandwidth Configuration4 | dBm | -252 -TT | -25 + 10log10(BWChannel /20)Note 2 -TT | -202 -TT |
|  |  | -273,5 -TT | -27 + 10log10(BWChannel /20)Note 3,5 -TT | -223,5 -TT |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: 10log10(x) is rounded to the nearest 0.5dB value.  NOTE 5: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM. | | | | |

Table 7.4.5-2: Void

Table 7.4.5-3: Test Tolerance (Maximum input level)

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

## 7.4A Maximum input level for CA

### 7.4A.0 Minimum conformance requirements

#### 7.4A.0.1 Maximum input level for Intra-band contiguous CA

For intra-band contiguous carrier aggregation maximum input level is defined as the maximum mean power received at the UE antenna port, over the Transmission bandwidth configuration of each CC.

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4A.0.1-1 for each component carrier.

Table 7.4A.0.1-1: Maximum input level for Intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | | | |
| B | C | D |  |
| Power in largest transmission bandwidth configuration CC, Plargest BW | dBm | -232 | -232 | -252 |  |
| -253, 4 | -253, 4 | -273, 4 |  |
| Power in each other CC | dBm | Plargest BW +10\*log{(NRB,c\*SCSc)/(NRB,largest BW\*SCSlargest BW)} | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c as defined in subclause 6.2.4.3.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM. | | | | | |

#### 7.4A.0.2 Maximum input level for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the maximum input level requirements are defined with the uplink configuration in accordance with 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified subclause 7.4.3 and Table 7.4A.0.1-1 for one component carrier and two component carriers per sub-block, respectively. The throughput of each downlink component carrier shall be ≥ 95% of the maximum throughput of the specified reference measurement channel as specified in Annex A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1 and A.5.2.1. The requirements apply with all downlink carriers active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4A.

#### 7.4A.0.3 Maximum input level 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 maximum input level is defined with the uplink active on the band(s) other than the band whose downlink is being tested. For NR CA configurations including an operating band without uplink band or an operating band with an

unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The UE shall meet the requirements specified in subclause 7.4.3 for each component carrier while all downlink carriers are active.

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

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4A.

### 7.4A.1 Maximum input level for CA (2DL CA)

7.4A.1.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.4A.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.1.4 Test description

7.4A.1.4.1 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 7.4A.1.4.1-1 or 7.4A.1.4.1-2. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.1.4.1-1: 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | NOTE 1 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'n | PCC RB allocation |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | 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.1.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | | |

Table 7.4A.1.4.1-2: 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 | | | NOTE 1, NOTE 3 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | NOTE 1, NOTE 4 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'n | PCC RB allocation |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 256QAM | 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.1.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 4: Test CC Combination setting is set as defined in Table 7.3A.1.4.1-2. 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 5: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | | |

Table 7.4A.1.4.1-3: 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 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'n | PCC RB allocation |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 256QAM | 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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.4A.1.4.1-1, Table 7.4A.1.4.1-2 or Table 7.4A.1.4.1-3.

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 7.4A.1.4.3*.*

7.4A.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.1.4.3.

3. SS activates SCC 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], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4A.1.4.1-1 for intra-band contiguous CA, 7.4A.1.4.1-2 for inter-band CA or 7.4A.1.4.1-3 for intra-band non-contiguous CA on both PCC and SCC. 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 Tables 7.4A.1.4.1-1 for intra-band contiguous CA, 7.4A.1.4.1-2 for inter-band CA or 7.4A.1.4.1-3 for intra-band non-contiguous CA. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.4A.1.5-1 for intra-band contiguous CA, Table 7.4A.1.5-2 for inter-band CA or Table 7.4A.1.5-3 for intra-band non-contiguous CA. Send uplink power control commands to the UE using 1dB 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 7.4A.1.5-1 for intra-band contiguous CA, Table 7.4A.1.5-2 for inter-band CA or 7.4A.1.5-3 for intra-band non-contiguous CA 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.

7. For intra-band contiguous and non-contiguous CA: measure the average throughput of each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

For inter-band CA: measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

8. For Inter-band CA only: Repeat steps from 1 to 7 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, except for operating bands without uplink band.

7.4A.1.4.3 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.

The following exception applies to 1024QAM testing:

Table 7.4A.1.4.3-1: PDSCH-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 Table 5.4.2.0-26 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| mcs-Table-r17 | qam1024 |  |  |
| } |  |  |  |

7.4A.1.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.1.5-1 for intra-band contiguous CA or Table 7.4A.1.5-2 for inter-band CA.

Table 7.4A.1.5-1: Maximum input level for Intra-band contiguous CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | | |
| B | CD | E |
| Power in largest transmission bandwidth configuration CC, Plargest BW | dBm | -232-TT | -232-TT-252-TT | -262-TT |
| -253, 4-TT | -253, 4-TT-273-TT | -283, 4-TT |
| Power in each other CC | dBm | Plargest BW +10\*log{(NRB,c\*SCSc)/(NRB,largest BW\*SCSlargest BW)} -TT | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c as defined in subclause 6.2.4.3.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.1.5-5. | | | | |

Table 7.4A.1.5-2: Maximum input level for inter-band

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -252-TT | | | | -242-TT | -232-TT | -222-TT | -212-TT | -202-TT | | | | |
| -273, 4-TT | | | | -263, 4-TT | -253, 4-TT | -243, 4-TT | -233, 4-TT | -223, 4-TT | | | | |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L as defined in subclause 6.2.4.  NOTE 2: Reference measurement channel is Annex A.3.2.3/A.3.3.3 for 64-QAM.  NOTE 3: Reference measurement channel is Annex A.3.2.4/A.3.3.4 for 256-QAM.  NOTE 4: Reference measurement channel is Annex A.3.2.5/A.3.3.5 for 1024-QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.1.5-5. | | | | | | | | | | | | | | |

Table 7.4A.1.5-3: Maximum input level for intra-band non-contiguous

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -252-TT | | | | -242-TT | -232-TT | -222-TT | -212-TT | -202-TT | | | | |
| -273-TT | | | | -263,4-TT | -253,4-TT | -243,4-TT | -233,4-TT | -223,4-TT | | | | |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L as defined in subclause 6.2.4.  NOTE 2: Reference measurement channel is Annex A.3.2.3/A.3.3.3 for 64-QAM.  NOTE 3: Reference measurement channel is Annex A.3.2.4/A.3.3.4 for 256-QAM.  NOTE 4: Reference measurement channel is Annex A.3.2.5/A.3.3.5 for 1024-QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.1.5-5. | | | | | | | | | | | | | | |

Table 7.4A.1.5-4: Void

Table 7.4A.1.5-5: Test Tolerance (Maximum input level)

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

### 7.4A.2 Maximum input level for CA (3DL CA)

7.4A.2.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.2.2 Test applicability

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

7.4A.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.2.4 Test description

7.4A.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 7.4A.2.4.1-1, 7.4A.2.4.1-2 or 7.4A.2.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.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 | | | Intra-band contiguous: Mid range for PCC and SCCs  Inter-band: NOTE 1, NOTE 5  Intra-band contiguous + Inter-band: NOTE 1, NOTE 5  Intra-band non-contiguous + Inter-band, Intra-band non-contiguous, Intra-band contiguous + Intra-band non-contiguous: NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1 (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. | | | NOTE 1, NOTE 6 | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest for PCC and SCCs | | | |
| Network signalling value | | | NS\_01 by default | | | |
| Test Parameters | | | | | | |
|  | Downlink Configuration | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | SCC2 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous) | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band) | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 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 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nYA Configuration  (Intra-band non-contiguous + Inter-band) | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)** | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 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 64QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | 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: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  NOTE 3: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA\_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n1A-n8A, X=1, Y =8.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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: Test CC Combination setting is set as defined in Table 7.3A.1.4.1-2. 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 7: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | | | |

Table 7.4A.2.4.1-2: Void

Table7.4A.2.4.1-3: Void

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.4A.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 7.4A.2.4.3*.*

7.4A.2.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.2.4.3.

3. SS activates SCC 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], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4A.2.4.1-1 to Table 7.4A.2.4.1-3 as appropriate for 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 Tables 7.4A.2.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.4A.2.5-1 and Table 7.4A.2.5-2 according to the type of CA. Send uplink power control commands to the UE using 1dB step size to ensure that the PCC 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 7.4A.2.5-1 or Table 7.4A.2.5-2 as appropriate 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.

7. Measure the average throughput for the carrier(s) indicated in table 7.4A.2.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.2.4.2-1.

Table 7.4A.2.4.2-1: Test repetition and measurement configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA configuration | Test ID  (NOTE1) | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 1, 2, 3 | 15 | PCC, SCC1, SCC2 | Table 7.4A.2.5-1 |
| Inter-band | 1, 2, 3 | 12, 22, 32 | SCC1, SCC2 | Table 7.4A.2.5-2 |
| Intra-band contiguous + Inter-band | 1, 2, 3 | 13 | SCC2 | Table 7.4A.2.5-2 |
| 23 | SCC1, SCC2 | Table 7.4A.2.5-1 |
| Intra-band non-contiguous + Inter-band | 1, 2, 3 | 14 | SCC2 | Table 7.4A.2.5-2 |
| 24 | SCC1, SCC2 | Table 7.4A.2.5-2 |
| Intra-band non-contiguous | 1, 2, 3 | 16 | PCC, SCC1, SCC2 | Table 7.4A.2.5-2 |
| Intra-band contiguous + Intra-band non-contiguous | 1, 2, 3 | 17 | PCC, SCC1, SCC2 | Table 7.4A.2.5-1  Table 7.4A.2.5-2 |
| NOTE 1: Refers to Test IDs in Table 7.4A.2.4.1-1  NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band)” in table 7.3A.2.4.1-11.  NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nXC-YA, CA\_nYA-nXC, CA\_nYA-nXB and CA\_nXB-nYA Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.2.4.1-2.  NOTE 4: 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 5: 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 6: 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 7: 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.  NOTE 8: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | |

7.4A.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.

The following exception applies to 1024QAM testing:

Table 7.4A.2.4.3-1: PDSCH-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 Table 5.4.2.0-26 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| mcs-Table-r17 | qam1024 |  |  |
| } |  |  |  |

7.4A.2.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.2.5-1 and Table 7.4A.2.5-2 as applicable.

Table 7.4A.2.5-1: Maximum input level for 3DL CA (Intra-band contiguous)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | | | |
| B | C | D |  |
| Power in largest transmission bandwidth configuration CC, Plargest BW | dBm | -232-TT | -232-TT | -252-TT |  |
| -253, 4-TT | -253, 4-TT | -273, 4-TT |  |
| Power in each other CC | dBm | Plargest BW +10\*log{(NRB,c\*SCSc)/(NRB,largest BW\*SCSlargest BW)} | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.2.5-3 for each CC. | | | | | |

Table 7.4A.2.5-2: Maximum input level for 3DL CA (Intra-band non-contiguous, Inter-band), per CC

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -252-TT | | | | -242-TT | -232-TT | -222-TT | -212-TT | -202-TT | | | | |
| -273-TT | | | | -263-TT | -253-TT | -243-TT | -233-TT | -223-TT | | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.2.5-3 for each CC. | | | | | | | | | | | | | | |

Table 7.4A.2.5-3: Test Tolerance (Maximum input level), per CC

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

### 7.4A.3 Maximum input level for CA (4DL CA)

7.4A.3.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.4A.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.3.4 Test description

7.4A.3.4.1 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 7.4A.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.3.4.1-1: Test Configuration Table for 4DL 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 6 | | | | |
| 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. | | | NOTE 1, NOTE 5 | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest for PCC and SCCs | | | | |
| Network signalling value | | | NS\_01 by default | | | | |
| Test Parameters | | | | | | | |
|  | Downlink Configuration | | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | SCC2 RB allocation | SCC3 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXE Configuration (Intra-band contiguous) | | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA-nRA Configuration (Inter-band) | | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| **Default Test Settings for a CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA Configurations**  **(Intra-band contiguous + Inter-band)** | | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nYA-nZA Configuration  (Intra-band non-contiguous + Inter-band) | | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nY(2A) Configuration  **(Intra-band non-contiguous + Intraband non-contiguous)** | | | | | | | |
| 1 | CP-OFDM 64QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 2 | CP-OFDM 256QAM | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| 3 | CP-OFDM 1024QAM | 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.3.4.1-1.  NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  NOTE 3: **Inter-band:** n**X,** n**Y,** n**Z,**n**R** correspond to the different bands in the CA Configuration. E.g. for CA\_n66A-n70A-n71A-n77A, nX=n66, nY=n70, nZ=n71 ,nR=n77; **Intra-band contiguous + Inter-band:** nX, nY correspond to the different bands in the CA Configuration, e.g. for CA\_1C-3A, nX=n1, nY=n3; **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 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: Test CC Combination setting is set as defined in Table 7.3A.3.4.1-1. 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 6: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1.  NOTE 7: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.4A.3.4.1-1.

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 7.4A.3.4.3*.*

7.4A.3.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.2.4.3.

3. SS activates SCC 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], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4A.3.4.1-1 as appropriate for 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 Tables 7.4A.3.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.4A.3.5-1 and Table 7.4A.3.5-2 according to the type of CA. Send uplink power control commands to the UE using 1dB step size to ensure that the PCC 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 7.4A.3.5-1 or Table 7.4A.3.5-2 as appropriate 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.

7. Measure the average throughput for the component carrier(s) indicated in table 7.4A.3.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.3.4.2-1.

Table 7.4A.3.4.2-1: Test repetition and measurement configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA configuration | Test ID  (NOTE1) | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 1, 2, 3 | 15 | PCC,SCC1, SCC2, SCC3 | Table 7.4A.3.5-1 |
| Inter-band | 1, 2, 3 | 12, 22, 32, 42 | SCC1, SCC2, SCC3 | Table 7.4A.3.5-2 |
| Intra-band contiguous + Inter-band | 1, 2, 3 | 13 | SCC2, SCC3 | Table 7.4A.3.5-2 |
| 23 | SCC1, SCC2, SCC3 | Table 7.4A.3.5-1 |
| 33 | SCC1, SCC2, SCC3 | Table 7.4A.3.5-1 |
| Intra-band non-contiguous + Inter-band | 1, 2, 3 | 14 | SCC2, SCC3 | Table 7.4A.3.5-2 |
| 24 | SCC1, SCC2, SCC3 | Table 7.4A.3.5-2 |
| 34 | SCC1, SCC2, SCC3 | Table 7.4A.3.5-2 |
| Intra-band non-contiguous + Intra-band non-contiguous | 1, 2, 3 | 1 | SCC2, SCC3 | Table 7.4A.3.5-2 |
| 2 | SCC2, SCC3 | Table 7.4A.3.5-2 |
| NOTE 1: Refers to Test IDs in Table 7.4A.3.4.1-1  NOTE 2: CA configuration ID as defined in table 7.3A.3.4.1-1.  NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 5: CA configuration ID as defined in “Default Test Settings for a CA\_nXE Configuration (Intra-band contiguous)” in table 7.3A.3.4.1-1.  NOTE 6: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)” in table 7.3A.3.4.1-1.  NOTE 7: Testing for 1024 QAM is applicable for UE supporting capabilities 1024QAM (pdsch-1024QAM-FR1). | | | | |

7.4A.3.4.3 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.

The following exception applies to 1024QAM testing:

Table 7.4A.3.4.3-1: PDSCH-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 Table 5.4.2.0-26 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| mcs-Table-r17 | qam1024 |  |  |
| } |  |  |  |

7.4A.3.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.3.5-1 and Table 7.4A.3.5-2 as applicable.

Table 7.4A.3.5-1: Maximum input level for 4DL CA (Intra-band contiguous)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | | | |
| B | C | D |  |
| Power in largest transmission bandwidth configuration CC, Plargest BW | dBm | -232-TT | -232-TT | -252-TT |  |
| -253, 4-TT | -253, 4-TT | -273, 4-TT |  |
| Power in each other CC | dBm | Plargest BW +10\*log{(NRB,c\*SCSc)/(NRB,largest BW\*SCSlargest BW)} | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.3.5-3 for each CC. | | | | | |

Table 7.4A.3.5-2: Maximum input level for 4DL CA (Intra-band non-contiguous, Inter-band), per CC

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -252-TT | | | | -242-TT | -232-TT | -222-TT | -212-TT | -202-TT | | | | |
| -273-TT | | | | -263,4-TT | -253,4-TT | -243,4-TT | -233,4-TT | -223-TT | | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.3.5-3 for each CC. | | | | | | | | | | | | | | |

Table 7.4A.3.5-3: Test Tolerance (Maximum input level), per CC

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

### 7.4A.4 Maximum input level for CA (5DL CA)

Editor’s Note:

* Test Configuration Table and test repetition and measurement configuration are TBD.
* RefSens for 5DL CA is FFS

7.4A.4.1 Test purpose

The same test purpose as defined in 7.4.1.

7.4A.4.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 5DL CA.

7.4A.4.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 7.4A.0.

7.4A.4.4 Test description

7.4A.4.4.1 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 7.4A.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4A.4.4.1-1: Test Configuration Table for 5DL CA[TBD]

[TBD]

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.4A.4.4.1-1.

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 7.4A.4.4.3*.*

7.4A.4.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.4A.2.4.3.

3. SS activates SCC 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 7.4A.4.4.1-1 as appropriate for 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 7.4A.4.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level for PCC and SCCs to the value as defined in Table 7.4A.4.5-1 and Table 7.4A.4.5-2 according to the type of CA. Send uplink power control commands to the UE using 1dB step size to ensure that the PCC 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 7.4A.4.5-1 or Table 7.4A.4.5-2 as appropriate 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.

7. Measure the average throughput for the component carrier(s) indicated in table 7.4A.4.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

8. Repeat steps 6 to 7 for all component carriers indicated in Table 7.4A.4.4.2-1.

Table 7.4A.4.4.2-1: Test repetition and measurement configuration

[TBD]

7.4A.4.4.3 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.

The following exception applies to 1024QAM testing:

Table 7.4A.4.4.3-1: PDSCH-Config

|  |  |  |  |
| --- | --- | --- | --- |
| Derivation Path: TS 38.508-1 Table 5.4.2.0-26 | | | |
| Information Element | Value/remark | Comment | Condition |
| PDSCH-Config ::= SEQUENCE { |  |  |  |
| mcs-Table-r17 | qam1024 |  |  |
| } |  |  |  |

7.4A.4.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3 with parameters specified in Table 7.4A.4.5-1 and Table 7.4A.4.5-2 as applicable.

Table 7.4A.4.5-1: Maximum input level for 5DL CA (Intra-band contiguous)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | | | |
| B | C | D |  |
| Power in largest transmission bandwidth configuration CC, Plargest BW | dBm | -232-TT | -232-TT | -252-TT |  |
| -253, 4-TT | -253, 4-TT | -273, 4-TT |  |
| Power in each other CC | dBm | Plargest BW +10\*log{(NRB,c\*SCSc)/(NRB,largest BW\*SCSlargest BW)} | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.4.5-3 for each CC. | | | | | |

Table 7.4A.4.5-2: Maximum input level for 5DL CA (Intra-band non-contiguous, Inter-band), per CC

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth | | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| Power in Transmission Bandwidth Configuration | dBm | -252-TT | | | | -242-TT | -232-TT | -222-TT | -212-TT | -202-TT | | | | |
| -273-TT | | | | -263,4-TT | -253,4-TT | -243,4-TT | -233,4-TT | -223-TT | | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Reference measurement channel is A.3.2.5 or A.3.3.5 for 1024 QAM.  NOTE 5: TT for each frequency is specified in Table 7.4A.4.5-3 for each CC. | | | | | | | | | | | | | | |

Table 7.4A.4.5-3: Test Tolerance (Maximum input level), per CC

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

## 7.4B Maximum input level for NR-DC

For inter-band NR-DC configurations, the maximum input level for the corresponding inter-band CA configuration as specified in clause 7.4A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.4A.

## 7.4D Maximum input level for UL MIMO

7.4D.1 Test purpose

Maximum input level tests the ability of UE that supports UL MIMO to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

7.4D.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.4D.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing, the minimum requirements specified in sub-clause 7.4 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.4D and 7.4.

7.4D.4 Test description

7.4D.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 7.4D.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4D.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters for Channel Bandwidths | | | |
| Downlink Configuration | | Uplink Configuration | |
| Modulation | RB allocation | Modulation | RB allocation |
| CP-OFDM 64 QAM | NOTE 1 | CP-OFDM QPSK | NOTE 2 |
| CP-OFDM 256 QAM | NOTE 1 | CP-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2.  NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A Figure A.3.1.1.2 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 UL and DL Reference Measurement Channel is set according to Table 7.4D.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 7.4D.4.3*.*

7.4D.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4D.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.4D.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

3. Set the Downlink signal level to the value defined in Table 7.4D.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 7.4D.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.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

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 7.4D.4-2-1: Void

7.4D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO

7.4D.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A3.3 with parameters specified in Table 7.4D.5-1.

Table 7.4D.5-1 Maximum input level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10, 15, 20 | 25, 30, 35, 40, 45, 50 | 60, 70, 80, 90, 100 |
| Power in Transmission Bandwidth Configuration4 | dBm | -252 -TT | -25 + 10log10(BWChannel /20)Note 2 -TT | -202 -TT |
|  |  | -273,5 -TT | -27 + 10log10(BWChannel /20)Note 3,5 -TT | -223,5 -TT |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Power in transmission bandwidth configuration value is rounded to the nearest 0.5dB value.  NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM.  NOTE 6: TT for each frequency is specified in Table 7.4D.5-2 | | | | |

Table 7.4D.5-2: Test Tolerance (Maximum input level)

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

## 7.4D\_1 Maximum input level for SUL with UL MIMO

7.4D\_1.1 Test purpose

Same test purpose as in clause 7.4D.1.

7.4D\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.4D\_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.4D.3.

7.4D\_1.4 Test description

7.4D\_1.4.1 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 7.4D\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4D\_1.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial 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 for SUL and NUL  With following exceptions:  SUL\_n78-n80: High in band n78 | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | |
| Test SCS as specified in Table 5.3.5-1 | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | |
| Test Parameters for Channel Bandwidths | | | |
| Downlink Configuration | | Uplink Configuration | |
| Modulation | RB allocation | Modulation | RB allocation |
| CP-OFDM 64 QAM | NOTE 1 | CP-OFDM QPSK | NOTE 2 |
| CP-OFDM 256 QAM | NOTE 1 | CP-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2.  NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.4D \_1.4.1-1.

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 7.4D\_1.4.3*.*

7.4D\_1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4D\_1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.4D\_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2

3. Set the Downlink signal level to the value defined in Table 7.4D\_1.5-1. 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 7.4D\_1.5-1 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.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

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.

7.4D\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.4D\_1.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A3.3 with parameters specified in Table 7.4D\_1.5-1.

Table 7.4D\_1.5-1 Maximum input level

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10, 15, 20 | 25, 30, 40, 45, 50 | 60, 70, 80, 90, 100 |
| Power in Transmission Bandwidth Configuration4 | dBm | -252 -TT | -25 + 10log10(BWChannel /20)Note 2 -TT | -202 -TT |
|  |  | -273,5 -TT | -27 + 10log10(BWChannel /20)Note 3,5 -TT | -223,5 -TT |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table  7.3C.0.2-1 with PCMAX\_L,f,c as defined in clause 6.2.4.  NOTE 2: Reference measurement channel is A.3.2.3 or A.3.3.3 for 64 QAM.  NOTE 3: Reference measurement channel is A.3.2.4 or A.3.3.4 for 256 QAM.  NOTE 4: Power in transmission bandwidth configuration value is rounded to the nearest 0.5dB value.  NOTE 5: Reference measurement channel is A.3.2.x for 1024 QAM.  NOTE 6: TT for each frequency is specified in Table 7.4D\_1.5-2 | | | | |

Table 7.4D\_1.5-2: Test Tolerance (Maximum input level)

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| 0.7 dB | 1.0 dB |

## 7.4J Maximum input level for ATG

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU and TT are FFS

- Message Contents are FFS pending on Rel-18 ASN.1 freeze

7.4J.1 Test purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to a g-NodeB.

7.4J.2 Test applicability

This test case applies to all types of NR UE release 18 and forward that support NR standalone ATG.

7.4J.3 Minimum conformance requirements

Maximum input level is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel. The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4J.3-1.

Table 7.4J.3-1: Maximum input level for ATG

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | ATG UE Types | | Reference measurement channel |
| Omni-directional antenna: receiver characteristics specified at the antenna connector(s) | Antenna array: receiver characteristics specified at transceiver array boundary (TAB) connectors |
| Power in Transmission Bandwidth Configuration | dBm | -42 | -30 | A.3.2.3 or A.3.3.3 for 64 QAM |
|  |  | -44 | -32 | A.3.2.4 or A.3.3.4 for 256 QAM |
| The applicable channel bandwidths | MHz | 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c as defined in clause 6.2J.2. | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.4J.

7.4J.4 Test description

7.4J.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 7.4J.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.4J.4.1-1: Test Configuration Table

|  |  |  |  |
| --- | --- | --- | --- |
| Initial 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | Lowest, Mid, Highest | |
| Test SCS as specified in Table 5.3.5-1 | | Lowest | |
| Test Parameters for Channel Bandwidths | | | |
| Downlink Configuration | | Uplink Configuration | |
| Modulation | RB allocation | Modulation | RB allocation |
| CP-OFDM 64 QAM | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| CP-OFDM 256 QAM | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific configuration of downlink RB allocation is defined in Table 7.3.2.4.1-2.  NOTE 2: The specific configuration of uplink RB allocation is defined in Table 7.3.2.4.1-3.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected. | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.1 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 7.4J.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 7.4J.4.3*.*

7.4J.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.4J.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Tables 7.4J.4.1-1. Since the UE has no payload data and no loopback data to send, the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.4J.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 7.4J.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.

- The transmit power is measured as the sum of power of all antenna connectors (for ATG UE with omni-directional antennas) or of all TAB connectors (for ATG UE with antenna array).

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2

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.

7.4J.4.3 Message contents

FFS

7.4J.5 Test requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.4J.5-1.

Table 7.4J.5-1: Maximum input level for ATG

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | ATG UE Types | | Reference measurement channel |
| Omni-directional antenna: receiver characteristics specified at the antenna connector(s) | Antenna array: receiver characteristics specified at transceiver array boundary (TAB) connectors |
| Power in Transmission Bandwidth Configuration | dBm | -42-TT | -30-TT | A.3.2.3 or A.3.3.3 for 64 QAM |
|  |  | -44-TT | -32-TT | A.3.2.4 or A.3.3.4 for 256 QAM |
| The applicable channel bandwidths | MHz | 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2.3-3 with PCMAX\_L,f,c as defined in clause 6.2J.2. | | | | |

Table 7.4J.5-2: Test Tolerance (Maximum input level for ATG)

|  |  |
| --- | --- |
| f ≤ 3.0GHz | 3.0GHz < f ≤6.0GHz |
| FFS | FFS |

## 7.5 Adjacent channel selectivity

7.5.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.5.3 Minimum conformance requirements

The UE shall fulfil the minimum requirements specified in Table 7.5.3-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and the minimum requirements specified in Table 7.5.3-2. for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz. These requirements apply for all values of an adjacent channel interferer up to -25 dBm and for any SCS specified for the channel bandwidth of the wanted signal. However, it is not possible to directly measure the ACS; instead the lower and upper range of test parameters are chosen as in Table 7.5.3-3 and Table 7.5.3-4 for verification of the requirements specified in Table 7.5.3-1 and as in Table 7.5.3-5, and Table 7.5.3-6 for verification of the requirements specified in Table 7.5.3-2. For these test parameters, the throughput 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). For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.5.3-1: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value | | | | |

Table 7.5.3-2: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5.3-3: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | |
| Pinterferer4 | dBm | REFSENS + 45.5 dB | REFSENS + 42.5 dB | REFSENS + 39.5 – 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5.3-4: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration4 | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5.3-5: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5.3-6: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.5.

7.5.4 Test description

7.5.4.1 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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.5.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5.4.1-1.

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 content are defined in clause 7.5.4.3.

7.5.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.5.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5.5-2 or Table 7.5.5-5 as appropriate (Case 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 7.5.5-2 or Table 7.5.5-5 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 in Table F.1.3-1.

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

4. Set the Interferer signal level to the value as defined in Table 7.5.5-2 or Table 7.5.5-5 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.

7. Set the Downlink signal level to the value as defined in Table 7.5.5-3 or Table 7.5.5-6 as appropriate (Case 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 7.5.5-3 or Table 7.5.5-6 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

8. Set the Interferer signal level to the value as defined in Table 7.5.5-3 or Table 7.5.5-6 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.

11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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.

7.5.4.3 Message contents

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

7.5.5 Test requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure 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 7.5.5-2 and 7.5.5-3.

Table 7.5.5-1: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value | | | | |

Table 7.5.5-2: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | |
| Pinterferer4 | dBm | REFSENS + 45.5 dB | REFSENS + 42.5 dB | REFSENS + 39.5 – 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5.5-3: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration4 | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

For NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.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)] with parameters specified in Tables 7.5.5-5 and 7.5.5-6.

Table 7.5.5-4: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5.5-5: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5.5-6: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5.5-7: Void

## 7.5A Adjacent channel selectivity for CA

### 7.5A.0 Minimum conformance requirements

#### 7.5A.0.1 Adjacent channel selectivity for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.5A.0.1-1 and 7.5A.0.1-1a for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm.

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 specified in Tables 7.5A.0.1-2, 7.5A.0.1-2a, 7.5A.0.1-3 and 7.5A.0.1-3a.

Table 7.5A.0.1-1: ACS for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | CA Bandwidth Class | | |
| Rx Parameter | Units | B | C | D |
| ACS | dB | 26.0 | 33.0 | 25.2 |

Table 7.5A.0.1-1a: ACS for intra-band contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | CA Bandwidth Class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 20.0 | 17.0 |

Table 7.5A.0.1-2: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | | |
| B | C | D |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 24.5 dB | Aggregated power + 31.5 dB | Aggregated power + 23.7 dB |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | |

Table 7.5A.0.1-2a: Test parameters for intra-band contiguous CA with FDL\_high<2700 MHz and FUL\_high<2700 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 18.5dB | Aggregated power + 15.5dB |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.0.1-3: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | | |
| B | C | D |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49.5 + 10log(NRB,c/NRB\_agg) | -56.5 | -48.7 + 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 | -25 |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | |

Table 7.5A.0.1-3a: Test parameters for intra-band contiguous CA with FDL\_high <2700 MHz and FUL\_high<2700 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -43.5+ 10log(NRB,c/NRB\_agg) | -40.5+ 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5+ Foffset  /  -2.5- Foffset | 2.5+ Foffset  /  -2.5- Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

#### 7.5A.0.2 Adjacent channel selectivity Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.3 and 7.5A.0.1 for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power Pinterferer shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.3-3 and Table 7.5A.0.1-2a for one component carrier and two component carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to Pinterferer in accordance with the ACS requirement for each sub-block (Table 7.5.3-1 and Table 7.5A.0.1-1a). For the upper range of test parameters (Case 2) for which the interferer power Pinterferer is -25 dBm (Table 7.5.3-4 and Table 7.5A.0.1-3a) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to Pinterferer like for Case 1.

For intra-band non-contiguous carrier aggregation with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.3 and 7.5A.0.1 for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power Pinterferer shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.3-3 and Table 7.5A.0.1-2 for one component carrier and two component carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to Pinterferer in accordance with the ACS requirement for each sub-block (Table 7.5.3-1 and Table 7.5A.0.1-1). For the upper range of test parameters (Case 2) for which the interferer power Pinterferer is -25 dBm (Table 7.5.3 and Table 7.5A.0.1-3) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to Pinterferer like for Case 1.

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).

#### 7.5A.0.3 Adjacent channel selectivity Inter-band CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band, the adjacent channel requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. For NR CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The UE shall meet the requirements specified in subclause 7.5.3 for each component carrier while all downlink carriers are active.

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).

### 7.5A.1 Adjacent channel selectivity for CA (2DL CA)

7.5A.1.1 Test Purpose

Adjacent channel selectivity for 2DL CA verifies the receiver's ability to receive a wanted 2DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 2DL CA.

7.5A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.1.4 Test Description

7.5A.1.4.1 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 configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.5A.1.4.1-1, Table 7.5A.1.4.1-2 or Table 7.5A.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5A.1.4.1-1: Test Configuration Table for intra-band contiguous 2DL 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Lowest NRB\_agg, Highest NRB\_agg  NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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 | | | | | |

Table 7.5A.1.4.1-2: Test Configuration Table for inter-band 2DL 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 except for the following cases:  CA\_n48A-n77A: Low range for PCC | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 4  NOTE 5 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  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.  NOTE 5: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | |

Table 7.5A.1.4.1-3: Test Configuration Table for intra-band non-conguous 2DL 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 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5A.1.4.1-1, Table 7.5A.1.4.1-2 or Table 7.5A.1.4.1-3.

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 according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5A.1.4.3.

7.5A.1.4.2 Test Procedure

1. Intra-band contiguous CA test:

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

1.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

1.3. SS activates SCC 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], clause9.3).

1.4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

1.5. 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 7.5A.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

1.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-2 or 7.5A.1.5-2a as appropriate (Case 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 7.5A.1.5-2 or Table 7.5A.1.5-2a 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.

1.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-2 or 7.5A.1.5-2a as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

1.8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

1.9. Repeat steps from 1.6 to 1.8, using an interfering signal above the wanted signal in Case 1 at step 1.7.

1.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-3 or 7.5A.1.5-3a as appropriate (Case 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 7.5A.1.5-3 or Table 7.5A.1.5-3a for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

1.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-3 or 7.5A.1.5-3a as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

1.12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

1.13. Repeat steps from 1.10 to 1.12, using an interfering signal above the wanted signal in Case 2 at step 1.11.

1.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

2. Inter-band CA test:

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

2.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

2.3. SS activates SCC 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], clause9.3).

2.4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-2 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

2.5. 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 7.5A.1.4.1-2. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

2.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-5 or 7.5A.1.5-8 as appropriate (Case 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 7.5A.1.5-5 or Table 7.5A.1.5-8 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.

2.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-5 or 7.5A.1.5-8 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

2.8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

2.9. Repeat steps from 2.6 to 2.8, using an interfering signal above the wanted signal in Case 1 at step 2.7.

2.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-6 or 7.5A.1.5-9 as appropriate (Case 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 7.5A.1.5-6 or Table 7.5A.1.5-9 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

2.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-6 or 7.5A.1.5-9 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

2.12. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

2.13. Repeat steps from 2.10 to 2.12, using an interfering signal above the wanted signal in Case 2 at step 2.11.

2.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

2.15. Repeat steps from 2.1 to 2.14 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, except for operating bands without uplink band.

3. Intra-band non-contiguous CA test:

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

3.2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.1.1. Message contents are defined in clause 7.5A.1.4.3.

3.3. SS activates SCC 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], clause9.3).

3.4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5A.1.4.1-3 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

3.5. 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 7.5A.1.4.1-3. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3.6. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-11 or 7.5A.1.5-14 as appropriate (Case 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 7.5A.1.5-11 or Table 7.5A.1.5-14 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.

3.7. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-11 or 7.5A.1.5-14 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

3.8. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

3.9. Repeat steps from 3.6 to 3.8, using an interfering signal above the wanted signal in Case 1 at step 3.7.

3.10. Set the Downlink signal level for PCC and SCC to the value as defined in Table 7.5A.1.5-12 or 7.5A.1.5-15 as appropriate (Case 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 7.5A.1.5-6 or Table 7.5A.1.5-9 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

3.11. Set the Interferer signal level to the value as defined in Table 7.5A.1.5-12 or 7.5A.1.5-15 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

3.12. Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

3.13. Repeat steps from 3.10 to 3.12, using an interfering signal above the wanted signal in Case 2 at step 3.11.

3.14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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 7.5A.1.4.2-1: Void

7.5A.1.4.3 Message Contents

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

7.5A.1.5 Test Requirement

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 for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.1.5-2, 7.5A.1.5-2a, 7.5A.1.5-3 and 7.5A.1.5-3a.

Table 7.5A.1.5-1: ACS for intra-band contiguous 2DL CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | CA Bandwidth Class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 26.0 | 33.0 |

Table 7.5A.1.5-1a: ACS for intra-band contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | CA Bandwidth Class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 20.0 | 17.0 |

Table 7.5A.1.5-2: Test parameters for intra-band contiguous 2DL CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 24.5 dB | Aggregated power + 31.5 dB |
| BWInterferer | MHz | 20 | BWchannel CA |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA |
| 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 6.2.4.3.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.1.5-2a: Test parameters for intra-band contiguous CA with FDL\_high<2700 MHz and FUL\_high<2700 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 18.5 dB | Aggregated power + 15.5 dB |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.1.5-3: Test parameters for intra-band contiguous 2DL CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49.5 + 10log(NRB,c/NRB\_agg) | -56.5 |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 20 | BWchannel CA |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA |
| NOTE 1: The transmitter shall be set to 24 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 6.2.4.3.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.1.5-3a: Test parameters for intra-band contiguous CA with FDL\_high <2700 MHz and FUL\_high<2700 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -43.5+ 10log(NRB,c/NRB\_agg) | -40.5+ 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5+ Foffset  /  -2.5- Foffset | 2.5+ Foffset  /  -2.5- Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | |

For NR SCC of inter-band CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.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)] with parameters specified in Tables 7.5A.1.5-5 and 7.5A.1.5-6.

Table 7.5A.1.5-4: ACS for NR band with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.1.5-5: Test parameters for NR inter-band CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 42.5 dB | REFSENS for SCC + 39.5 - 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.1.5-6: Test parameters for NR inter-band CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

For NR SCC of inter-band CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.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)] with parameters specified in Tables 7.5A.1.5-8 and 7.5A.1.5-9.

Table 7.5A.1.5-7: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5A.1.5-8: Test parameters for NR inter-band CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5A.1.5-9: Test parameters for NR inter-band CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

For NR SCC of intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.5A.1.5-11 and 7.5A.1.5-12.

Table 7.5A.1.5-10: ACS for NR band with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.1.5-11: Test parameters for NR intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 42.5 dB | REFSENS for SCC + 39.5 - 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.1.5-12: Test parameters for NR intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

For NR SCC of intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.5A.1.5-14 and 7.5A.1.5-15.

Table 7.5A.1.5-13: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5A.1.5-14: Test parameters for NR intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5A.1.5-15: Test parameters for NR intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

### 7.5A.2 Adjacent channel selectivity for CA (3DL CA)

7.5A.2.1 Test Purpose

Adjacent channel selectivity for 3DL CA verifies the receiver's ability to receive a wanted 3DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.2.2 Test Applicability

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

7.5A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.2.4 Test Description

7.5A.2.4.1 Initial Conditions

Same as in clause 7.5A.1.4.1 with following exceptions:

- Instead of Table 7.5A.1.4.1-1🡪 use Table 7.5A.2.4.1-1.

- Instead of Table 7.5A.1.4.1-2🡪 use Table 7.5A.2.4.1-1.

- Instead of Table 7.5A.1.4.1-3🡪 use Table 7.5A.2.4.1-1.

Table 7.5A.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 | | | Intra-band contiguous: Mid range for PCC and SCCs  Inter-band CA: NOTE 1, NOTE 5  Inter-band + Intra-band contiguous : NOTE 1, NOTE 5  Inter-band + Intra-band non-contiguous, Intra-band non-contiguous, Intra-band contiguous + Intra-band non-contiguous: NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1(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. | | | Intra-band contiguous: Lowest NRB\_agg, Highest NRB\_agg  Inter-band: Highest NRB\_agg  Inter-band + Intra-band contiguous : Highest NRB\_agg  Inter-band + Intra-band non-contiguous : Highest NRB\_agg  Intra-band non-contiguous : Highest NRB\_agg  Intra-band contiguous + Intra-band non-contiguous : Highest NRB\_agg  NOTE 6  NOTE 7 | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest for PCC and SCCs | | | |
| Network signalling value | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | |
| Test Parameters | | | | | | |
|  | Downlink Configuration | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | SCC2 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous) | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band) | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **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 | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nYA Configuration  (Intra-band non-contiguous + Inter-band) | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)** | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| 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 | 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: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  NOTE 3: **Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n8A, X=1, Y=3, Z=8; **Intra-band contiguous + Inter-band:** X,Y correspond to the different bands in the CA Configuration, e.g. for CA\_1C-3A, X=1,Y=3; **Intra-band non-contiguous + Inter-band:** X and Y correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n1A-n8A, X=1, Y =8  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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: 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 7: 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. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.5A.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 7.5A.2.4.3*.*

Table 7.5A.2.4.1-2: Void

Table 7.5A.2.4.1-3: Void

7.5A.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 5.1.1. Message contents are defined in clause 7.5A.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], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5A.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 7.5A.2.4.1-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level according to Table 7.5A.2.4.2-1 as appropriate (Case 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 7.5A.2.4.2-1 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.

7. Set the Interferer signal level to the value as defined in Table 7.5A.2.4.2-1 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

8. Measure the average throughput for the carrier(s) indicated in Table 7.5A.2.4.2-1 for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level according to Table 7.5A.2.4.2-1 as appropriate (Case 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 7.5A.2.4.2-1 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

11. Set the Interferer signal level to the value as defined in 7.5A.2.4.2-1 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

12. Measure the average throughput for the carrier(s) indicated in Table 7.5A.2.4.2-1 for a duration sufficient to achieve statistical significance according to Annex H.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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 7.5A.2.4.2-1: Test repetition and measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 16 | PCC, SCC1, SCC2 | 7.5A.2.5-14  7.5A.2.5-24  7.5A.2.5-34 |
| Inter-band | 11 | SCC1, SCC2 | 7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| 21 |
| 31 |
| Intra-band contiguous + Inter-band | 12 | SCC2 | 7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| 22 | SCC1, SCC2 | 7.5A.2.5-15  7.5A.2.5-1a5  7.5A.2.5-25  7.5A.2.5-2a5  7.5A.2.5-35  7.5A.2.5-3a5 |
| Intra-band non-contiguous + Inter-band | 13 | SCC2 | 7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| 23 | SCC1, SCC2 | 7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| Intra-band non-contiguous | 17 | SCC1, SCC2 | 7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| Intra-band contiguous + Intra-band non-contiguous | 18 | SCC1, SCC2 | 7.5A.2.5-15  7.5A.2.5-1a5  7.5A.2.5-25  7.5A.2.5-2a5  7.5A.2.5-35  7.5A.2.5-3a5  7.5A.2.5-4  7.5A.2.5-5  7.5A.2.5-6  7.5A.2.5-7  7.5A.2.5-8  7.5A.2.5-9 |
| 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-YA, 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: Test requirements and parameters refer to CA bandwidth D.  NOTE 5: Test requirements and parameters refer to CA bandwidth B or C.  NOTE 6: 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 7: 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 8: 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. | | | |

7.5A.2.4.3 Message Contents

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

7.5A.2.5 Test Requirement

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 for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.2.5-2 and 7.5A.2.5-3.

Table 7.5A.2.5-1: ACS for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | NR CA bandwidth class | | | |
| Rx Parameter | Units | B | C | D |  |
| ACS | dB | 26.0 | 33.0 | 25.2 |  |

Table 7.5A.2.5-1a: ACS for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | NR CA bandwidth class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 20.0 | 17.0 |

Table 7.5A.2.5-2: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |  |
| PInterferer | dBm | Aggregated power + 24.5 dB | Aggregated power + 31.5 dB | Aggregated power + 23.7 dB |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 - Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.2.5-2a: Test parameters for intra-band contiguous CA with FDL\_low<2700 MHz and FUL\_low<2700 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 18.5 dB | Aggregated power + 15.5 dB |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.2.5-3: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49.5 + 10log(NRB,c/NRB\_agg) | -56.5 | -48.7 + 10log(NRB,c/NRB\_agg) |  |
| PInterferer | dBm | -25 | -25 | -25 |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.2.5-3a: Test parameters for intra-band contiguous CA with FDL\_low <2700 MHz and FUL\_low<2700 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -43.5 + 10log(NRB,c/NRB\_agg) | -40.5 + 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

For NR SCC of inter-band and intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.2.5-5 and 7.5A.2.5-6.

Table 7.5A.2.5-4: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.2.5-5: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 42.5 dB | REFSENS for SCC + 39.5 - 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.2.5-6: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

For NR SCC of inter-band and intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.2.5-8 and 7.5A.2.5-9.

Table 7.5A.2.5-7: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5A.2.5-8: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1 (inter-band, intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5A.2.5-9: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

### 7.5A.3 Adjacent channel selectivity for CA (4DL CA)

Editor’s note: - part content of Table 7.5A.3.4.2-1 is FFS.

7.5A.3.1 Test Purpose

Adjacent channel selectivity for 4DL CA verifies the receiver's ability to receive a wanted 4DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.3.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 4DL CA.

7.5A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.3.4 Test Description

7.5A.3.4.1 Initial Conditions

Same as in clause 7.5A.1.4.1 with following exceptions:

- Instead of Table 7.5A.1.4.1-1🡪 use Table 7.5A.3.4.1-1.

- Instead of Table 7.5A.1.4.1-2🡪 use Table 7.5A.3.4.1-2.

- Instead of Table 7.5A.1.4.1-3🡪 use Table 7.5A.3.4.1-3.

Table 7.5A.3.4.1-1: Test Configuration Table for 4DL 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 range for PCC and SCCs  Inter-band CA: NOTE 1, NOTE 5  Inter-band + Intra-band contiguous : NOTE 1, NOTE 5  Inter-band + Intra-band non-contiguous : NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.3.4.1-1(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. | | | | Intra-band contiguous: Lowest NRB\_agg, Highest NRB\_agg  Inter-band: Highest NRB\_agg  Inter-band + Intra-band contiguous : Highest NRB\_agg  Inter-band + Intra-band non-contiguous : Highest NRB\_agg  NOTE 6  NOTE 7 | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | | Lowest for PCC and SCCs | | | | |
| Network signalling value | | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | |
| Test Parameters | | | | | | | | |
|  | Downlink Configuration | | | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | | SCC2 RB allocation | SCC3 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXE Configuration (intra-band contiguous) | | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA-nRA Configuration (Inter-band) | | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYB-nZA, CA\_nXA-nYA-nZB, CA\_nXD-nYA, CA\_nXC-nYB, CA\_nXC-nYC and CA\_nXB-nYB Configurations  (Intra-band contiguous + Inter-band) | | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZ(2A), CA\_nXA-nY(3A) and CA\_nX(2A)-nY(2A) Configuration  (Intra-band non-contiguous + Inter-band) | | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(4A) Configuration intra-band non-contiguous) | | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | 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.3.4.1-1.  NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  NOTE 3: **Inter-band:** nX, nY, nZ, nR correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n7A-n28A, nX=n1, nY=n3, nZ=n7,nR=n28; **Intra-band contiguous + Inter-band:** nX, nY, nZ correspond to the different bands in the CA Configuration, E.g. for CA\_n3A-n7B-n28A, nX=n1, nY=n3, nz=n28; **Intra-band non-contiguous + Inter-band:** X,Y,Z correspond to the different bands in the CA Configuration. E.g. for CA\_n2A-n66A-n77(2A), nX=n2, nY=n66, nZ=n77;  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 6: 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 7: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.3. DL channel bandwidth shall be selected first. | | | | | | | | |

Table 7.5A.3.4.1-2: Void

Table 7.5A.3.4.1-3: Void

7.5A.3.4.2 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 5.1.1. Message contents are defined in clause 7.5A.3.4.3.

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], clause9.3).

4. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5A.3.4.1-1 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 7.5A.3.4.2-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level according to Table 7.5A.3.4.2-1 as appropriate (Case 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 7.5A.3.4.2-1 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.

7. Set the Interferer signal level to the value as defined in Table 7.5A.3.4.2-1 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level according to Table 7.5A.3.4.2-1 as appropriate (Case 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 7.5A.3.4.2-1 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

11. Set the Interferer signal level to the value as defined in Table 7.5A.3.4.2-1 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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 7.5A.3.4.2-1: Test repetition and measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 14 | PCC, SCC1, SCC2,SCC3 | TBD |
| Inter-band | 11 | SCC1, SCC2,SCC3 | 7.5A.3.5-4, 7.5A.3.5-5, 7.5A.3.5-6, 7.5A.3.5-7, 7.5A.3.5-8, 7.5A.3.5-9 |
|  | 21 |
|  | 31 |
|  | 41 |
| Intra-band contiguous + Inter-band | 12 | TBD | TBD |
| 22 |
| 32 |
| Intra-band non-contiguous + Inter-band | 13 | TBD | TBD |
| 23 |
| 33 |
| Intra-band non-contiguous | 15 | TBD | TBD |
| NOTE 1: CA configuration ID as defined in table 7.3A.3.4.1-1.  NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA\_nXA-nYB-nZA, CA\_nXA-nYA-nZB, CA\_nXD-nYA, CA\_nXC-nYB, CA\_nXC-nYC and CA\_nXB-nYB Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nXA-nYA-nZ(2A), CA\_nXA-nY(3A) and CA\_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA\_nXE Configuration (Intra-band contiguous)” in table 7.3A.3.4.1-1.  NOTE 5: CA configuration ID as defined in “Default Test Settings for a CA\_nX(4A) Configuration intra-band non-contiguous)” in table 7.3A.3.4.1-1. | | | |

7.5A.3.4.3 Message Contents

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

7.5A.3.5 Test Requirement

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 for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.3.5-2, 7.5A.3.5-2a, 7.5A.3.5-3, 7.5A.3.5-3a.

Table 7.5A.3.5-1: ACS for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | NR CA bandwidth class | | | |
| Rx Parameter | Units | B | C | D |  |
| ACS | dB | 26.0 | 33.0 | 25.2 |  |

Table 7.5A.3.5-1a: ACS for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | NR CA bandwidth class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 20.0 | 17.0 |

Table 7.5A.3.5-2: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |  |
| PInterferer | dBm | Aggregated power + 24.5 dB | Aggregated power + 31.5 dB | Aggregated power + 23.7 dB |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 - Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.3.5-2a: Test parameters for intra-band contiguous CA with FDL\_low<2700 MHz and FUL\_low<2700 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 18.5 dB | Aggregated power + 15.5 dB |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.3.5-3: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49.5 + 10log(NRB,c/NRB\_agg) | -56.5 | -48.7 + 10log(NRB,c/NRB\_agg) |  |
| PInterferer | dBm | -25 | -25 | -25 |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.3.5-3a: Test parameters for intra-band contiguous CA with FDL\_low <2700 MHz and FUL\_low<2700 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -43.5 + 10log(NRB,c/NRB\_agg) | -40.5 + 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.3.5-5 and 7.5A.3.5-6.

Table 7.5A.3.5-4: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.3.5-5: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 42.5 dB | REFSENS for SCC + 39.5 - 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5A.3.5-6: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -53.5 | -50.5 + 10log10(BWChannel /20) |
| Pinterferer | dBm | -25 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset from SCC) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.3.5-8 and 7.5A.3.5-9.

Table 7.5A.3.5-7: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5A.3.5-8: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1 (inter-band,intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5A.3.5-9: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 |
| Pinterferer | dBm | -25 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset from SCC) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

### 7.5A.4 Adjacent channel selectivity for CA (5DL CA)

Editor’s Note:

* Test Configuration Table and test repetition and measurement configuration are TBD.
* RefSens for 5DL CA is FFS

7.5A.4.1 Test Purpose

Adjacent channel selectivity for 5DL CA verifies the receiver's ability to receive a wanted 5DL carrier aggregated at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel.

7.5A.4.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 5DL CA.

7.5A.4.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.5A.0.

7.5A.4.4 Test Description

7.5A.4.4.1 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 configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA configuration, are shown in Table 7.5A.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5A.4.4.1-1: Test Configuration Table for 5DL CA

[TBD]

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.3 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 7.5A.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 7.5A.4.4.3*.*

7.5A.4.4.2 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 5.1.1. Message contents are defined in clause 7.5A.4.4.3.

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 7.5A.4.4.1-1 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 7.5A.4.4.2-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the Downlink signal level according to Table 7.5A.4.4.2-1 as appropriate (Case 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 7.5A.4.4.2-1 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.

7. Set the Interferer signal level to the value as defined in Table 7.5A.4.4.2-1 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

8. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.

10. Set the Downlink signal level according to Table 7.5A.4.4.2-1 as appropriate (Case 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 7.5A.4.4.2-1 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

11. Set the Interferer signal level to the value as defined in Table 7.5A.4.4.2-1 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

12. Measure the average throughput for each component carrier for a duration sufficient to achieve statistical significance according to Annex H.2A.

13. Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

14. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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 7.5A.4.4.2-1: Test repetition and measurement configuration

[TBD]

7.5A.4.4.3 Message Contents

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

7.5A.4.5 Test Requirement

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 for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5A.4.5-2, 7.5A.4.5-2a, 7.5A.4.5-3, 7.5A.4.5-3a.

Table 7.5A.4.5-1: ACS for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | NR CA bandwidth class | | | |
| Rx Parameter | Units | B | C | D |  |
| ACS | dB | 26.0 | 33.0 | 25.2 |  |

Table 7.5A.4.5-1a: ACS for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | NR CA bandwidth class | |
| Rx Parameter | Units | B | C |
| ACS | dB | 20.0 | 17.0 |

Table 7.5A.4.5-2: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB | REFSENS + 14 dB |  |
| PInterferer | dBm | Aggregated power + 24.5 dB | Aggregated power + 31.5 dB | Aggregated power + 23.7 dB |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 - Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.4.5-2a: Test parameters for intra-band contiguous CA with FDL\_low<2700 MHz and FUL\_low<2700 MHz, case 1

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | REFSENS + 14 dB |
| PInterferer | dBm | Aggregated power + 18.5 dB | Aggregated power + 15.5 dB |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

Table 7.5A.4.5-3: Test parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49.5 + 10log(NRB,c/NRB\_agg) | -56.5 | -48.7 + 10log(NRB,c/NRB\_agg) |  |
| PInterferer | dBm | -25 | -25 | -25 |  |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |  |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 -Foffset | BWchannel CA  /  -BWchannel CA | 25 + Foffset  /  -25 -Foffset |  |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

Table 7.5A.4.5-3a: Test parameters for intra-band contiguous CA with FDL\_low <2700 MHz and FUL\_low<2700 MHz, case 2

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA Bandwidth Class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -43.5 + 10log(NRB,c/NRB\_agg) | -40.5 + 10log(NRB,c/NRB\_agg) |
| PInterferer | dBm | -25 | -25 |
| BWInterferer | MHz | 5 | 5 |
| FInterferer (offset) | MHz | 2.5 + Foffset  /  -2.5 - Foffset | 2.5 + Foffset  /  -2.5 - Foffset |
| NOTE 1: The transmitter shall be set to 24 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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. | | | |

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.4.5-5 and 7.5A.4.5-6.

Table 7.5A.4.5-4: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| ACS | dB | 33 | 33 | 30 | 27 | 26 |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| ACS | dB | 25.5 | 24 | 23 | 22.5 | 21 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| ACS | dB | 20.5 | 20 |  |  |  |

Table 7.5A.4.5-5: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 42.5 dB | REFSENS for SCC + 39.5 dB | REFSENS for SCC + 38.5 dB |
| BWinterferer | MHz | 5 | 5 | 5 | 5 | 5 |
| Finterferer (offset from SCC) | MHz | 5 / -5 | 7.5 / -7.5 | 10 / -10 | 12.5 / -12.5 | 15 / -15 |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | | |
| Pinterferer | dBm | REFSENS for SCC + 38 dB | REFSENS for SCC + 36.5 dB | REFSENS for SCC + 35.5 dB | REFSENS for SCC + 35 dB | REFSENS for SCC + 33.5 dB |
| BWinterferer | MHz | 5 | 5 | 5 | 5 | 5 |
| Finterferer (offset from SCC) | MHz | 17.5 / -17.5 | 22.5 / -22.5 | 27.5 / -27.5 | 32.5  /  -32.5 | 42.5  /  -42.5 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | |  |  |  |
| Pinterferer | dBm | REFSENS for SCC + 33 dB | REFSENS for SCC + 32.5 dB |  |  |  |
| BWinterferer | MHz | 5 | 5 |  |  |  |
| Finterferer (offset from SCC) | MHz | 47.5  /  -47.5 | 52.5  /  -52.5 |  |  |  |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the NR interferer RMC 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. | | | | | | |

Table 7.5A.4.5-6: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | -56.5 | -53.5 | -50.5 | -49.5 |
| Pinterferer | dBm | -25 | | | | |
| BWinterferer | MHz | 5 | 5 | 5 | 5 | 5 |
| Finterferer (offset from SCC) | MHz | 5 / -5 | 7.5 / -7.5 | 10 / -10 | 12.5 / -12.5 | 15 / -15 |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -49 | -47 | -46.5 | -46 | -44.5 |
| Pinterferer | dBm | -25 | | | | |
| BWinterferer | MHz | 5 | 5 | 5 | 5 | 5 |
| Finterferer (offset from SCC) | MHz | 17.5 / -17.5 | 22.5 / -22.5 | 27.5 / -27.5 | 32.5  /  -32.5 | 42.5  /  -42.5 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -44 | -43.5 |  |  |  |
| Pinterferer | dBm | -25 | |  |  |  |
| BWinterferer | MHz | 5 | 5 |  |  |  |
| Finterferer (offset from SCC) | MHz | 47.5  /  -47.5 | 52.5  /  -52.5 |  |  |  |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | | | |

For NR PCC and SCCs of inter-band and intra-band non-contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.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) with parameters specified in Tables 7.5A.4.5-8 and 7.5A.4.5-9.

Table 7.5A.4.5-7: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 40 MHz | 50 MHz |
| ACS | dB | 33 | 33 | 33 | 33 | 33 |
| RX parameter | Units | Channel bandwidth | | | | |
| 60 MHz | 80 MHz | 90 MHz | 100 MHz |  |
| ACS | dB | 33 | 33 | 33 | 33 |  |

Table 7.5A.4.5-8: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 40 MHz | 50 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | | |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 40 | 50 |
| Finterferer (offset from SCC) | MHz | 10 / -10 | 15 / -15 | 20 / -20 | 40 / -40 | 50 / -50 |
| RX parameter | Units | Channel bandwidth | | | | |
| 60 MHz | 80 MHz | 90 MHz | 100 MHz |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | |  |
| Pinterferer | dBm | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 45.5 dB | REFSENS for SCC + 45.5 dB |  |
| BWinterferer | MHz | 60 | 80 | 90 | 100 |  |
| Finterferer (offset from SCC) | MHz | 60 / -60 | 80 / -80 | 90 / -90 | 100 / -100 |  |
| 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | | | |

Table 7.5A.4.5-9: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2 (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 40 MHz | 50 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | | | | |
| Pinterferer | dBm | -25 | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 40 | 50 |
| Finterferer (offset from SCC) | MHz | 10 / -10 | 15 / -15 | 20 / -20 | 40 / -40 | 50 / -50 |
| RX parameter | Units | Channel bandwidth | | | | |
| 60 MHz | 80 MHz | 90 MHz | 100 MHz |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | -56.5 | | | |  |
| Pinterferer | dBm | -25 | -25 | -25 | -25 |  |
| BWinterferer | MHz | 60 | 80 | 90 | 100 |  |
| Finterferer (offset from SCC) | MHz | 60 / -60 | 80 / -80 | 90 / -90 | 100 / -100 |  |
| NOTE 1: The transmitter shall be set to 24 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: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | | | |

## 7.5B Adjacent channel selectivity for NR-DC

For inter-band NR-DC configurations, the adjacent channel selectivity for the corresponding inter-band CA configuration as specified in clause 7.5A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.5A.

## 7.5D Adjacent channel selectivity for UL MIMO

7.5D.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5D.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.5D.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in sub-clause 7.5 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.5D and 7.5.

7.5D.4 Test description

7.5D.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 7.5D.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5D.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid and Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2 and 7.3.2.4.1-3 for Downlink and Uplink respectively.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.4 for TE diagram and section A.3.2.3 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5D.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* and Test Loop Function On according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5D.4.3.

7.5D.4.2 Test procedure

Same test procedure as specified in 7.5.2.4.2 with the following exception:

- Instead of Table 7.5.4.1-1, use Table 7.5D.4.1-1 in step 1.

- Step 2: 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 7.5D.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

7.5D.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO

7.5D.5 Test requirement

Same test requirement as defined in Clause 7.5.5.

## 7.5D\_1 Adjacent channel selectivity for SUL with UL MIMO

7.5D\_1.1 Test purpose

Same test purpose as in clause 7.5D.1

7.5D\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.5D\_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.5D.3

7.5D\_1.4 Test description

7.5D\_1.4.1 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 7.5D\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annex A.2 and Annex A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5D\_1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 for SUL and NUL  With following exceptions:  SUL\_n78-n80: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2 and 7.3.2.4.1-3 for Downlink and Uplink respectively.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.5D\_1.4.1-1.

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* and Test Loop Function On according to TS 38.508-1 [5] clause 4.5. Message content are defined in clause 7.5D\_1.4.3.

7.5D\_1.4.2 Test procedure

Same test procedure as specified in 7.5.2.4.2 with the following exception:

- Instead of Table 7.5.4.1-1, use Table 7.5D\_1.4.1-1 in step 1.

- Step 2: 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 7.5D\_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

7.5D\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.5D\_1.5 Test requirement

Same test requirement as defined in Clause 7.5.5.

## 7.5F Adjacent channel selectivity

### 7.5F.1 Adjacent channel selectivity for shared spectrum channel access

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- Test Configuration Table is FFS

- Message content for NS\_53 is FFS

- TP analysis is TBD

- MU and TT for >6GHz (band n96) are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available

7.5F.1.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5F.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.5F.1.3 Minimum conformance requirements

Instead of the general ACS requirements specified in clause 7.5, the UE shall fulfil the minimum requirements specified in Table 7.5F.1.3-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.5F.1.3-2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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).

Table 7.5F.1.3-1: ACS for shared spectrum channel access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| ACS | dB | 24 | 21 | 19.2 | 18 |

Table 7.5F.1.3-2: Test parameters for shared spectrum channel access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | | |
| Pinterferer | dBm | REFSENS + 36.5 dB | REFSENS + 33.5 dB | REFSENS + 31.7 dB | REFSENS + 30.5 dB |
| BWinterferer | MHz | 20 | | | |
| Finterferer (offset) | MHz | 20 / -20 | | | |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.5F.1.

7.5F.1.4 Test description

7.5F.1.4.1 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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.5F1..4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5F.1.4.1-1: Test Configuration Table

FFS

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5F.1.4.1-1.

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 content are defined in clause 7.5F.1.4.3.

7.5F.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format [1\_1] for C\_RNTI to transmit the DL RMC according to Table 7.5F.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.5F.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5F.1.5-2. 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 7.5F.1.5-2 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 in Table F.1.3-1.

4. Set the Interferer signal level to the value as defined in Table 7.5F.1.5-2 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

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.

7.5F.1.4.3 Message contents

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

7.5F.1.5 Test requirement

For NR bands under test, the throughput measurement derived in test procedure 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 7.5F.1.5-2.

Table 7.5F.1.5-1: ACS for shared spectrum channel access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| ACS | dB | 24 | 21 | 19.2 | 18 |

Table 7.5F.1.5-2: Test parameters for shared spectrum channel access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | | |
| Pinterferer | dBm | REFSENS + 36.5 dB | REFSENS + 33.5 dB | REFSENS + 31.7 dB | REFSENS + 30.5 dB |
| BWinterferer | MHz | 20 | | | |
| Finterferer (offset) | MHz | 20 / -20 | | | |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | | | | |

## 7.5J Adjacent channel selectivity for ATG

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU and TT are FFS

- Message Contents are FFS pending on Rel-18 ASN.1 freeze

7.5J.1 Test purpose

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5J.2 Test applicability

This test case applies to all types of NR UE release 18 and forward that support NR standalone ATG.

7.5J.3 Minimum conformance requirements

Adjacent channel selectivity (ACS) is a measure of a receiver's ability to receive an NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

The UE shall fulfil the minimum requirements specified in Table 7.5J.3-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and the minimum requirements specified in Table 7.5J.3-2 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz. These requirements apply for all values of an adjacent channel interferer up to -42 dBm with omni-directional antenna and -30dBm with antenna array for any SCS specified for the channel bandwidth of the wanted signal. However, it is not possible to directly measure the ACS; instead the lower and upper range of test parameters are chosen as in Table 7.5J.3-3 and Table 7.5J.3-4 for verification of the requirements specified in Table 7.5J.3-1, and as in Table 7.5J.3-5 and Table 7.5J.3-6 for verification of the requirements specified in Table 7.5J.3-2. For these test parameters, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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).

Table 7.5J.3-1: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 3, 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value | | | | |

Table 7.5J.3-2: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5J.3-3: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | | |
|  |  | 3 | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | | |
| Pinterferer4 | dBm |  | REFSENS + 45.5 dB | REFSENS + 42.5 dB | REFSENS + 39.5 – 10log10(BWChannel /20) |
| BWinterferer | MHz | 3 | 5 | | |
| Finterferer (offset) | MHz | 3 /- 3 | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | | |

Table 7.5J.3-4: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration4 | dBm | -73.55  -61.56 | -70.55  -58.56 | -67.5 + 10log10(BWChannel /20)5  -55.5 + 10log10(BWChannel /20)6 |
| Pinterferer | dBm | -425  -306 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value.  NOTE 5: Pinterferer shall be set to -42dBm for omni-directional antenna.  NOTE 6: Pinterferer shall be set to -30dBm for antenna array. | | | | |

Table 7.5J.3-5: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5J.3-6: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | -73.54  -61.55 |
| Pinterferer | dBm | -424  -305 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: Pinterferer shall be set to -42dBm for omni-directional antenna.  NOTE 5: Pinterferer shall be set to -30dBm for antenna array. | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.5J.

7.5J.4 Test description

7.5J.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.5J.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5J.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.5J.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 content are defined in clause 7.5J.4.3.

7.5J.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.5J.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.5J.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.5J.5-2 or Table 7.5J.5-5 as appropriate (Case 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 7.5J.5-2 or Table 7.5J.5-5 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 in Table F.1.3-1.

- The transmit power is measured as the sum of power of all antenna connectors (for ATG UE with omni-directional antennas) or of all TAB connectors (for ATG UE with antenna array).

4. Set the Interferer signal level to the value as defined in Table 7.5J.5-2 or Table 7.5J.5-5 as appropriate (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 4.

7. Set the Downlink signal level to the value as defined in Table 7.5J.5-3 or Table 7.5J.5-6 as appropriate (Case 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 7.5J.5-3 or Table 7.5J.5-6 for at least the duration of the Throughput measurement, where MU and Uplink power control window size are defined above.

8. Set the Interferer signal level to the value as defined in Table 7.5J.5-3 or Table 7.5J.5-6 as appropriate (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in Annex D.

9. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

10. Repeat steps from 7 to 9, using an interfering signal above the wanted signal in Case 2 at step 8.

11. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

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.

7.5J.4.3 Message contents

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7.5J.5 Test requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure 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 7.5J.5-2 and 7.5J.5-3.

Table 7.5J.5-1: ACS for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
| 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 | 30 | 27 – 10log10(BWChannel /20) |
| NOTE1: ACS value is rounded to the next higher 0.5dB value | | | | |

Table 7.5J.5-2: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | |
| Pinterferer4 | dBm | REFSENS + 45.5 dB | REFSENS + 42.5 dB | REFSENS + 39.5 – 10log10(BWChannel /20) |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the NR interferer RMC 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.  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.5J.5-3: Test parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, case 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration4 | dBm | -73.55  -61.56 | -70.55  -58.56 | -67.5 + 10log10(BWChannel /20)5  -55.5 + 10log10(BWChannel /20)6 |
| Pinterferer | dBm | -425  -306 | | |
| BWinterferer | MHz | 5 | | |
| Finterferer (offset) | MHz | BWChannel /2 + 2.5  /  -(BWChannel /2 + 2.5) | | |
| NOTE 1: The transmitter shall be set to 24 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 3: The interferer consists of the RMC 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  NOTE 4: 10log10(x) is rounded to the next higher 0.5dB value.  NOTE 5: Pinterferer shall be set to -42dBm for omni-directional antenna.  NOTE 6: Pinterferer shall be set to -30dBm for antenna array. | | | | |

For NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in [Annexes A.2.2, A.2.3 and A.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)] with parameters specified in Tables 7.5J.5-5 and 7.5J.5-6.

Table 7.5J.5-4: ACS for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
| 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| ACS | dB | 33 |

Table 7.5J.5-5: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 1

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB |
| Pinterferer | dBm | REFSENS + 45.5 dB |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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. | | |

Table 7.5J.5-6: Test parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, case 2

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | -73.54  -61.55 |
| Pinterferer | dBm | -424  -305 |
| BWinterferer | MHz | BWChannel |
| Finterferer (offset) | MHz | BWChannel  /  -BWChannel |
| NOTE 1: The transmitter shall be set to 24 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 6.2J.2.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC 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.  NOTE 4: Pinterferer shall be set to -42dBm for omni-directional antenna.  NOTE 5: Pinterferer shall be set to -30dBm for antenna array. | | |

## 7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver’s ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

### 7.6.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

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### 7.6.2 In-band blocking

7.6.2.1 Test purpose

In band blocking is defined for an unwanted interfering signal falling into the range from 15 MHz below to 15 MHz above the UE receive band, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or into an immediately adjacent frequency range up 3\*BWChannel below or above the UE receive band, with FDL\_low ≥3300 MHz and FUL\_low ≥ 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.6.2.3 Minimum conformance requirements

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The throughput of the wanted signal 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) with parameters specified in Table 7.6.2.3-1 and Table 7.6.2.3-2. The relative throughput shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.2.3-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration3 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| BWinterferer | MHz | 5 | | |
| FIoffset, case 1 | MHz | 7.5 | | |
| FIoffset, case 2 | MHz | 12.5 | | |
| 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: The interferer consists of the RMC 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 3 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.6.2.3-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
|  | Pinterferer | dBm | -56 | -44 | -15 | -38 |
|  | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |  | -BWChannel/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28, n29, n34, n38, n39, n40, n41, n483, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n85, n91, n92, n93, n94, n100, n101 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1.  NOTE 4: For SDL bands, requirements shall be applied only for CA band combination cases. | | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into an immediately adjacent frequency range up to 3\* BWChannel below or above the UE receive band where BWChannel is the bandwidth of the wanted signal. The throughput of the wanted signal 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 7.6.2.3-3 and Table 7.6.2.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.2.3-3: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB |
| BWinterferer | MHz | BWChannel |
| FIoffset, case 1 | MHz | (3/2)\*BWChannel |
| FIoffset, case 2 | MHz | (5/2)\*BWChannel |
| 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: The interferer consists of the RMC 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 | | |

Table 7.6.2.3-4: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |
|  | Finterferer |  | NOTE 2 | FDL\_low – 3\*BWChannel  to  FDL\_high + 3\*BWChannel |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: BWChannel denotes the channel bandwidth of the wanted signal | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.2.

7.6.2.4 Test description

7.6.2.4.1 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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6.2.4.1-1.

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 content are defined in clause 7.6.2.4.3.

7.6.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6.2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.2.5-1 and 7.6.2.5-2 or Tables 7.6.2.5-3 and 7.6.2.5-4 as appropriate depending on NR band.

4. Set the downlink signal level according to the table 7.6.2.5-1 or 7.6.2.5-3 as appropriate. 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 7.6.2.5-1 or Table 7.6.2.5-3 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.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. Interferer frequencies should be chosen starting with an offset nearest to the centre frequency and sweep outwards towards the band edges. In order to ensure that full range is tested for interferer frequency, run last test steps at frequency equal to FInterferer range limit defined at the corresponding band edge.

8. If applicable based on NR band, repeat steps from 3 to 5, using interfering signals in Case 3 at step 3.

9. If applicable based on NR band, repeat steps from 3 to 5, using interfering signals in Case 4 at step 3.

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.

7.6.2.4.3 Message contents

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

7.6.2.5 Test requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.6.2.5-1 and 7.6.2.5-2.

Table 7.6.2.5-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration3 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| BWinterferer | MHz | 5 | | |
| FIoffset, case 1 | MHz | 7.5 | | |
| FIoffset, case 2 | MHz | 12.5 | | |
| 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: The interferer consists of the RMC 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 3: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.6.2.5-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
|  | Pinterferer | dBm | -56 | -44 | -15 | -38 |
|  | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |  | -BWChannel/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28,n34, n38,n39, n40, n41, n483, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n85, n91, n92, n93, n94, n100, n101 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. | | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2 and A.3 with parameters specified in Tables 7.6.2.5-3 and 7.6.2.5-4.

Table 7.6.2.5-3: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB |
| BWinterferer | MHz | BWChannel |
| FIoffset, case 1 | MHz | (3/2)\*BWChannel |
| FIoffset, case 2 | MHz | (5/2)\*BWChannel |
| 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: The interferer consists of the RMC 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 | | |

Table 7.6.2.5-4: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |
|  | Finterferer |  | NOTE 2 | FDL\_low – 3\*BWChannel  to  FDL\_high + 3\*BWChannel |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: BWChannel denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6.2.5-5: Void

### 7.6.3 Out-of-band blocking

7.6.3.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or falling outside a frequency range up to 3\*BWChannel below or from 3\*BWChannel above the UE receive band, with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

7.6.3.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.6.3.3 Minimum Conformance Requirements

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band. The throughput of the wanted signal 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 7.6.3.3-1 and Table 7.6.3.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.3.3-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |
| --- | --- |
| **Channel bandwidth** | **Power in transmission bandwidth configuration [dBm]** |
| 5 MHz | REFSENS + 6.0 dB |
| 10 MHz | REFSENS + 6.0 dB |
| 15 MHz | REFSENS + 7.0 dB |
| 20 MHz | REFSENS + 9.0 dB |
| 25 MHz | REFSENS + 10.0 dB |
| 30 MHz | REFSENS + 11.0 dB |
| 35 MHz | REFSENS + 11.5 dB |
| 40 MHz | REFSENS + 12.0 dB |
| 45 MHz | REFSENS + 12.5 dB |
| 50 MHz | REFSENS + 13.0 dB |
| 60 MHz | REFSENS + 14.0 dB |
| 70 MHz | REFSENS + 14.5 dB |
| 80 MHz | REFSENS + 15.0 dB |
| 90 MHz | REFSENS + 15.5 dB |
| 100 MHz | REFSENS + 16.0 dB |
| NOTE: 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. | |

Table 7.6.3.3-2: 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, n13, n14, n20, n24, n25, n26, n29, n30, n28, n34, n38, n39, n40, n41, n485, n50, n51, n538, n65, n66, n70, n71, n74, n75, n76, n91, n92, n93, n94, n100, n101 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ 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: 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.  NOTE 8: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2580 MHz and FInterferer < 2775 MHz.  NOTE 9: For SDL bands, requirements shall be applied only for CA band combination cases. | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3.3-2, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, BWChannel isthe bandwidth of the frequency channel in MHz and *n* = 1,2,3 for SCS = 15,30,60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range up to 3\*BWChannel below or from 3\*BWChannel above the UE receive band, where BWChannel is the channel bandwidth. The throughput of the wanted signal 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 7.6.3.3-3 and Table 7.6.3.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.3.3-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| NOTE: 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. | | | | |

Table 7.6.3.3-4: 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\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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. | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3.3-4, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, BWChannel the bandwidth of the frequency channel in MHz and *n* = 1,2,3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.3.

7.6.3.4 Test Description

7.6.3.4.1 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 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 7.6.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) 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.3.

Table 7.6.3.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | One frequency chosen arbitrarily from low or high range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3) | | |
| Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508 [5] Annex A, in Figure A.3.1.4.2 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 [5] subclause 4.4.3.

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

4. The UL and DL Reference Measurement channels are set according to Table 7.6.3.4.1-1.

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 7.6.3.4.3.

7.6.3.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.3.5-2 or 7.6.3.5-4. The frequency step size is  MHz.

4. Set the downlink signal level according to the table 7.6.3.5-1 or 7.6.3.5-3. 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 7.6.3.5-1 or Table 7.6.3.5-3 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.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

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.

7.6.3.4.3 Message Contents

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

7.6.3.5 Test Requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6.3.5-1 and 7.6.3.5-2.

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the number of spurious response frequencies recorded in the final step 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 7.7 Spurious Response are applicable.

Table 7.6.3.5-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |
| --- | --- |
| **Channel bandwidth** | **Power in transmission bandwidth configuration [dBm]** |
| 5 MHz | REFSENS + 6.0 dB |
| 10 MHz | REFSENS + 6.0 dB |
| 15 MHz | REFSENS + 7.0 dB |
| 20 MHz | REFSENS + 9.0 dB |
| 25 MHz | REFSENS + 10.0 dB |
| 30 MHz | REFSENS + 11.0 dB |
| 35 MHz | REFSENS + 11.5 dB |
| 40 MHz | REFSENS + 12.0 dB |
| 45 MHz | REFSENS + 12.5 dB |
| 50 MHz | REFSENS + 13.0 dB |
| 60 MHz | REFSENS + 14.0 dB |
| 70 MHz | REFSENS + 14.5 dB |
| 80 MHz | REFSENS + 15.0 dB |
| 90 MHz | REFSENS + 15.5 dB |
| 100 MHz | REFSENS + 16.0 dB |
| NOTE: 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. | |

Table 7.6.3.5-2: 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, n13, n14, n20, n24, n25, n26, n28, n30, n34, n38, n39, n40, n41, n485, n50, n51, n538, n65, n66, n70, n71, n74, n91, n92, n93, n94, n100, n101 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ 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: 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.  NOTE 8: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2580 MHz and FInterferer < 2775 MHz. | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6.3.5-3 and 7.6.3.5-4.

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the number of spurious response frequencies recorded in the final step 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 7.7 Spurious Response are applicable.

Table 7.6.3.5-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| NOTE: 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. | | | | |

Table 7.6.3.5-4: 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\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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. | | | | | |

Table 7.6.3.5-5: Void

### 7.6.4 Narrow band blocking

7.6.4.1 Test Purpose

Verifies a receiver's ability to receive a NR signal at its assigned channel frequency 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 NR Node B transmitters exist (except in the adjacent channels and spurious response).

7.6.4.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.6.4.3 Minimum Conformance Requirements

The relative throughput 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 7.6.4.3-1. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.4.3-1: Narrow Band Blocking

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Channel Bandwidth (MHz) | | | | | |
|  |  |  | 5 | 10 | 15 | 20 | 25, 30, 35, 40, 45, 50 | 60, 70, 80, 90, 100 |
| n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28, n29, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n100, n101 | Pw | dBm | PREFSENS + channel-bandwidth specific value below | | | | | |
|  | dB | 16 | 13 | 14 | 16 | 16 | 16 |
| Puw (CW) | dBm | -55 | | | | | |
| Fuw (offset SCS= 15 kHz) 4 | MHz |  | | | |  | NA |
| Fuw (offset SCS= 30 kHz)4 | MHz | NA | | | | |  |
| NOTE 1: The transmitter shall be set a 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4  NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2.3-1a, Table 7.3.2.3-1b and Table 7.3.2.3-2 for two and four antenna ports, respectively.  NOTE 4: Fuw shall be rounded to half of SCS.  NOTE 5: For SDL bands, requirements shall be applied only for CA band combination cases. | | | | | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6.4.

7.6.4.4 Test Description

7.6.4.4.1 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 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in table 7.6.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) 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 7.6.4.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid and Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 2) | | |
| Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1 | | | According to CH BW SCS in table 7.6.4.3-1 | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.2 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 UL and DL Reference Measurement channels are set according to Table 7.6.4.4.1-1.

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* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.6.4.4.3.

7.6.4.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6.4.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6.4.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6.4.5-1.

4. Set the downlink signal level according to the 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.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.

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.

7.6.4.4.3 Message Contents

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

7.6.4.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Table 7.6.4.5-1.

Table 7.6.4.5-1: Narrow-band blocking

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Channel Bandwidth (MHz) | | | | | |
|  |  |  | 5 | 10 | 15 | 20 | 25, 30, 35, 40, 45, 50 | 60, 70, 80, 90, 100 |
| n1, n2, n3, n5, n7, n8, n12, n13, n14, n18, n20, n24, n25, n26, n28, n29, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n67, n70, n71, n74, n75, n76, n100, n101 | Pw | dBm | PREFSENS + channel-bandwidth specific value below | | | | | |
|  | dB | 16 | 13 | 14 | 16 | 16 | 16 |
| Puw (CW) | dBm | -55 | | | | | |
| Fuw (offset SCS= 15 kHz) 4 | MHz |  | | | |  | NA |
| Fuw (offset SCS= 30 kHz)4 | MHz | NA | | | | |  |
| NOTE 1: The transmitter shall be set a 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4  NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2.3-1a, Table 7.3.2.3-1b and Table 7.3.2.3-2 for two and four antenna ports, respectively.  NOTE 4: Fuw shall be rounded to half of SCS.  NOTE 5: For SDL bands, requirements shall be applied only for CA band combination cases. | | | | | | | | |

Table 7.6.4.5-2 Void

## 7.6A Blocking characteristics for CA

### 7.6A.1 General

### 7.6A.2 Inband blocking for CA

#### 7.6A.2.0 Minimum requirements

##### 7.6A.2.0.1 In-band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. The UE shall fulfil the minimum requirement specified in Table 7.6A.2.0.1-1 and 7.6A.2.0.1-1a for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm. 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).

Table 7.6A.2.0.1-1: In-band blocking 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 | dB | REFSENS + CA bandwidth class specific value below | | |
| 10.0 | 6 | 13.8 |
| BWInterferer | MHz | 20 | BWchannel CA | 50 |
| FIoffset, case 1 | MHz | 30 | BWchannel CA+ BWchannel CA/2 | 75 |
| FIoffset, case 2 | MHz | 50 | BWInterferer + FIoffset, case 1 | 125 |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | |

Table 7.6A.2.0.1-1a: In-band blocking 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 + NR CA bandwidth class specific value below | REFSENS + NR CA bandwidth class specific value below |
| 16.0 | 19.0 |
| BWInterferer | MHz | 5 | 5 |
| FIoffset, case 1 | MHz | 7.5 | 7.5 |
| FIoffset, case 2 | MHz | 12.5 | 12.5 |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | |

Table 7.6A.2.0.1-2: In-band blocking for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |
| Finterferer | MHz | NOTE 2 | FDL\_low – 3BWchannel CA  to  FDL\_high + 3BWchannel CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.0.1-2a: In-band blocking for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 |
| Pinterferer | dBm | -56 | -44 |  |
| n66  n41  n484  n40 | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal.  NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. | | | | | |

##### 7.6A.2.0.2 In-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.3.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.2 and in this subclause for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

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).

##### 7.6A.2.0.3 In-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 in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.2 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.6.2.3-2 and 7.6.2.3-4 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

For NR CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.2-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The requirements for the component carrier configured in the operating band without uplink operation are specified in clause 7.6.2.3 while all downlink carriers are active.

Table 7.6A.2.3-1: Void

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).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.2.

#### 7.6A.2.1 In-band blocking for CA (2DL CA)

7.6A.2.1.1 Test purpose

Inband blocking is defined for an unwanted interfering signal falling into the range from 15 MHz below to 15 MHz above the UE receive band, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or into an immediately adjacent frequency range up 3\* BWChannel\_CA below or above the UE receive band, with FDL\_high ≥ 3300 MHz and FUL\_high ≥ 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6A.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support 2DL CA.

7.6A.2.1.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.1.4 Test description

7.6A.2.1.4.1 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 configuration 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.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2..

Table 7.6A.2.1.4.1-1: 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg, NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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 | | | | | |

Table 7.6A.2.1.4.1-2: 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 | | | NOTE 1, NOTE 3 except for the following cases:  CA\_n48A-n77A: Low range for PCC | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 1, NOTE 4, NOTE 5 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  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.  NOTE 5: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | |

Table 7.6A.2.1.4.1-3: Test configuration table for Intraband 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 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3.

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 content are defined in clause 7.6A.2.1.4.3.

7.6A.2.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.1.4.3.

3. SS activates SCC 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 Tables 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3 on both SCC and PCC. 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 Tables 7.6A.2.1.4.1-1, 7.6A.2.1.4.1-2 or 7.6A.2.1.4.1-3 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. For Intra-band contiguous CA: Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6A.2.1.5.1-1 and 7.6A.2.1.5.1-2 or Tables 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a as appropriate depending on NR band.

For Inter-band CA: Set the parameters of the signal generator for an interfering signal below the SCC’s wanted signal in Case 1 according to Tables 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2 or Tables 7.6A.2.1.5.3-1a and 7.6A.2.1.5.3-2a as appropriate depending on NR band. If interfering signal bandwidth overlaps with PCC bandwidth, skip the test and go to step 9.

For Intra-band non-contiguous CA: Set the parameters of the signal generator for an interfering signal below the PCC’s wanted signal in Case 1 according to 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2 or Tables 7.6A.2.1.5.3-1a and 7.6A.2.1.5.3-2a as appropriate depending on NR bands as appropriate, excluding frequencies where the interferer centre frequency falls within SCC carrier ±(BW/2 + FIoffset,case 1), where BW & offset refer to SCC.

7. Set the downlink signal level on both carriers according to the table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a as appropriate. 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.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a 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. For Intra-band contiguous CA: Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A.

For Inter-band CA: Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

For Intra-band non-contiguous CA: Measure the average throughput of PCC for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 6.

10. For Intra-band non-contiguous only: Repeat steps from 6 to 9, using an interfering signal below and above the SCC in Case 1 and measuring SCC instead of PCC in step 8, excluding the frequencies where the interferer centre frequency falls within PCC carrier ±(BW/2 + FIoffset,case 1), where BW & offset refer to PCC.

11. Repeat steps from 6 to 10, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. For inter-band CA: skip the testing at interfering signal frequencies where interfering signal bandwidth overlaps with PCC bandwidth.

12. Repeat steps from 6 to 10, using interfering signals in Case 3 as applicable at step 6and 9. The ranges of case 3 are covered in steps equal to the interferer bandwidth. For inter-band CA: skip the testing at interfering signal frequencies where interfering signal bandwidth overlaps with PCC bandwidth.

13. For Inter-band CA only: Repeat steps from 1 to 12 setting the original PCell as SCell and the original SCell as PCell in the corresponding CA configuration, 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.2.1.4.3 Message contents

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

7.6A.2.1.5 Test requirement

7.6A.2.1.5.1 Intra-band contiguous 2DL CA

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 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a. 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.2.1.5.1-1: In-band blocking 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 |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below | | |
| 10.0 | 6 |  |
| BWInterferer | MHz | 20 | BWchannel CA |  |
| FIoffset, case 1 | MHz | 30 | BWchannel CA+ BWchannel CA/2 |  |
| FIoffset, case 2 | MHz | 50 | BWInterferer + FIoffset, case 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | |

Table 7.6A.2.1.5.1-1a: In-band blocking 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 + NR CA bandwidth class specific value below | REFSENS + NR CA bandwidth class specific value below |
| 16.0 | 19.0 |
| BWInterferer | MHz | 5 | 5 |
| FIoffset, case 1 | MHz | 7.5 | 7.5 |
| FIoffset, case 2 | MHz | 12.5 | 12.5 |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | |

Table 7.6A.2.1.5.1-2: In-band blocking for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |
| Finterferer | MHz | NOTE 2 | FDL\_low – 3BWchannel CA  to  FDL\_high + 3BWchannel CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.1.5.1-2a: In-band blocking for intra-band contiguous CA with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 |
| Pinterferer | dBm | -56 | -44 |  |
| n66  n41  n484 | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal  NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A | | | | | |

7.6A.2.1.5.2 In-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.2. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

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 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2.

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.2.1.5.3 In-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 in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements for each component carrier, when operated as SCell, while all downlink carriers are active.

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 7.6A.2.1.5.3-1 and 7.6A.2.1.5.3-2. 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.2.1.5.3-1: In-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 specific value below | | | | |
| dB | 6 | 6 | 7 | 9 | 10 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 35 MHz | 40 MHz | 45 MHz | 50 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 11 | 11.5 | 12 | 12.5 | 13 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| RX parameter | Units | Channel bandwidth | | | | |
| 60 MHz | 70 MHz | **80 MHz** | **90 MHz** | **100 MHz** |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 14 | 14.5 | 15 | 15.5 | 16 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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: The interferer consists of the RMC 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.. | | | | | | |

Table 7.6A.2.1.5.3-1a: In-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 | 25 MHz | 30 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 25 | 30 |
| FIoffset, case 1 | MHz | 15 | 22.5 | 30 | 37.5 | 45 |
| FIoffset, case 2 | MHz | 25 | 37.5 | 50 | 62.5 | 75 |
| RX parameter | Units | Channel bandwidth | | | | |
| 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 35 | 40 | 45 | 50 | 60 |
| FIoffset, case 1 | MHz | 52.5 | 60 | 67.5 | 75 | 90 |
| FIoffset, case 2 | MHz | 87.5 | 100 | 112.5 | 125 | 150 |
| RX parameter | Units | Channel bandwidth | | | | |
| 70 MHz | 80 MHz | 90 MHz | 100 MHz |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | | | |
| dB | 6 | | | |  |
| BWinterferer | MHz | 70 | 80 | 90 | 100 |  |
| FIoffset, case 1 | MHz | 105 | 120 | 135 | 150 |  |
| FIoffset, case 2 | MHz | 175 | 200 | 225 | 250 |  |
| 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: The interferer consists of the RMC 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. | | | | | | |

Table 7.6A.2.1.5.3-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 |
| Pinterferer | dBm | -56 | -44 | -15 |
| n1, n2, n3, n5, n7, n8, n12, n20, n28, n38, n39, n40, n41, n483, n50, n51, n66, n70, n74, n75, n76 | Finterferer (offset) | MHz | - BWChannel\_CA /2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA /2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: - BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. | | | | | |

Table 7.6A.2.1.5.3-2a: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| Finterferer |  | NOTE 2 | FDL\_low – 3\* BWChannel\_CA  to  FDL\_high + 3\* BWChannel\_CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.1.5.3-2b: In-band blocking parameters for additional NR operating bands for carrier aggregation with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| n29 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal  NOTE 4: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2-1, Pinterferer power defined in Table 7.6A.2.1.5.3-2 and 7.6A.2.1.5.3-2a is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2-1.

#### 7.6A.2.2 In-band Blocking for CA (3DL CA)

7.6A.2.2.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6A.2.2.2 Test applicability

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

7.6A.2.2.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.2.4 Test description

7.6A.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 configuration 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.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.2.2.4.1-1: 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 | | | Intra-band contiguous: Mid range for all CCs  Inter-band: NOTE 1, NOTE 5  Intra-band contiguous + Inter-band: NOTE 1, NOTE 5  Intra-band non-contiguous + Inter-band, Intra-band non-contiguous, Intra-band contiguous + Intra-band non-contiguous: NOTE 1 with Wgap for intra-band non-contiguous defined in table 7.3A.2.4.1-1 (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\_agg, NOTE 1, NOTE 6, NOTE 7 | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest for PCC and SCCs | | | |
| Network signalling value | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | |
| Test Parameters | | | | | | |
|  | Downlink Configuration | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | SCC2 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXD Configuration (Intra-band contiguous CA) | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA Configuration (Inter-band) | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **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 | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **Default Test Settings for a CA\_nX(2A)-nYA Configurations**  **(Intra-band non-contiguous + Inter-band)** | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **Default Test Settings for a CA\_nX(3A) Configuration (Intra-band non-contiguous)** | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| **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 | 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: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  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; **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; **Intra-band non-contiguous + Inter-band:** nX and nY correspond to the different bands in the CA Configuration. E.g. for CA\_n1(2A)-n8A, nX=n1, nY =n8.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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: 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 7: 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.2.2.4.1-2: Void

Table 7.6A.2.2.4.1-3: 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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.6A.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 7.6A.2.2.4.3*.*

7.6A.2.2.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.2.4.3.

3. SS activates SCC 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 Tables 7.6A.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3 on both SCC and PCC. 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 Tables 7.6A.2.2.4.1-1, 7.6A.2.2.4.1-2 or 7.6A.2.2.4.1-3 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6A.2.2.4.2-1, excluding the frequencies where the interferer centre frequency falls within each CC carrier ±(BW/2 + FIoffset), where BW & offset refer to each CC.

7 Set the downlink signal level according to the Table 7.6A.2.2.4.2-1. 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 7.6A.2.2.4.2-1 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 for the carrier(s) indicated in Table 7.6A.2.2.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6A.2.2.4.2-1 in Case 1 at step 6, excluding the frequencies where the interferer centre frequency falls within each CC carrier ±(BW/2 + FIoffset), where BW & offset refer to each CC.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6A.2.2.4.2-1.

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.2.2.4.2-1: Test repetition and measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 14 | PCC, SCC1, SCC2 | 7.6A.2.2.5-3  7.6A.2.2.5-3a  7.6A.2.2.5-4  7.6A.2.2.5-4a |
| Inter-band | 11 | SCC1, SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-1b  7.6A.2.2.5-2  7.6A.2.2.5-2a |
| 21 |
| 31 |
| Intra-band contiguous + Inter-band | 12 | SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-1b  7.6A.2.2.5-2  7.6A.2.2.5-2a |
| 22 | SCC1, SCC2 | 7.6A.2.2.5-3  7.6A.2.2.5-3a  7.6A.2.2.5-4  7.6A.2.2.5-4a |
| Intra-band non-contiguous + Inter-band | 23 | SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-1b  7.6A.2.2.5-2  7.6A.2.2.5-2a |
| 33 | SCC1, SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-2  7.6A.2.2.5-2a |
| Intra-band non-contiguous | 15 | PCC, SCC1, SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-1b  7.6A.2.2.5-2  7.6A.2.2.5-2a |
| Intra-band contiguous + Intra-band non-contiguous | 16 | PCC, SCC1, SCC2 | 7.6A.2.2.5-1  7.6A.2.2.5-1a  7.6A.2.2.5-1b  7.6A.2.2.5-2  7.6A.2.2.5-2a  7.6A.2.2.5-3  7.6A.2.2.5-3a  7.6A.2.2.5-4  7.6A.2.2.5-4a |
| 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.2.2.4.3 Message Contents

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

7.6A.2.2.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex 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 below, according to the type of CA. 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.2.2.5-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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: The interferer consists of the RMC 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. | | | | | | |

Table 7.6A.2.2.5-1a: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
| Pinterferer | dBm | -56 | -44 | -15 | -38 |
| Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |  | - BWChannel\_CA/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n26, n28,n34, n38,n39, n40, n41, n483, n50, n51, n53, n65, n66, n70, n74, n75, n76 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer(offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. | | | | | | |

7.6A.2.2.5-1b: In-band blocking for additional NR operating bands for carrier aggregation with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| n29 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal  NOTE 4: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.2.5-2: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 25 | 30 |
| FIoffset, case 1 | MHz | 15 | 22.5 | 30 | 37.5 | 45 |
| FIoffset, case 2 | MHz | 25 | 37.5 | 50 | 62.5 | 75 |
| RX parameter | Units | Channel bandwidth | | | | |
| 35 MHz | 40 MHz | 45 MHz | 50 MHz | 60 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 35 | 40 | 45 | 50 | 60 |
| FIoffset, case 1 | MHz | 52.5 | 60 | 67.5 | 75 | 90 |
| FIoffset, case 2 | MHz | 87.5 | 100 | 112.5 | 125 | 150 |
| RX parameter | Units | Channel bandwidth | | | | |
| 70MHz | 80 MHz | 90 MHz | 100 MHz |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 70 | 80 | 90 | 100 |  |
| FIoffset, case 1 | MHz | 105 | 120 | 135 | 150 |  |
| FIoffset, case 2 | MHz | 175 | 200 | 225 | 250 |  |
| 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: The interferer consists of the RMC 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 | | | | | | |

Table 7.6A.2.2.5-2a: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| Finterferer |  | NOTE 2 | FDL\_low – 3\* BWChannel\_CA  to  FDL\_high + 3\* BWChannel\_CA |
| NOTE 1: The absolute value of the interferer offset Finterferer(offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.2.5-3: In-band blocking parameters with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (intra-band contiguous CA)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dB | REFSENS + CA bandwidth class specific value below | | | |
| 10.0 | 6 | 13.8 |  |
| BWInterferer | MHz | 20 | BWChannel\_CA | 50 |  |
| FIoffset, case 1 | MHz | 30 | BWChannel\_CA + BWChannel\_CA /2 | 75 |  |
| FIoffset, case 2 | MHz | 50 | BWInterferer + FIoffset, case 1 | 125 |  |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | |

Table 7.6A.2.2.5-3a: In-band blocking parameters with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz (intra-band contiguous CA)

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + NR CA bandwidth class specific value below | |
| 16.0 | 19.0 |
| BWInterferer | MHz | 5 | 5 |
| FIoffset, case 1 | MHz | 7.5 | 7.5 |
| FIoffset, case 2 | MHz | 12.5 | 12.5 |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | |

Table7.6A.2.2.5-4: In-band blocking with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (intra-band contiguous CA)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWChannel\_CA/2 –FIoffset, case 1  and  BWChannel\_CA/2 +FIoffset, case 1 | ≤ -BWChannel\_CA/2 –FIoffset, case 2  and  ≥ BWChannel\_CA/2 +FIoffset, case 2 |
| Finterferer | MHz | NOTE 2 | FDL\_low – 3BWchannel CA  to  FDL\_high + 3BWchannel CA |
| NOTE 1: The absolute value of the interferer offset Finterferer(offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.2.5-4a: In-band blocking with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz (intra-band contiguous CA)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 |
| Pinterferer | dBm | -56 | -44 |  |
| n41, n66, n484,n40 | Finterferer (offset) | MHz | -BWChannel\_CA/2 –FIoffset, case 1  and  BWChannel\_CA/2 +FIoffset, case 1 | ≤ -BWChannel\_CA/2 –FIoffset, case 2  and  ≥ BWChannel\_CA/2 +FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signal  NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. | | | | | |

For the UE which supports inter-band CA configuration in Table 7.3A.3.2.3-1, Pinterferer power defined in Table 7.6A.2.2.5-1a and Table 7.6A.2.2.5-2a is increased by the amount given by ΔRIB,c in Table 7.3A.3.2.3-1.

#### 7.6A.2.3 In-band Blocking for CA (4DL CA)

7.6A.2.3.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6A.2.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support 4DL CA.

7.6A.2.3.3 Minimum conformance requirements

Minimum requirements are defined in clause 7.6A.2.0.

7.6A.2.3.4 Test description

7.6A.2.3.4.1 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 configuration 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.2.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6A.2.3.4.1-1: Test Configuration Table for 4DL 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 6 | | | | |
| 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\_agg, NOTE 1, NOTE 5, NOTE 7 | | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest for PCC and SCCs | | | | |
| Network signalling value | | | NS\_01  Unless given by Table 7.3.2.3-4 for the band with active uplink carrier | | | | |
| Test Parameters | | | | | | | |
|  | Downlink Configuration | | | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC1 RB allocation | SCC2 RB allocation | SCC3 RB allocation | CC  Mod'n | PCC RB allocation |
| Default Test Settings for a CA\_nXE Configuration (Intra-band contiguous CA) | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXA-nYA-nZA-nRA Configuration (Inter-band) | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nXC-nYA-ZA and CA\_nXB-nYA-ZA Configurations  (Intra-band contiguous + Inter-band) | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nYA-ZA Configurations  (Intra-band non-contiguous + Inter-band) | | | | | | | |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | | | DFT-s-OFDM QPSK | NOTE 1 |
| Default Test Settings for a CA\_nX(2A)-nY(2A) Configurations  (Intra-band non-contiguous + Intra-band non-contiguous) | | | | | | | |
| 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.3.4.1-1.  NOTE 2: CA Configuration Test CC Combination test settings are checked separately for each CA Configuration.  NOTE 3: **Inter-band:** nX, nY, nZ, nR correspond to the different bands in the CA Configuration. E.g. for CA\_n1A-n3A-n28A-n78A, nX=n1, nY=n3, nZ=n28, nR=n78; **Intra-band contiguous + Inter-band:** nX, nY, nZ correspond to the different bands in the CA Configuration, e.g. for CA\_n48B-n66A-n70A, nX=n48, nY=n66, nZ=n70; **Intra-band non-contiguous + Inter-band:** nX, nY, nZ correspond to the different bands in the CA Configuration. E.g. for CA\_n48(2A)-n66A-n70A, nX=n48, nY=n66, nZ=n70.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: 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 6: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1.  NOTE 7: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.3. DL channel bandwidth shall be selected first. | | | | | | | |

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 for PCC 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 UL and Reference Measurement Channel is set according to Tables 7.6A.2.3.4.1-1.

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 7.6A.2.2.4.3*.*

7.6A.2.3.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.2.3.4.3.

3. SS activates SCC 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.2.3.4.1-1 on both SCC and PCC. 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.2.3.4.1-1 on PCC. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Table 7.6A.2.3.4.2-1.

7 Set the downlink signal level according to the Table 7.6A.2.3.4.2-1. 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 7.6A.2.2.4.2-1 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 for the carrier(s) indicated in Table 7.6A.2.3.4.2-1 for duration sufficient to achieve statistical significance according to Annex H.2A.

9 Repeat steps from 6 to 8, using an interfering signal above the measured carrier(s) according to Table 7.6A.2.3.4.2-1 in Case 1 at step 6.

10 Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

11. Repeat steps 1 to 10 for all component carriers listed in Table 7.6A.2.3.4.2-1.

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.2.3.4.2-1: Test repetition and measurement configuration

|  |  |  |  |
| --- | --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on | Table with test parameters to select |
| Intra-band contiguous | 1 | PCC, SCC1, SCC2, SCC3 | 7.6A.2.3.5-3  7.6A.2.3.5-3a  7.6A.2.3.5-4  7.6A.2.3.5-4a |
| Inter-band | 11 | SCC1, SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-1b  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| 21 |
| 31 |
| 41 |
| Intra-band contiguous + Inter-band | 12 | SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-1b  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| 22 | SCC1, SCC2, SCC3 | 7.6A.2.3.5-3  7.6A.2.3.5-3a  7.6A.2.3.5-4  7.6A.2.3.5-4a |
| 32 | SCC1, SCC2, SCC3 | 7.6A.2.3.5-3  7.6A.2.3.5-3a  7.6A.2.3.5-4  7.6A.2.3.5-4a |
| Intra-band non-contiguous + Inter-band | 13 | SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-1b  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| 23 | SCC1, SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-1b  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| 33 | SCC1, SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| Intra-band non-contiguous + Intra-band non-contiguous | 14 | SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| 24 | SCC2, SCC3 | 7.6A.2.3.5-1  7.6A.2.3.5-1a  7.6A.2.3.5-2  7.6A.2.3.5-2a |
| NOTE 1: CA configuration ID as defined in table 7.3A.3.4.1-1.  NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)” in table 7.3A.3.4.1-1.  NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)” in table 7.3A.2.4.1-1. | | | |

7.6A.2.3.4.3 Message Contents

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

7.6A.2.3.5 Test requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex 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 below, according to the type of CA.

Table 7.6A.2.3.5-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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: The interferer consists of the RMC 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. | | | | | | |

Table 7.6A.2.3.5-1a: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
| Pinterferer | dBm | -56 | -44 | -15 | -38 |
| Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |  | - BWChannel\_CA/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n26, n28,n34, n38,n39, n40, n41, n483, n50, n51, n53, n65, n66, n70, n74, n75, n76 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. | | | | | | |

7.6A.2.3.5-1b: In-band blocking for additional NR operating bands for carrier aggregation with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz (inter-band)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| n29 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal  NOTE 4: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.3.5-2: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 25 | 30 |
| FIoffset, case 1 | MHz | 15 | 22.5 | 30 | 37.5 | 45 |
| FIoffset, case 2 | MHz | 25 | 37.5 | 50 | 62.5 | 75 |
| RX parameter | Units | Channel bandwidth | | | | |
| 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 40 | 50 | 60 | 70 | 80 |
| FIoffset, case 1 | MHz | 60 | 75 | 90 | 105 | 120 |
| FIoffset, case 2 | MHz | 100 | 125 | 150 | 175 | 200 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | |  |  |  |
| dB | 6 | |  |  |  |
| BWinterferer | MHz | 90 | 100 |  |  |  |
| FIoffset, case 1 | MHz | 135 | 150 |  |  |  |
| FIoffset, case 2 | MHz | 225 | 250 |  |  |  |
| 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: The interferer consists of the RMC 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 | | | | | | |

Table 7.6A.2.3.5-2a: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (inter-band, intra-band non-contiguous)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | - BWChannel\_CA/2 –  FIoffset, case 1  and  BWChannel\_CA/2 +  FIoffset, case 1 | ≤ - BWChannel\_CA/2 –  FIoffset, case 2  and  ≥BWChannel\_CA/2 +  FIoffset, case 2 |
| Finterferer |  | NOTE 2 | FDL\_low – 3\* BWChannel\_CA  to  FDL\_high + 3\* BWChannel\_CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.3.5-3: In-band blocking parameters with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (intra-band contiguous CA)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C | D |  |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below | | | |
| 10.0 | 6 | 13.8 |  |
| BWInterferer | MHz | 20 | BWChannel\_CA | 50 |  |
| FIoffset, case 1 | MHz | 30 | BWChannel\_CA+ BWChannel\_CA/2 | 75 |  |
| FIoffset, case 2 | MHz | 50 | BWInterferer + FIoffset, case 1 | 125 |  |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | | | |

Table 7.6A.2.3.5-3a: In-band blocking parameters with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz (intra-band contiguous CA)

|  |  |  |  |
| --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | |
| B | C |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + NR CA bandwidth class specific value below | |
| 16.0 | 19.0 |
| BWInterferer | MHz | 5 | 5 |
| FIoffset, case 1 | MHz | 7.5 | 7.5 |
| FIoffset, case 2 | MHz | 12.5 | 12.5 |
| 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: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 | | | |

Table7.6A.2.3.5-4: In-band blocking with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (intra-band contiguous CA)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -BWchannel\_CA/2 –FIoffset, case 1  and  BWchannel\_CA/2 +FIoffset, case 1 | ≤ -BWChannel\_CA/2 –FIoffset, case 2  and  ≥ BWChannel\_CA/2 +FIoffset, case 2 |
| Finterferer | MHz | NOTE 2 | FDL\_low – 3\*BWChannel\_CA  to  FDL\_high + 3\*BWChannel\_CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWChannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.3.5-4a: In-band blocking with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz (intra-band contiguous CA)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 |
| Pinterferer | dBm | -56 | -44 |  |
| n41, n66, n484,n40 | Finterferer (offset) | MHz | -BWChannel CA/2 –FIoffset, case 1  and  BWChannel CA/2 +FIoffset, case 1 | ≤ -BWChannel CA/2 –FIoffset, case 2  and  ≥ BWChannel CA/2 +FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel\_CA/2 – FIoffset, case 1; b: BWchannel\_CA/2 + FIoffset, case 1  NOTE 3: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signal  NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. | | | | | |

For the UE which supports inter-band CA configuration in Table 7.3A.3.2.3-1, Pinterferer power defined in Table 7.6A.2.3.5-1a and Table 7.6A.2.3.5-2a is increased by the amount given by ΔRIB,c in Table 7.3A.3.2.3-1.

### 7.6A.3 Out-of-band blocking for CA

#### 7.6A.3.0 Minimum conformance requirements

##### 7.6A.3.0.1 Out-of-band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test.

The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6A.3.0.1-1 and Tables 7.6A.3.0.1-2 being on either side of the aggregated signal. 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).

Table 7.6A.3.0.1-1: Out-of-band blocking parameters for intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | CA bandwidth class | | | |
| B | C | D |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + CA bandwidth class specific value below | | | |
| dB | 9 | 9 | 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. | | | | | |

Table 7.6A.3.0.1-2: 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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| n77, n78  (NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)  or  FDL\_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)  or  FDL\_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 signal  NOTE 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 | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6A.3-2, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of MHz with  the number of resource blocks in the downlink transmission bandwidth configuration, BWChannel is the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7A.1 apply.

##### 7.6A.3.0.2 Out-of-band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the out-of-band blocking requirements are defined with the uplink configuration in accordance with table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.3 and 7.6A.3.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

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).

##### 7.6A.3.0.3 Out-of-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 out-of-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.3 for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with component carriers in operating bands < 2.7GHz including n48, and for FDL\_Low(*j*) – 15 MHz ≤ f ≤ FDL\_High(*j*) + 15 MHz, the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5 and 7.6.2 shall be applied for carrier *j*. For inter-band carrier aggregation with component carriers in operating bands > 2.7GHz excluding n48, and for FDL\_Low(*j*) – 3\* BWChannel ≤ f ≤ FDL\_High(*j*) + 3\* BWChannel, the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5 and 7.6.2 shall be applied for carrier *j*. FDL\_Low(*j*) and FDL\_High(*j*) denote the respective lower and upper frequency limits of the operating band containing carrier *j*, *j* = 1,…,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination. BWChannel denotes the channel bandwidth of the wanted signal component carrier j. 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 inter-band carrier aggregation with uplink assigned to two NR bands, the out-of-band blocking requirements specified in subclause 7.6.3 shall be met with the transmitter power for the uplink set to 7 dB below PCMAX\_L,f,c for each serving cell c.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.6.3.3-2 and 7.6.3.3-4 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.0.3-1, exceptions to the requirement specified in Table 7.6A.3.0.3-2 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.3.0.3-1: CA band combination with exceptions allowed

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

Table 7.6A.3.0.3-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when , where and are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. and are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. | | |

For all interferer frequency ranges specified in subclause 7.6.3 a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz with *NRB* the number of resource blocks in the downlink transmission bandwidth configuration, BWChannel the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7 apply.

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).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.3.

#### 7.6A.3.1 Out-of-band blocking for CA (2DL CA)

7.6A.3.1.1 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.3.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.6A.3.1.3 Minimum conformance requirements

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

7.6A.3.1.4 Test description

7.6A.3.1.4.1 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.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3. 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.3.1.4.1-1: 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

Table 7.6A.3.1.4.1-2: 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 | | | NOTE 4 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 5  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 4: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 5: 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 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | |

Table 7.6A.3.1.4.1-3: 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 CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | NOTE 1, NOTE 3 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest NRB\_agg for PCC and SCC, NOTE 1 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

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.3.1.4.1-1, Table 7.6A.3.1.4.1-2 or Table 7.6A.3.1.4.1-3.

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.3.1.4.3*.*

7.6A.3.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.1.4.3.

3. SS activates SCC 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.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 on both PCC and SCC. 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.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 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 parameters of the CW signal generator for an interfering signal below the CA Band for intra-band CA, or below the SCC’s operating band for inter-band CA according to table 7.6A.3.1.5.1-2, 7.6A.3.1.5.3-2 or 7.6A.3.1.5.3-4. 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.3.1.5.3-2 and 7.6A.3.1.5.3-4 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.1.5.3-5, exceptions to the requirement specified in Table 7.6A.3.1.5.3-6 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 the table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for both 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.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 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 of SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A for intra-band CA.

9. Record the frequencies for which the throughput doesn't meet the requirements.

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

11. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 10, 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.3.1.4.3 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.3.1.5 Test requirement

7.6A.3.1.5.1 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.3.1.5.1-1 and 7.6A.3.1.5.1-2.

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.3.1.5.1-1: Out-of-band blocking parameters for intra-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| RX parameter | Units | CA bandwidth class | |
| B | C |
| Power in transmission bandwidth configuration | dBm | REFSENS + CA bandwidth class specific value below | |
| dB | 9 | 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.3.1.5.1-2: 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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| n77, n78  (NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)  or  FDL\_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)  or  FDL\_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 signal  NOTE 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.3.1.5.2 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.3.1.5.3-1 and 7.6A.3.1.5.3-2 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Tables 7.6A.3.1.5.3-3 and 7.6A.3.1.5.3-4 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).

7.6A.3.1.5.3 Out-of-band blocking for Inter-band CA

Except for the spurious response frequencies recorded in step 9 of test procedure, the throughput measurement derived in the test procedure of 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 Tables 7.6A.3.1.5.3-1 and 7.6A.3.1.5.3-2 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Tables 7.6A.3.1.5.3-3 and 7.6A.3.1.5.3-4 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.

Table 7.6A.3.1.5.3-1: 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 | 50 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.3.1.5.3-2: 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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  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.3.1.5.3-3: 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.3.1.5.3-4: 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\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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.0.3.2.1-1, Pinterferer power defined in Table 7.6A.3.1.5.3-2 and 7.6A.3.1.5.3-4 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.1.5.3-5, exceptions to the requirement specified in Table 7.6A.3.1.5.3-6 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.3.1.5.3-5: CA band combination with exceptions allowed

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

Table 7.6A.3.1.5.3-6: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when , where and are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. and are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. | | |

#### 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\_agg  NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

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 5  Intra-band contiguous + Inter-band: NOTE 5  Intra-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\_agg  NOTE 3  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| n77, n78  (NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)  or  FDL\_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)  or  FDL\_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 signal  NOTE 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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  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\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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 , where and are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. and are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. | | |

#### 7.6A.3.3 Out-of-band blocking for CA (4DL CA)

7.6A.3.3.1 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.3.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.6A.3.3.3 Minimum conformance requirements

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

7.6A.3.3.4 Test description

7.6A.3.3.4.1 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.3.3.4.1-1. 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.3.3.4.1-1: 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 5  Intra-band contiguous + Inter-band: NOTE 5  Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5)  Intra-band non-contiguous + Intra-band non-contiguous: 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\_agg  NOTE 3  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1. 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.3.3. DL channel bandwidth shall be selected first. | | | | | |

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.3.3.4.1-1.

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 7.6A.3.3.4.3*.*

7.6A.3.3.4.2 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.3.3.4.3.

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.3.3.4.1-1 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.3.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

6. For the CCs the throughput is measured on according to Table 7.6A.3.3.4.2-1, 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 7.6A.3.3.5.1-2 or 7.6A.3.3.5.1-4. 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.3.3.5.1-2 and 7.6A.3.3.5.1-4 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.3.3.5.1-5, exceptions to the requirement specified in Table 7.6A.3.3.5.1-6 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 the Table 7.6A.3.3.5.1-1, or 7.6A.3.3.5.1-3 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.3.3.5.1-1, or 7.6A.3.3.5.1-3 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.3.3.4.2-1 for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA.

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 each SCC’s operating band for inter-band CA at step 6.

12. For Inter-band CA: Switch the SCell into PCell and repeat steps 1 to 11 for the CA configuration IDs in REFSENS indicated in Table 7.6A.3.3.4.2-1, 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.3.3.4.2-1: Test repetition and measurement configuration

|  |  |  |
| --- | --- | --- |
| CA configuration | CA configuration ID in REFSENS | Throughput measured on |
|  |  |  |
|  |
|  |
| Inter-band | 11 | SCC1, SCC2, SCC3 |
| 21 |
| 31 |
| 41 |
| Intra-band contiguous + Inter-band | 12 | SCC2, SCC3 |
| 22 | SCC1, SCC2, SCC3 |
| 32 | SCC1, SCC2, SCC3 |
| Intra-band non-contiguous + Inter-band | 13 | SCC2, SCC3 |
| 23 | SCC1, SCC2, SCC3 |
| 33 | SCC1, SCC2, SCC3 |
| Intra-band non-contiguous + Intra-band non-contiguous | 14 | SCC2, SCC3 |
| 24 | SCC2, SCC3 |
| NOTE 1: CA configuration ID as defined in Table 7.3A.3.4.1-1.  NOTE 2: CA configuration ID as defined in “Default Test Settings for a CA\_nXC-nYA-nZA and CA\_nXB-nYA-nZA Configurations (Intra-band contiguous + Inter-band)” in Table 7.3A.3.4.1-1.  NOTE 3: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nYA-nZA Configuration (Intra-band non-contiguous + Inter-band)” in Table 7.3A.3.4.1-1.  NOTE 4: CA configuration ID as defined in “Default Test Settings for a CA\_nX(2A)-nY(2A) Configuration (Intra-band non-contiguous + Intra-band non-contiguous)” in Table 7.3A.2.4.1-1. | | |

7.6A.3.3.4.3 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.3.3.5 Test requirement

7.6A.3.3.5.1 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.3.3.5.1-1 and 7.6A.3.3.5.1-2 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Tables 7.6A.3.3.5.1-3 and 7.6A.3.3.5.1-4 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.3.3.5.1-1: 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.3.3.5.1-2: 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, n50, n51, n66, n70, n71, n74, n75, n76 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  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 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.3.3.5.1-3: 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.3.3.5.1-4: 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\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤  -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high  + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤  -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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.3.3.5.1-2 and 7.6A.3.3.5.1-4 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.3.3.5.1-5, exceptions to the requirement specified in Table 7.6A.3.3.5.1-6 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.3.3.5.1-5: CA band combination with exceptions allowed

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

Table 7.6A.3.3.5.1-6: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when , where and are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. and are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. | | |

### 7.6A.4 Narrow band blocking for CA

#### 7.6A.4.0 Minimum conformance requirements

##### 7.6A.4.0.1 Narrow band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggregation, the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6A.4.0.1-1 with the uplink configuration. For UE(s) supporting one uplink, the uplink configuration of the PCC shall be in accordance with Table 7.3.2.3-3. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.6A.4.0.1-1 being on either side of the aggregated signal. 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, A3.2 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 7.6A.4.0.1-1.

Table 7.6A.4.0.1-1: Narrow-band blocking for intra-band contiguous CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | NR CA bandwidth class | |
| B | C |
| n41, n66, n48, n71 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + NA CA Bandwidth Class specific value below | REFSENS + NA CA Bandwidth Class specific value below |
| 16 | 16 |
| Puw (CW) | dBm | -55 | -55 |
| Fuw (offset for*f* = 15 kHz, 30 kHz) | MHz | - Foffset – 0.2  /  + Foffset + 0.2 | - Foffset – 0.2  /  + Foffset + 0.2 |
| NOTE 1: The transmitter shall be set a 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.3.2 and A3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 for two and four antenna ports, respectively.  NOTE 4: The Fuw (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to MHz to be offset from the sub-carrier raster. | | | | |

##### 7.6A.4.0.2 Narrow band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz with one uplink carrier and two or more downlink sub-blocks, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.4 and 7.6A.4.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

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).

##### 7.6A.4.0.3 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. The UE shall meet the requirements specified in subclause 7.6.4 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, PUW power defined in Table 7.6.4.3-1 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

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).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6A.4.

#### 7.6A.4.1 Narrow band blocking for CA (2DL CA)

7.6A.4,1.1 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.4.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.6A.4.1.3 Minimum conformance requirements

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

7.6A.4.1.4 Test description

7.6A.4.1.4.1 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.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3. 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.4.1.4.1-1: 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

Table 7.6A.4.1.4.1-2: 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 | | | NOTE 4 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 5  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | According to CH BW SCS in table 7.6.4.3-1 | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 4: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 5: 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 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | |

Table 7.6A.4.1.4.1-3: 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 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | According to CH BW SCS in table 7.6.4.3-1 | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

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.4.1.4.1-1, Table 7.6A.4.1.4.1-2 or Table 7.6A.4.1.4.1-3.

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.4.1.4.3*.*

7.6A.4.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.4.1.4.3.

3. SS activates SCC 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.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3 on both PCC and SCC. 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.4.1.4.1-1, 7.6A.4.1.4.1-2 or 7.6A.4.1.4.1-3 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 the CA Band for intra-band CA, or below the SCC’s operating band for inter-band CA according to Table 7.6A.4.1.5.1-1 for for intra-band contiguous CA or 7.6.4.5-1 otherwise . 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 both carriers according to 7.6A.4.1.5.1-1 or 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 7.6A.4.1.5.1-1 or 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 SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both 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, and between PCC’s and SCC’s wanted signal for intra-band non-contiguous CA, or above the 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.

7.6A.4.1.4.3 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.4.1.5 Test requirement

7.6A.4.1.5.1 Narrow band blocking for Intra-band contiguous CA

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, A3.2 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 7.6A.4.1.5.1-1.

Table 7.6A.4.1.5.1-1: Narrow-band blocking for intra-band contiguous CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | NR CA bandwidth class | |
| B | C |
| n41, n48, n66, n71 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + NA CA Bandwidth Class specific value below | REFSENS + NA CA Bandwidth Class specific value below |
| 16 | 16 |
| Puw (CW) | dBm | -55 | -55 |
| Fuw (offset for*f* = 15 kHz, 30 kHz) | MHz | - Foffset – 0.2  /  + Foffset + 0.2 | - Foffset – 0.2  /  + Foffset + 0.2 |
| NOTE 1: The transmitter shall be set a 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.3.2 and A3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2.3-1 and Table 7.3.2.3-2 for two and four antenna ports, respectively.  NOTE 4: The Fuw (offset) is the frequency separation of the centre frequency of the carrier closest to the interferer and the centre frequency of the interferer and shall be further adjusted to MHz to be offset from the sub-carrier raster.  NOTE 5: 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.4.1.5.2 Narrow band blocking for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with FDL\_low < 2700 MHz and FUL\_low < 2700 MHz with one uplink carrier and two downlink carriers, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. The UE shall meet the requirements for each carrier as specified in subclause 7.6.4 for each component carrier respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

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 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.

7.6A.4.1.5.3 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.

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.

#### 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 5  Intra-band contiguous + Inter-band: NOTE 5  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\_agg  NOTE 3  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

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.

#### 7.6A.4.3 Narrow band blocking for CA (4DL CA)

7.6A.4.3.1 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.4.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.6A.4.3.3 Minimum conformance requirements

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

7.6A.4.3.4 Test description

7.6A.4.3.4.1 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.4.3.4.1-1. 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.4.3.4.1-1: Test configuration table for 4DL 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 5  Intra-band contiguous + Inter-band: NOTE 5  Intra-band non-contiguous + Inter-band: MaxWGap for Intra-band non-contiguous (NOTE 5)  Intra-band non-contiguous + Intra-band non-contiguous: 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\_agg  NOTE 3  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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.3.4.1-1.  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.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1. 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.3.3. DL channel bandwidth shall be selected first. | | | | | |

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.4.3.4.1-1 or Table 7.6A.4.3.4.1-2.

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.4.3.4.3*.*

7.6A.4.3.4.2 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.4.3.4.3.

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.4.3.4.1-1 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.4.3.4.1-1 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 7.6.4.5-1 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 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.3.4.1-1 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.4.3.4.3 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.4.3.5 Test requirement

7.6A.4.3.5.1 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.4.3.5.1-1: 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.

## 7.6B Blocking characteristics for NR-DC

For inter-band NR-DC configurations, the blocking characteristics for the corresponding inter-band CA configuration as specified in clause 7.6A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.6A.

## 7.6C Blocking characteristics for SUL

### 7.6C.1 General

### 7.6C.2 In-band blocking for SUL

7.6C.2.1 Test purpose

Same test purpose as in clause 7.6.2.1.

7.6C.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

7.6C.2.3 Minimum conformance requirements

For SUL operation, the in-band blocking requirement for downlink bands specified in clause 7.6.2.3 shall be met.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.2.

7.6C.2.4 Test description

Same test description as specified in clause 7.6.2.4 with following exceptions:

Instead of table 5.3.5-1 🡪 use Table 5.5C-1

Instead of table 7.6.2.4.1-1 🡪 use Table 7.6C.2.4-1.

Table 7.6C.2.4-1: Test Configuration Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 for both SUL carrier and Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n81: 20 MHz  n82: 20 MHz  n83: 20 MHz  n84: 20 MHz  n86: 40 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | | 15kHz for SUL carrier and lowest SCS for Non-SUL carrier | | |
| Test Parameters | | | | | | |
| Test ID | DL Configuration | | UL Configuration | | SUL Configuration | |
|  | Mod'n | RB allocation | N/A | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) |  | | DFT-s-OFDM QPSK | REFSENS (NOTE 1) |
| NOTE 1: The specific configuration of SUL and DL are defined in Table 7.3C.2.4.1-1.  NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.8 for TE diagram and section A.3.2 for UE diagram.

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

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, additionally the following exception shown in Table 7.6C.2.4-2 is considered.

Table 7.6C.2.4-2: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

Table 7.6C.2.4-3: Void

7.6C.2.5 Test requirement

Same test requirement specified in clause 7.6.2.5 for downlink bands shall be met for in-band blocking testing for SUL.

### 7.6C.2\_1 Inband Blocking for SUL with DL CA

#### 7.6C.2\_1.1 Inband Blocking for SUL with 2 DL CA

Editor’s Note: No test points defined for Inband Blocking for SULwith inter-band 2 DL CA testing. The testing is covered by 7.6.2 and 7.6C.2.

7.6C.2\_1.1.1 Test purpose

Same test purpose as in clause 7.6A.2.1.

7.6C.2\_1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands and intra-band contiguous 2DL CA.

7.6C.2\_1.1.3 Minimum conformance requirements

For SUL operation with downlink CA, the in-band blocking requirement for downlink bands specified in clause 7.6A.2.0 shall be met.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.2.

7.6C.2\_1.1.4 Test description

7.6C.2\_1.1.4.1 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 configuration specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each SUL configuration, are shown in Table 7.6C.2\_1.1.4.1-1 for SUL with intra-band contiguous DL CA or Table 7.6C.2\_1.1.4.1-2 for SUL with inter-band DL CA. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6C.2\_1.1.4.1-1: Test configuration table for SUL configuration with 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 for both SUL carrier and Non-SUL carrier | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest NRB\_agg for downlink bands  For SUL band:  n80: 30 MHz  n81: 20 MHz  n82: 20 MHz  n83: 20 MHz  n84: 20 MHz  n86: 40 MHz  n95: 15 MHz | | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier and lowest for Non-SUL carrier | | | |
| Test Parameters | | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | SUL Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | N/A | CC  Mod'n | PCC RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific downlink configuration is defined in Table 7.3A.1.4.1-1.  NOTE 2: The specific SUL configuration is defined in Table 7.3C.2.4.1-1a.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | | |

**For SUL configuration with inter-band DL CA:** No testing need to be performed since the testing has been covered in test case 7.6.2 and 7.6C.2. For band combination CA\_nX\_SUL\_nY-nZ, test the inband blocking of SUL configuration or NR band as listed in Table 7.6C.2\_1.1.4.1-2.

Table 7.6C.2\_1.1.4.1-2: Test band combinations and configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Band configuration | Verifying in-band blocking of SUL configurations/ NR band | Subtest case | Table with test parameters to select |
| CA\_n1A\_SUL\_n78A-n80A | SUL\_n78-n80 | 7.6C.2 | Table 7.6C.2.4-1 |
| n1 | 7.6.2 | Table 7.6.2.4.1-1 |
| CA\_n1A\_SUL\_n78A-n84A | SUL\_n78-n84 | 7.6C.2 | Table 7.6C.2.4-1 |
| n1 | 7.6.2 | Table 7.6.2.4.1-1 |
| CA\_n3A\_SUL\_n78A-n80A | SUL\_n78-n80 | 7.6C.2 | Table 7.6C.2.4-1 |
| n3 | 7.6.2 | Table 7.6.2.4.1-1 |
| CA\_n28A\_SUL\_n41A-n83A | SUL\_n41-n83 | 7.6C.2 | Table 7.6C.2.4-1 |
| n28 | 7.6.2 | Table 7.6.2.4.1-1 |
| CA\_n28A\_SUL\_n79A-n83A | SUL\_n79A-n83A | 7.6C.2 | Table 7.6C.2.4-1 |
| n28 | 7.6.2 | Table 7.6.2.4.1-1 |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.10 for TE diagram and section A.3.2 for UE diagram.

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

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, additionally the following exception shown in Table7.6C.2\_1.1.4.1-3 is considered.

Table 7.6C.2\_1.1.4.1-3: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

7.6C.2\_1.1.4.2 Test procedure

For SUL configuration with intra-band contiguous DL CA:

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6C.2\_1.1.4.1.

3. SS activates SCC 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 7.6C.2\_1.1.4.1-1 on both SCC and PCC. 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 7.6C.2\_1.1.4.1-1 on SUL. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the signal generator for an interfering signal below the aggregated component carriers in Case 1 according to Tables 7.6A.2.1.5.1-1 and 7.6A.2.1.5.1-2 or Tables 7.6A.2.1.5.1-1a and 7.6A.2.1.5.1-2a as appropriate depending on NR band.

7. Set the downlink signal level on both carriers according to the Table 7.6A.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a as appropriate. 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.2.1.5.1-1, 7.6A.2.1.5.1-1a or 7.6A.2.1.5.3-1, 7.6A.2.1.5.3-1a 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.

8. Measure the average throughput of both carriers for a duration sufficient to achieve statistical significance according to Annex H.2A.

9. Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 6.

10. Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth.

12. Repeat steps from 6 to 10, using interfering signals in Case 3 as applicable at step 6and 9. The ranges of case 3 are covered in steps equal to the interferer bandwidth.

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.

7.6C.2\_1.1.5 Test requirement

Same test requirement specified in 7.6A.2.1.5.1 shall be met for downlink bands for SUL configuration with intra-band contiguous DL CA.

Same test requirement specified in clause 7.6C.2.5 or 7.6.2.5 for each band or band combinations listed in Table 7.6C.2\_1.1.4.1-2 shall be met for inband blocking testing for SUL configuration with inter-band DL CA.

### 7.6C.3 Out-of-band blocking for SUL

7.6C.3.1 Test Purpose

Same test purpose as in clause 7.6.3.1.

7.6C.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands.

7.6C.3.3 Minimum conformance requirements

For SUL operation, the out-of-band blocking requirement for downlink bands specified in clause 7.6.3 shall be met. For operation band combination listed in Table 7.6C.3.3-1, exceptions to the requirement specified in Table 7.6C.3.3-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3.3-1: SUL operating band combination with exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n78-n81 |
| SUL\_n78-n82 |
| SUL\_n78-n83 |
| SUL\_n79-n81 |
| SUL\_n79-n83 |

Table 7.6C.3.3-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when, where and are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively. | | |

For all interferer frequency ranges specified in clause 7.6.3 a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz with *NRB* the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.3.

7.6C.3.4 Test description

Same test description as specified in clause 7.6.3.4 with following exceptions:

Instead of table 5.3.5-1 🡪 use Table 5.5C-1

Instead of table 7.6.3.4.1-1 🡪 use Table 7.6C.3.4-1.

Table 7.6C.3.4-1: Test Configuration Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 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 for SUL carrier  One frequency chosen arbitrarily from low or high range for Non-SUL carrier | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n81: 20 MHz  n82: 20 MHz  n83: 20 MHz  n84: 20 MHz  n86: 40 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | | 15kHz for SUL carrier and lowest for Non-SUL carrier | | |
| Test Parameters | | | | | | |
| Test ID | DL Configuration | | UL Configuration | | SUL Configuration | |
|  | Mod'n | RB allocation | N/A | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | Full RB (NOTE 1) |  | | DFT-s-OFDM QPSK | REFSENS (NOTE 1) |
| NOTE 1: The specific configuration of SUL and DL are defined in Table 7.3C.2.4.1-1.  NOTE 2: Test Channel Bandwidths are checked separately for each SUL band combination, the applicable channel bandwidths are specified in Table 5.5C-1.  NOTE 3: DFT-s-OFDM PI/2 BPSK test applies only for UEs which supports half Pi BPSK in FR1.  NOTE 4: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | | |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.9 for TE diagram and section A.3.2 for UE diagram.

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

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, additionally the following exception shown in Table 7.6C.3.4-2 is considered.

Table 7.6C.3.4-2: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

Table 7.6C.3.4-3: Void

7.6C.3.5 Test Requirement

For SUL operation, the out-of-band blocking requirement for downlink bands specified in clause 7.6.3.5 shall be met. For operation band combination listed in Table 7.6C.3.5-1, exceptions to the requirement specified in Table 7.6C.3.5-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3.5-1: SUL operating band combination with exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n78-n81 |
| SUL\_n78-n82 |
| SUL\_n78-n83 |
| SUL\_n79-n81 |
| SUL\_n79-n83 |

Table 7.6C.3.5-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when, where and are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively. | | |

For all interferer frequency ranges, a maximum of



exceptions are allowed for the spurious response frequencies recorded in the final step of test procedure in each assigned frequency channel when measured using a step size of  MHz with *NRB* the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

### 7.6C.3\_1 Out-of-band blocking for SUL with DL CA

#### 7.6C.3\_1.1 Out-of-band Blocking for SUL with 2 DL CA

Editor’s Note: No test points defined for Out-of-band Blocking for SULwith inter-band 2 DL CA testing. The testing is covered by 7.6.3 and 7.6C.3

7.6C.3\_1.1.1 Test purpose

Same test purpose as in clause 7.6.3.1.

7.6C.3\_1.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward that support SUL operating on the SUL bands and intra-band contiguous 2DL CA.

7.6C.3\_1.1.3 Minimum conformance requirements

For SUL operation with downlink CA, the out-of-band blocking requirement for downlink bands specified in clause 7.6A.3 shall be met. For operation band combination listed in Table 7.6C.3\_1.1.3-1, exceptions to the requirement specified in Table 7.6C.3\_1.1.3-2 are allowed when the second order intermodulation product of the SUL carrier and the CW interfering signal fully or partially overlaps with the DL carrier.

Table 7.6C.3\_1.1.3-1: SUL operating band combination with exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n78-n81 |
| SUL\_n78-n82 |
| SUL\_n78-n83 |
| SUL\_n79-n81 |
| SUL\_n79-n83 |

Table7.6C.3\_1.1.3-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when, where and are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively. | | |

For all interferer frequency ranges specified in clause 7.6.3 a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of MHz with *NRB* the number of resource blocks in the downlink transmission bandwidth configuration, BWChannel the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

The normative reference for this requirement is TS 38.101-1 [2] clauses 7.6C.3.

7.6C.3\_1.1.4 Test description

7.6C.3\_1.1.4.1 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 7.6C.3\_1.1.4.1-1 for SUL with intra-band contiguous DL CA or Table 7.6C.3\_1.1.4.1-2 for SUL with inter-band DL CA. 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 7.6C.3\_1.1.4.1-1: Test configuration table for SUL configuration with 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 for SUL carrier  One frequency chosen arbitrarily from low or high range for Non-SUL carrier | | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest NRB\_agg for downlink bands  For SUL band:  n80: 30 MHz  n81: 20 MHz  n82: 20 MHz  n83: 20 MHz  n84: 20 MHz  n86: 40 MHz  n95: 15 MHz | | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz | | | |
| Test Parameters | | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | SUL Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | N/A | CC  Mod'n | PCC RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | NOTE 1 | DFT-s-OFDM QPSK | NOTE 2 |
| NOTE 1: The specific downlink configuration is defined in Table 7.3A.1.4.1-1.  NOTE 2: The specific SUL configuration is defined in Table 7.3C.2.4.1-1a.  NOTE 3: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | | |

**For SUL configuration with inter-band DL CA:** No testing need to be performed since the testing has been covered in test case 7.6.3 and 7.6C.3. For band combination CA\_nX\_SUL\_nY-nZ, test the out-of-band blocking of SUL configuration or NR band as listed in Table 7.6C.3\_1.1.4.1-2.

Table 7.6C.3\_1.1.4.1-2: Test band combinations and configuration

|  |  |  |  |
| --- | --- | --- | --- |
| Band configuration | Verifying out-of-band blocking of SUL configurations/ NR band | Subtest case | Table with test parameters to select |
| CA\_n1A\_SUL\_n78A-n80A | SUL\_n78-n80 | 7.6C.3 | Table 7.6C.3.4-1 |
| n1 | 7.6.3 | Table 7.6.3.4.1-1 |
| CA\_n1A\_SUL\_n78A-n84A | SUL\_n78-n84 | 7.6C.3 | Table 7.6C.3.4-1 |
| n1 | 7.6.3 | Table 7.6.3.4.1-1 |
| CA\_n3A\_SUL\_n78A-n80A | SUL\_n78-n80 | 7.6C.3 | Table 7.6C.3.4-1 |
| n3 | 7.6.3 | Table 7.6.3.4.1-1 |
| CA\_n28A\_SUL\_n41A-n83A | SUL\_n41-n83 | 7.6C.3 | Table 7.6C.3.4-1 |
| n28 | 7.6.3 | Table 7.6.3.4.1-1 |
| CA\_n28A\_SUL\_n79A-n83A | SUL\_n79A-n83A | 7.6C.3 | Table 7.6C.3.4-1 |
| n28 | 7.6.3 | Table 7.6.3.4.1-1 |

- Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.4.10 for TE diagram and section A.3.2 for UE diagram.

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

- Downlink signals are initially setup according to Annex C.0, C.1, C.2 and uplink signals according to Annex G.0, G.1, G.2, and G.3.0 with consideration of supplementary uplink physical channels.

Message contents in initial conditions are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Tables 4.6.1-28 with condition SUL AND (RF OR RRM), 4.6.3-14 with condition SUL\_SUL for SUL carrier, and Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, additionally the following exception shown in Table7.6C.3\_1.1.4.1-3 is considered.

Table 7.6C.3\_1.1.4.1-3: *PUSCH-Config*

|  |
| --- |
| Derivation Path: TS 38.508-1 [5], Table 4.6.3-118 with condition TRANSFORM\_PRECODER\_ENABLED |

7.6C.3\_1.1.4.2 Test procedure

For SUL configuration with intra-band contiguous DL CA:

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.6A.3.1.4.3.

3. SS activates SCC 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 7.6C.3\_1.1.4.1-1 on both PCC and SCC. 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 7.6C.3\_1.1.4.1-1 on SUL. Since the UE has no payload 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 the CA Band for intra-band CA, or below the SCC’s operating band for inter-band CA according to Table 7.6A.3.1.5.1-2, 7.6A.3.1.5.3-2 or 7.6A.3.1.5.3-4. 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.

7. Set the downlink signal level according to the Table 7.6A.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 for both 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.3.1.5.1-1, 7.6A.3.1.5.3-1 or 7.6A.3.1.5.3-3 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.

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

9. Record the frequencies for which the throughput doesn't meet the requirements.

10. Repeat steps from 6 to 9, using an interfering signal above the CA Band for intra-band CA at step 6.

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.

7.6C.3\_1.1.5 Test requirement

Same test requirement specified in 7.6A.3.1.5.1 shall be met for downlink bands for SUL configuration with intra-band contiguous DL CA with following exception:

Table 7.6C.3\_1.1.5-1: SUL operating band combination with exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n78-n81 |
| SUL\_n78-n82 |
| SUL\_n78-n83 |
| SUL\_n79-n81 |
| SUL\_n79-n83 |

Table 7.6C.3\_1.1.5-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when, where and are the channel bandwidths configured for SUL and DL (victim) bands in MHz, respectively. | | |

Same test requirement specified in clause 7.6C.3.5 or 7.6.3.5 for each band or band combinations listed in Table 7.6C.3\_1.1.4-1 shall be met for out-of-band blocking testing for SUL configuration with inter-band 2DL CA.

## 7.6D Blocking characteristics for UL MIMO

### 7.6D.1 General

The blocking characteristic for UL MIMO is a measure of the receiver's ability of an UE that support UL MIMO to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

### 7.6D.2 In-band blocking for UL MIMO

7.6D.2.1 Test purpose

In-band blocking for UL MIMO is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the receive band of an UE that support UL MIMO, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or into the range from 3CBW below to 3CBW above the receive band of an UE that support UL MIMO, with FDL\_high < 3300 MHz and FUL\_high < 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

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

7.6D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.2.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.2.4 Test description

7.6D.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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.6D.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.4 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6D.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 content are defined in clause 7.6D.2.4.3.

7.6D.2.4.2 Test procedure

Same test procedure as specified in 7.6.2.4.2.

7.6D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

7.6D.2.5 Test requirement

Same test requirement as specified in 7.6.2.5.

Table 7.6D.2.5-1: Void

### 7.6D.2\_1 In-band blocking for SUL with UL MIMO

7.6D.2\_1.1 Test purpose

Same test purpose as in clause 7.6D.2.1.

7.6D.2\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.6D.2\_1.3 Minimum conformance requirements

Same as in clause 7.6D.2.3.

7.6D.2\_1.4 Test description

7.6D.2\_1.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.2\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.6D.2\_1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 for SUL and NUL  With following exceptions:  SUL\_n78-n80: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.6D.2\_1.4.1-1.

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 content are defined in clause 7.6D.2\_1.4.3.

7.6D.2\_1.4.2 Test procedure

Same test procedure as specified in 7.6.2.4.2.

7.6D.2\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.6D.2\_1.5 Test requirement

Same test requirement as specified in 7.6D.2.5.

### 7.6D.3 Out-of-band blocking for UL MIMO

7.6D.3.1 Test purpose

Out-of-band blocking for UL MIMO is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the receive band of an UE that support UL MIMO, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or falling more than 3CBW below or above the receive band of an UE that support UL MIMO, with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

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

7.6D.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.3.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.3.4 Test description

7.6D.3.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.6D.3.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | One frequency chosen arbitrarily from low or high range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.5 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6D.3.4.1-1.

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 content are defined in clause 7.6D.3.4.3.

7.6D.3.4.2 Test procedure

Same test procedure as specified in 7.6.3.4.2.

7.6D.3.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

7.6D.3.5 Test requirement

Same test requirement as specified in 7.6.3.5.

Table 7.6D.3.5-1: Void

### 7.6D.3\_1 Out-of-band blocking for SUL with UL MIMO

7.6D.3\_1.1 Test purpose

Same test purpose as in clause 7.6D.3.1.

7.6D.3\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.6D.3\_1.3 Minimum conformance requirements

Same minimum conformance requirements as specified in 7.6D.3.3

7.6D.3\_1.4 Test description

7.6D.3\_1.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.3\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.6D.3\_1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 for SUL carrier  One frequency chosen arbitrarily from low or high range for Non-SUL carrier  With following exceptions:  SUL\_n78-n80: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.6D.3\_1.4.1-1.

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 content are defined in clause 7.6D.3\_1.4.3.

7.6D.3\_1.4.2 Test procedure

Same test procedure as specified in 7.6.3.4.2.

7.6D.3\_1.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.6D.3\_1.5 Test requirement

Same test requirement as specified in 7.6.3.5.

### 7.6D.4 Narrow band blocking for UL MIMO

7.6D.4.1 Test purpose

Narrow band blocking for UL MIMO is defined for a receiver's ability of an UE that supports UL MIMO to receive a NR signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

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

7.6D.4.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.6D.4.3 Minimum conformance requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in subclause 7.6 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6D.

7.6D.4.4 Test description

7.6D.4.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6D.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.6D.4.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.5 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6D.4.4.1-1.

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 content are defined in clause 7.6D.4.4.3.

7.6D.4.4.2 Test procedure

Same test procedure as specified in 7.6.4.4.2.

7.6D.4.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

7.6D.4.5 Test requirement

Same test requirement as specified in 7.6.4.5.

Table 7.6D.4.5-1: Void

### 7.6D.4\_1 Void

## 7.6E Blocking characteristics for V2X

### 7.6E.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

### 7.6E.2 In-band blocking for V2X

#### 7.6E.2.0 Minimum conformance requirements

7.6E.2.0.1 General

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annex A.7.2 with parameters specified in Table 7.6E.2.0.1-1 and Table 7.6E.2.0.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.2.0.1-1: In-band blocking parameters for NR V2X

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 10 MHz | 20 MHz | 30 MHz | 40 MHz |
| Power in transmission bandwidth configuration | dBm | PREFSENS\_V2X + channel bandwidth specific value below | | | |
|  | dB | 6 | 9 | 11 | 12 |
| BWinterferer | MHz | 10 | | | |
| FIoffset, case 1 | MHz | 15 | | | |
| FIoffset, case 2 | MHz | 25 | | | |
| NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. | | | | | |

Table 7.6E.2.0.1-2: In-band blocking for NR V2X

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| n38, n47 | Pinterferer | dBm | -44 | -44 |
|  | Finterferer (offset) | MHz | -BW/2 – FIoffset, case 1  and  BW/2 + FIoffset, case 1 | ≤ -BW/2 – FIoffset, case 2  and  ≥ BW/2 + FIoffset, case 2 |
|  | Finterferer | MHz | NOTE 2 | FDL\_low – 30  to  FDL\_high + 30 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.  NOTE 2: For each carrier frequency the requirement is valid for two frequencies:  a. the carrier frequency -BW/2 – FIoffset, case 1 and  b. the carrier frequency +BW/2 + FIoffset, case 1  NOTE 3: FInterferer range values for unwanted modulated interfering signal are interferer centre frequencies  NOTE 4: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS. | | | | |

7.6E.2.0.2 In-band blocking for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.6E.2.0.1 shall apply for the NR sidelink reception in the operating bands in Table 5.2E.2-1 and the requirements specified in clause 7.6.2 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6E.2.

#### 7.6E.2.1 In-band blocking for V2X / non-concurrent operation

FFS

#### 7.6E.2.2 In-band blocking for V2X / con-current operation

FFS

### 7.6E.3 Out-of-band blocking for V2X

#### 7.6E.3.0 Minimum conformance requirements

7.6E.3.0.1 General

For NR V2X bands out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 30 MHz below or above the UE receive band. When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.6E.3.0.1-1 and Table 7.6E.3.0.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.3.0.1-1: Out-of-band blocking parameters for NR V2X

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 10 MHz | 20 MHz | 30 MHz | 40 MHz |
| Power in transmission bandwidth configuration | dBm | PREFSENS\_V2X + channel bandwidth specific value below | | | |
|  | dB | 6 | 9 | 11 | 12 |
| NOTE: Reference measurement channel is A.7.2. | | | | | |

Table 7.6E.3.0.1-2: Out of-band blocking for NR V2X

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Units | Range 1 | Range 2 | Range 3 |
| n47 | Pinterferer | dBm | -44 | -30 | -15 |
|  | Finterferer (CW) | MHz | FDL\_low -30 to  FDL\_low -60 | FDL\_low -60 to  FDL\_low -85 | FDL\_low -85 to  1 MHz |
|  |  |  | FDL\_high +30 to  FDL\_high + 60 | FDL\_high +60 to  FDL\_high +85 | FDL\_high +85 to  +12750 MHz |
| n38 | Pinterferer | dBm | -44 | -30 | -15 |
|  | Finterferer (CW) | MHz | FDL\_low -30 to  FDL\_low -60 | FDL\_low -60 to  FDL\_low -85 | FDL\_low -85 to  1 MHz |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4400 MHz. | | | | | |

7.6E.3.0.2 Out-of-band blocking for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.6E.3.0.1 shall apply for the NR sidelink reception in Band n47 and the requirements specified in clause 7.6.3 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6E.3.

#### 7.6E.3.1 Out-of-band blocking for V2X / non-concurrent operation

FFS

#### 7.6E.3.2 Out-of-band blocking for V2X / con-current operation

FFS

## 7.6F Blocking characteristics for shared spectrum channel access

### 7.6F.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

### 7.6F.2 In-band blocking

#### 7.6F.2.1 In-band blocking for shared spectrum channel access

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU and TT for >6GHz (band n96) are working assumption based on analysis of single TE vendor. Values will be revisited once analysis from other TE vendors is available.

- Message contents and test procedure specific for NR-U is TBD

##### 7.6F.2.1.1 Test purpose

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 60 MHz below or above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

##### 7.6F.2.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

##### 7.6F.2.1.3 Minimum conformance requirements

In-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 60 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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 7.6F.2.1.3-1 and Table 7.6F.2.1.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.2.1.3-1: In-band blocking parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | |
|  | dB | 9 | 12 | 13.8 | 15 |
| BWinterferer | MHz | 20 | | | |
| FIoffset, case 1 | MHz | 30 | | | |
| FIoffset, case 2 | MHz | ≥ 50 | | | |

Table 7.6F.2.1.3-2: In-band blocking for shared access bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
|  | Finterferer (offset) | MHz | -CBW/2 –  FIoffset, case 1  and  CBW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |
| n46, n96 | Finterferer |  | NOTE 2 | FDL\_low – 3\*CBW  to  FDL\_high + 3\*CBW,  NOTE 4 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: CBW denotes the channel bandwidth of the wanted signal.  NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – FIoffset, case 2 and CBW/2 + FIoffset, case 2 | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6F.2.1.

##### 7.6F.2.1.4 Test description

7.6F.2.1.4.1 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 operating bands supporting operation with shared spectrum channel access. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.6F.2.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6F.2.1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3F.2.4.1-2 and Table 7.3F.2.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3F.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6F.2.1.4.1-1.

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 content are defined in clause 7.6F.2.1.4.3.

7.6F.2.1.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6F.2.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6F.2.1.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in according to Tables 7.6F.2.1.5-1 and 7.6F.2.1.5-2.

4. Set the downlink signal level according to Tables 7.6F.2.1.5-1. 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 7.6F.2.1.5-1 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.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

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.

7.6F.2.1.4.3 Message contents

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

##### 7.6F.2.1.5 Test requirement

For NR bands supporting shared spectrum channel access, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.6F.2.1.5-1 and Tables 7.6F.2.1.5-2.

Table 7.6F.2.1.5-1: In-band blocking parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | |
|  | dB | 9 | 12 | 13.8 | 15 |
| BWinterferer | MHz | 20 | | | |
| FIoffset, case 1 | MHz | 30 | | | |
| FIoffset, case 2 | MHz | ≥ 50 | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3F.2.3-3 with PCMAX\_L,f,c defined in clause [6.2F.4].  NOTE 2: The interferer consists of the RMC 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 | | | | | |

Table 7.6F.2.1.5-2: In-band blocking for shared access bands

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
|  | Finterferer (offset) | MHz | -CBW/2 –  FIoffset, case 1  and  CBW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |
| n46, n96 | Finterferer |  | NOTE 2 | FDL\_low – 3\*CBW  to  FDL\_high + 3\*CBW,  NOTE 4 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: CBW denotes the channel bandwidth of the wanted signal  NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – FIoffset, case 2 and CBW/2 + FIoffset, case 2 | | | | |

#### 7.6F.2.2 In-band blocking for Intra-band contiguous shared spectrum channel access CA

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### 7.6F.3 Out-of-band blocking

7.6F.3.1 Out-of-band blocking for shared spectrum channel access

7.6F.3.1.1 Test purpose

The test purpose is to verify the ability of the UE to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, and with the present of CW interfering signal falling outside a frequency range 60 MHz or greater below or above the UE receive band.

7.6F.3.1.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.6F.3.1.3 Minimum conformance requirements

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 60 MHz or greater below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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 7.6F.3.1.3-1 and Table 7.6F.3.1.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.3.1.3-1: Out-of-band blocking parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth 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 with PCMAX\_L,f,c defined in clause 6.2.4. | | | | | |

Table 7.6F.3.1.3-2: Out of-band blocking for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Range1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -44 | -30 | -15 |
| n46, n96 | Finterferer (CW) | MHz | N/A | -200 < f – FDL\_low ≤ -3\*CBW  or  3\*CBW ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*CBW)  or  FDL\_high + MAX(200,3\*CBW)  ≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4200 MHz.  NOTE 2: CBW denotes the channel bandwidth of the wanted signal | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6F.3.1.3-2, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7F apply.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6F.3.1

7.6F.3.1.4 Test description

7.6F.3.1.4.1 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 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing are shown in Table 7.6F.3.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) 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.3.

Table 7.6F.3.1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | One frequency chosen arbitrarily from low or high range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table Table 7.3F.2.4.1-2 and Table 7.3F.2.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3F.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508 [5] Annex A, in Figure A.3.1.4.2 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 [5] subclause 4.4.3.

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

4. The UL and DL Reference Measurement channels are set according to Table 7.6F.3.1.4.1-1.

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 7.6F.3.1.4.2.

7.6F.3.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6F.3.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6F.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6F.3.1.5- 2. The frequency step size is  MHz.

4. Set the downlink signal level according to Table 7.6F.3.1.5-1. 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 7.6F.3.1.5-1 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.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

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.

7.6F.3.1.4.2 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.6F.3.1.5 Test Requirement

For NR bands with shared spectrum channel access, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Table 7.6F.3.1.5-1 and Table 7.6F.3.1.5-2.

The number of spurious response frequencies recorded in the final step 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 7.7F Spurious Response are applicable.

Table 7.6F.3.1.5-1: Out-of-band blocking parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth 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 7.3F.2-3 with PCMAX\_L,f,c defined in clause 6.2F.4. | | | | | |

Table 7.6F.3.1.5-2: Out of-band blocking for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Range1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -44 | -30 | -15 |
| n46, n96 | Finterferer (CW) | MHz | N/A | -200 < f – FDL\_low ≤ -3\*CBW  or  3\*CBW ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*CBW)  or  FDL\_high + MAX(200,3\*CBW)  ≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 4200 MHz.  NOTE 2: CBW denotes the channel bandwidth of the wanted signal | | | | | |

7.6J Blocking characteristics for ATG

7.6J.1 General

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

### 7.6J.2 In-band blocking for ATG

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU and TT are FFS

- Message Contents are FFS pending on Rel-18 ASN.1 freeze

7.6J.2.1 Test purpose

In band blocking is defined for an unwanted interfering signal falling into the range from 15 MHz below to 15 MHz above the UE receive band, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or into an immediately adjacent frequency range up 3\*BWChannel below or above the UE receive band, with FDL\_low ≥3300 MHz and FUL\_low ≥ 3300 MHz, at which the relative throughput shall meet or exceed the requirement for the specified measurement channel.

7.6J.2.2 Test applicability

This test case applies to all types of NR UE release 18 and forward that support NR standalone ATG.

7.6J.2.3 Minimum conformance requirements

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The throughput of the wanted signal 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) with parameters specified in Table 7.6J.2.3-1 and Table 7.6J.2.3-2. The relative throughput shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6J.2.3-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration3 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| BWinterferer | MHz | 5 | | |
| FIoffset, case 1 | MHz | 7.5 | | |
| FIoffset, case 2 | MHz | 12.5 | | |
| 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 6.2J.2.  NOTE 2: The interferer consists of the RMC 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 3 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.6J.2.3-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
|  | Pinterferer | dBm | -56 | -44 | -15 | -38 |
|  | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |  | -BWChannel/2-11 |
| n1, n3, n34, n39, n41 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1 | | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into an immediately adjacent frequency range up to 3\* BWChannel below or above the UE receive band where BWChannel is the bandwidth of the wanted signal. The throughput of the wanted signal 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 7.6J.2.3-3 and Table 7.6J.2.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6J.2.3-3: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB |
| BWinterferer | MHz | BWChannel |
| FIoffset, case 1 | MHz | (3/2)\*BWChannel |
| FIoffset, case 2 | MHz | (5/2)\*BWChannel |
| 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 6.2J.2.  NOTE 2: The interferer consists of the RMC 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 | | |

Table 7.6J.2.3-4: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
| n78, n79 | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |
|  | Finterferer |  | NOTE 2 | FDL\_low – 3\*BWChannel  to  FDL\_high + 3\*BWChannel |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: BWChannel denotes the channel bandwidth of the wanted signal | | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6J.2 and 7.6.2.

7.6J.2.4 Test description

7.6J.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 7.6J.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6J.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.1 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.6J.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 7.6J.2.4.3.

7.6J.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6J.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6J.2.4.1-1. Since the UL has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.

3. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6J.2.5-1 and 7.6J.2.5-2 or Tables 7.6J.2.5-3 and 7.6J.2.5-4 as appropriate depending on NR band.

4. Set the downlink signal level according to the table 7.6J.2.5-1 or 7.6J.2.5-3 as appropriate. 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 7.6J.2.5-1 or Table 7.6J.2.5-3 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.

- The transmit power is measured as the sum of power of all antenna connectors (for ATG UE with omni-directional antennas) or of all TAB connectors (for ATG UE with antenna array).

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.

7. Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3and 6. The ranges of case 2 are covered in steps equal to the interferer bandwidth. Interferer frequencies should be chosen starting with an offset nearest to the centre frequency and sweep outwards towards the band edges. In order to ensure that full range is tested for interferer frequency, run last test steps at frequency equal to FInterferer range limit defined at the corresponding band edge.

8. If applicable based on NR band, repeat steps from 3 to 5, using interfering signals in Case 4 at step 3.

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.

7.6J.2.4.3 Message contents

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7.6J.2.5 Test requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex in Annexes A.2.2, A.2.3 and A.3.2 with parameters specified in Tables 7.6J.2.5-1 and 7.6J.2.5-2.

Table 7.6J.2.5-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration3 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| BWinterferer | MHz | 5 | | |
| FIoffset, case 1 | MHz | 7.5 | | |
| FIoffset, case 2 | MHz | 12.5 | | |
| 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 6.2J.2.  NOTE 2: The interferer consists of the RMC 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 3: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.6J.2.5-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
|  | Pinterferer | dBm | -56 | -44 | -15 | -38 |
|  | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |  | -BWChannel/2-11 |
| n1, n3, n34, n39, n41 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1 | | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.2 and A.3 with parameters specified in Tables 7.6J.2.5-3 and 7.6J.2.5-4.

Table 7.6J.2.5-3: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB |
| BWinterferer | MHz | BWChannel |
| FIoffset, case 1 | MHz | (3/2)\*BWChannel |
| FIoffset, case 2 | MHz | (5/2)\*BWChannel |
| 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 6.2J.2.  NOTE 2: The interferer consists of the RMC 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 | | |

Table 7.6J.2.5-4: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
| n78, n79 | Finterferer (offset) | MHz | -BWChannel/2 –  FIoffset, case 1  and  BWChannel/2 +  FIoffset, case 1 | ≤ -BWChannel/2 –  FIoffset, case 2  and  ≥ BWChannel/2 +  FIoffset, case 2 |
|  | Finterferer |  | NOTE 2 | FDL\_low – 3\*BWChannel  to  FDL\_high + 3\*BWChannel |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1  NOTE 3: BWChannel denotes the channel bandwidth of the wanted signal | | | | |

### 7.6J.3 Out-of-band blocking for ATG

Editor’s note: This clause is incomplete. The following aspects are either missing or not yet determined:

- MU and TT are FFS

- Message Contents are FFS pending on Rel-18 ASN.1 freeze

7.6J.3.1 Test Purpose

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band, with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, or falling outside a frequency range up to 3\*BWChannel below or from 3\*BWChannel above the UE receive band, with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

7.6J.3.2 Test Applicability

This test case applies to all types of NR UE release 18 and forward that support NR standalone ATG.

7.6J.3.3 Minimum Conformance Requirements

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band. The throughput of the wanted signal 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 7.6J.3.3-1 and Table 7.6J.3.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6J.3.3-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |
| --- | --- |
| **Channel bandwidth** | **Power in transmission bandwidth configuration [dBm]** |
| 5 MHz | REFSENS + 6.0 dB |
| 10 MHz | REFSENS + 6.0 dB |
| 15 MHz | REFSENS + 7.0 dB |
| 20 MHz | REFSENS + 9.0 dB |
| 25 MHz | REFSENS + 10.0 dB |
| 30 MHz | REFSENS + 11.0 dB |
| 35 MHz | REFSENS + 11.5 dB |
| 40 MHz | REFSENS + 12.0 dB |
| 45 MHz | REFSENS + 12.5 dB |
| 50 MHz | REFSENS + 13.0 dB |
| 60 MHz | REFSENS + 14.0 dB |
| 70 MHz | REFSENS + 14.5 dB |
| 80 MHz | REFSENS + 15.0 dB |
| 90 MHz | REFSENS + 15.5 dB |
| 100 MHz | REFSENS + 16.0 dB |
| NOTE: 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 6.2J.2. | |

Table 7.6J.3.3-2: 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, n3 n34, n39, n41 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz. | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6J.3.3-2, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, BWChannel isthe bandwidth of the frequency channel in MHz and *n* = 1,2,3 for SCS = 15,30,60 kHz, respectively. For these exceptions, the requirements in subclause 7.7J apply.

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range up to 3\*BWChannel below or from 3\*BWChannel above the UE receive band, where BWChannel is the channel bandwidth. The throughput of the wanted signal 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 7.6J.3.3-3 and Table 7.6J.3.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6J.3.3-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| NOTE: 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 6.2J.2. | | | | |

Table 7.6J.3.3-4: 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 |
| n78  (NOTE 3) | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low ≤ -3\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high+ MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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. | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6J.3.3-4, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, BWChannel the bandwidth of the frequency channel in MHz and *n* = 1,2,3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in subclause 7.7J apply.

NOTE: In 3GPP, the ATG UE out-of-band blocking specification is defined to ensure the telecommunication link and there may be other sources of interference and regulatory issues that need to be considered when designing ATG UE, i.e. avionic equipment.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.6J.3 and 7.6.3.

7.6J.3.4 Test Description

7.6J.3.4.1 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 5.3.5-1. All these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, and are shown in Table 7.6J.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) 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.3.

Table 7.6J.3.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | One frequency chosen arbitrarily from low or high range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508 [5] Annex A, in Figure A.3.1.4.2 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 [5] subclause 4.4.3.

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

4. The UL and DL Reference Measurement channels are set according to Table 7.6J.3.4.1-1.

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 7.6J.3.4.3.

7.6J.3.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6J.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6J.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to Table 7.6J.3.5-2 or 7.6J.3.5-4. The frequency step size is  MHz.

4. Set the downlink signal level according to the Table 7.6J.3.5-1 or 7.6J.3.5-3. 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 7.6J.3.5-1 or Table 7.6J.3.5-3 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.

- The transmit power is measured as the sum of power of all antenna connectors (for ATG UE with omni-directional antennas) or of all TAB connectors (for ATG UE with antenna array).

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.

6. Record the frequencies for which the throughput doesn't meet the requirements.

7. Repeat steps from 3 to 6, using an interfering signal above the wanted signal at step 3.

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.

7.6J.3.4.3 Message Contents

FFS

7.6J.3.5 Test Requirement

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6J.3.5-1 and 7.6J.3.5-2.

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz, the number of spurious response frequencies recorded in the final step 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 7.7J Spurious Response are applicable.

Table 7.6J.3.5-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |
| --- | --- |
| **Channel bandwidth** | **Power in transmission bandwidth configuration [dBm]** |
| 5 MHz | REFSENS + 6.0 dB |
| 10 MHz | REFSENS + 6.0 dB |
| 15 MHz | REFSENS + 7.0 dB |
| 20 MHz | REFSENS + 9.0 dB |
| 25 MHz | REFSENS + 10.0 dB |
| 30 MHz | REFSENS + 11.0 dB |
| 35 MHz | REFSENS + 11.5 dB |
| 40 MHz | REFSENS + 12.0 dB |
| 45 MHz | REFSENS + 12.5 dB |
| 50 MHz | REFSENS + 13.0 dB |
| 60 MHz | REFSENS + 14.0 dB |
| 70 MHz | REFSENS + 14.5 dB |
| 80 MHz | REFSENS + 15.0 dB |
| 90 MHz | REFSENS + 15.5 dB |
| 100 MHz | REFSENS + 16.0 dB |
| NOTE: 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 6.2J.2. | |

Table 7.6J.3.5-2: 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, n3, n34, n39, n41 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| NOTE: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz. | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters specified in Tables 7.6J.3.5-3 and 7.6J.3.5-4.

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz, the number of spurious response frequencies recorded in the final step 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 7.7J Spurious Response are applicable.

Table 7.6J.3.5-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| NOTE: 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 6.2J.2 | | | | |

Table 7.6J.3.5-4: 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 |
| n78  (NOTE 3) | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low ≤ -3\*BWChannel  or  3\*BWChannel ≤ f – FDL\_high < 60 | -200 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel)  or  FDL\_high + MAX(200,3\*BWChannel)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | -150 < f – FDL\_low ≤ -MAX(60,3\*BWChannel)  or  MAX(60,3\*BWChannel) ≤ f – FDL\_high < 150 | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel)  or  FDL\_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 signal  NOTE 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. | | | | | |

## 7.7 Spurious response

7.7.1 Test Purpose

Spurious response is a measure of the ability of the receiver to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency for which a response is obtained, i.e. for which the out-of-band blocking limit as specified in subclause 7.6.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7.2 Test Applicability

This test applies to all types of NR UE release 15 and forward.

7.7.3 Minimum Conformance Requirements

The throughput 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 for the wanted signal as specified in Table 7.7.3-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and in Table 7.7.3-1a for NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥ 3300 MHz and for the interferer as specified in Table 7.7.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.7.3-1: Spurious response parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration2 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| 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: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.7.3-1a: Spurious response parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| 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. | | | | |

Table 7.7.3-2: Spurious response

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer  (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7.

7.7.4 Test Description

7.7.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.3.4.1 in order to test spurious responses obtained in clause 7.6.3 under the same conditions.

7.7.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6.3.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6.3.4.2.

4. Set the downlink signal level according to the table 7.7.5-1 or 7.7.5-1a. 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 7.7.5-1 or 7.7.5-1a 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.5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

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.

7.7.4.3 Message Contents

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

7.7.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters for the wanted signal as specified in Table 7.7.5-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and in Table 7.7.5-1a for NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥ 3300 MHz and for the interferer as specified in Table 7.7.5-2.

Table 7.7.5-1: Spurious response parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration2 | dBm | REFSENS + 6 dB | REFSENS +  7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| 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: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.7.5-1a: Spurious response parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| 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. | | | | |

Table 7.7.5-2: Spurious response

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer  (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

Table 7.7.5-3: Void

## 7.7A Spurious response for CA

### 7.7A.0 Minimum conformance requirements

#### 7.7A.0.1 Minimum conformance requirements for intra-band contiguous CA

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7A.1.

Table 7.7A.0.1-1: Spurious response parameters for intra-band contiguous CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | BW Class | | |
| B | C | D |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel specific value below | | |
| dB | 9 | 9 | 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. | | | | |

Table 7.7A.0.1-2: Spurious response for CA

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

#### 7.7A.0.2 Void

#### 7.7A.0.3 Minimum conformance requirements 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 spurious response are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.7 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.7.3-2 is increased by the amount given by ΔRIB,c defined in Table 7.3A.0.3.2.1-1.

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).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7A.3.

#### 7.7A.0.4 Minimum conformance requirements for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the spurious response requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in clauses 7.7 and 7.7A.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

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).

### 7.7A.1 Spurious response for CA (2DL CA)

7.7A.1.1 Test Purpose

Spurious response for 2DL CA verifies the receiver's ability to receive a wanted 2DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 2DL CA.

7.7A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.1.4 Test Description

7.7A.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.1.4.1 in order to test spurious responses obtained in clause 7.6A.3.1 under the same conditions.

7.7A.1.4.2 Test Procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.7A.1.4.3.

3. SS activates SCC 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 Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCC. 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 Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCC. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

6. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7A.0.1-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6A.3 Out-of-band blocking for CA.

7. Set the downlink signal level according to Table 7.7A.0.1-1 for both 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 7.7A.0.1-1 + (10log(P\_LCRB/NRB\_alloc) for PCC, 10log(S\_LCRB/NRB\_alloc) for SCC) 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. For each spurious frequency, measure the average throughput for each component carrier for duration sufficient to achieve statistical significance according to Annex H.2A.

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 7.7A.1.4.2-1: Void

7.7A.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.7A.1.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex 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 7.7A.0.1-1 and 7.7A.0.1-2. For the UE which supports inter-band 2DL CA configuration in Table7.3A.0.3.2.1-1, PInterferer power defined in Table 7.7A.0.1-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

### 7.7A.2 Spurious response for CA (3DL CA)

7.7A.2.1 Test Purpose

Spurious response for 3DL CA verifies the receiver's ability to receive a wanted 3DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.2.2 Test Applicability

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

7.7A.2.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.2.4 Test Description

7.7A.2.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.2.4.1 in order to test spurious responses obtained in clause 7.6A.3.2 under the same conditions.

7.7A.2.4.2 Test Procedure

Same test procedure as sub-clause 7.7A.1.4.2 with the following exceptions:

Step 1, 2 and 4 of Test Procedure as in clause 7.7A.1.4.2 is replaced by:

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCCs. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Test Configuration Table 7.6A.3.1.4.1-1, 7.6A.3.1.4.1-2 or 7.6A.3.1.4.1-3 in Clause 7.6A.3 on both PCC and SCCs. Since the UE has no payload data to send, the UE sends uplink MAC padding bits on the UL RMC.

4. Set the downlink signal level according to Table 7.7A.0.1-1 for both 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 7.7A.0.1-1 + (10log(P\_LCRB/NRB\_alloc) for PCC, 10log(S\_LCRB/NRB\_alloc) for SCC) 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.

7.7A.2.4.3 Message Contents

Same message contents as sub-clause 7.7A.1.4.3.

7.7A.2.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex 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 7.7A.0.1-1 and 7.7A.0.1-2. For the UE which supports inter-band 3DL CA configuration in Table 7.3A.0.3.2.3-1, PInterferer power defined in Table 7.7A.0.1-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.3-1.

### 7.7A.3 Spurious response for CA (4DL CA)

7.7A.3.1 Test Purpose

Spurious response for 4DL CA verifies the receiver's ability to receive a wanted 4DL carrier aggregated signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in sub-clause 7.6A.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7A.3.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support 4DL CA.

7.7A.3.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.7A.0.

7.7A.3.4 Test Description

7.7A.3.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6A.3.3.4.1 in order to test spurious responses obtained in clause 7.6A.3.3 under the same conditions.

7.7A.3.4.2 Test Procedure

Same test procedure as sub-clause 7.7A.2.4.2.

7.7A.3.4.3 Message Contents

Same message contents as sub-clause 7.7A.1.4.3.

7.7A.3.5 Test Requirement

The throughput measurement of each carrier derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex 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 7.7A.0.1-1 and 7.7A.0.1-2.For the UE which supports inter-band 4DL CA configuration in Table 7.3.2\_1.3-1 and Table 7.3A.0.3.2.4-1, PInterferer power defined in Table 7.7A.0.1-2 is increased by the amount given by ΔRIB,c in Table 7.3.2\_1.3-1 and Table 7.3A.0.3.2.4-1.

## 7.7B Spurious response for NR-DC

For inter-band NR-DC configurations, the spurious response for the corresponding inter-band CA configuration as specified in clause 7.7A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.7A.

## 7.7D Spurious response for UL MIMO

7.7D.1 Test Purpose

Spurious response verifies the ability of the UE that support UL MIMO to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking for UL MIMO limit as specified in sub-clause 7.6D.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7D.2 Test Applicability

This test applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.7D.3 Minimum Conformance Requirements

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.7.3 shall be met with the UL MIMO configurations specified in Table 6.2D.1.4.1-1 in Clause 6.2 D.1 UE maximum output power for UL MIMO. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmitter antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7D.

7.7D.4 Test Description

7.7D.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6D.3.4.1 in order to test spurious responses obtained in clause 7.6D.3 under the same conditions.

7.7D.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Test Configuration Table 7.6D.3.4.1-1 in Clause 7.6D.3. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Test Configuration Table 7.6D.3.4.1-1 in Clause 7.6D.3. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6D.3.4.2.

4. Set the downlink signal level according to the Table 7.7.5-1 or 7.7.5-1a. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7.5-1a in table 7.7.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

7.7D.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] clause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

7.7D.5 Test Requirement

Same test requirement as specified in 7.7.5.

## 7.7D\_1 Spurious response for SUL with UL MIMO

7.7D\_1.1 Test Purpose

Same test purpose as in clause 7.7D.1.

7.7D\_1.2 Test Applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.7D\_1.3 Minimum Conformance Requirements

Same minimum conformance requirements as in clause 7.7D.3.

7.7D\_1.4 Test Description

7.7D\_1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6D.3\_1.4.1 in order to test spurious responses obtained in clause 7.6D.3 under the same conditions.

7.7D\_1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Test Configuration Table 7.6D.3\_1.4.1-1 in Clause 7.6D.3\_1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 Test Configuration Table 7.6D.3\_1.4.1-1 in Clause 7.6D.3\_1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC. The PDCCH DCI format 0\_1 is specified with condition 2TX\_UL\_MIMO in 38.508-1 [5] subclause 4.3.6.1.1.2.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6D.3\_1.4.2.

4. Set the downlink signal level according to the Table 7.7.5-1 or 7.7.5-1a. Send uplink power control commands to the UE (less or equal to 1dB step size should be used), to ensure that the UE output power is within +0, - 3.4 dB of the target level in table 7.7.5-1a in table 7.7.5-1 for carrier frequency f ≤ 3.0GHz or within +0, -4.0 dB of the target level for carrier frequency 3.0GHz < f ≤ 4.2GHz, for at least the duration of the throughput measurement.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

7.7D\_1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.7D\_1.5 Test Requirement

Same test requirement as specified in 7.7.5.

## 7.7E Spurious response for V2X

### 7.7E.0 Minimum conformance requirements

7.7E.0.1 General

Spurious response is a measure of the receiver’s ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency for which a response is obtained, i.e. for which the out-of-band blocking limit as specified in clause 7.6E.3.0.1 is not met.

When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters for the wanted signal as specified in Table 7.7E.0.1-1 and Table 7.7E.0.1-2 for NR V2X bands. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.7E.0.1-1: Spurious response parameters for NR V2X

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 10 MHz | 20 MHz | 30 MHz | 40 MHz |
| Power in transmission bandwidth configuration | dBm | PREFSENS\_V2X + channel bandwidth specific value below | | | |
|  | dB | 6 | 9 | 11 | 12 |
| NOTE 1: Reference measurement channel is A.7.2 | | | | | |

Table 7.7E.0.1-2: Spurious response for NR V2X

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

7.7E.0.2 Spurious response for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.7E.0.1 shall apply for the NR sidelink reception in the operating bands in Table 5.2E.2-1 and the requirements specified in clause 7.7 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7E.

### 7.7E.1 Spurious response for V2X / non-concurrent operation

### 7.7E.2 Spurious response for V2X / con-current operation

## 7.7F Spurious response for shared spectrum channel access

### 7.7F.1 Spurious response for shared spectrum channel access

#### 7.7F.1.1 Test Purpose

Spurious response verifies the ability of the UE that supports shared spectrum channel access to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking for shared spectrum channel access as specified in sub-clause 7.6F.3.1 is not met.

#### 7.7F.1.2 Test Applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

#### 7.7F.1.3 Minimum Conformance Requirements

For spurious responses, the throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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 7.7F.1.3-1 and Table 7.7F.1.3-2. The relative throughput requirement shall be met for any SCS at any other frequency at which a response is obtained i.e. for which the limit as specified in clause 7.6F.3.1 is not met.

Table 7.7F.1.3-1: Spurious response parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth 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 7.3F.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4. | | | | | |

Table 7.7F.1.3-2: Spurious response for shared spectrum channel access

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7F.1

#### 7.7F.1.4 Test Description

7.7F.1.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6F.3.1.4.1 in order to test spurious responses obtained in clause 7.6F.3.1 under the same conditions.

7.7F.1.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6F.3.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6F.3.1.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7F.1.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6F.3.1.4.2.

4. Set the downlink signal level according to Table 7.7F.1.5-1. 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 7.7F.1.5-1 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.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

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.

7.7F.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

#### 7.7F.1.5 Test Requirements

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters for the wanted signal as specified in Table 7.7F.1.5-1, and for the interferer as specified in Table 7.7F.1.5-2.

Table 7.7F.1.5-1: Spurious response parameters for shared access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth 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 7.3F.2.3-3 with PCMAX\_L,f,c defined in clause 6.2.4. | | | | | |

Table 7.7F.1.5-2: Spurious response for shared spectrum channel access

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

### 7.7F.2 Intra-band contiguous shared spectrum channel access CA

FFS

## 7.7J Spurious response for ATG

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Annex F MU/TT is FFS.

- Message contents are TBC pending on Rel-18 ASN.1 freeze.

7.7J.1 Test Purpose

Spurious response is a measure of the ability of the receiver to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency for which a response is obtained, i.e. for which the out-of-band blocking limit as specified in subclause 7.6J.3 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7J.2 Test Applicability

This test case applies to all types of NR ATG UE release 18 and forward.

7.7J.3 Minimum Conformance Requirements

For ATG UE, the minimum conformance requirements shall be the same as in clause 7.7.3.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.7J.

7.7J.4 Test Description

7.7J.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6J.3.4.1 in order to test spurious responses obtained in clause 7.6J.3 under the same conditions.

7.7J.4.2 Test Procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.6J.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.6J.3.4.1-1. Since the UE has no payload and no loopback data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7J.5-2. The spurious frequencies are taken from records in the final step of test procedures in clause 7.6J.3.4.2.

4. Set the downlink signal level according to the table 7.7J.5-1 or 7.7J.5-1a. 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 7.7J.5-1 or 7.7J.5-1a 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.

5. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

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.

7.7J.4.3 Message Contents

FFS

7.7J.5 Test Requirement

The throughput measurement derived in test procedure shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 and A.3.3 with parameters for the wanted signal as specified in Table 7.7J.5-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and in Table 7.7J.5-1a for NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥ 3300 MHz and for the interferer as specified in Table 7.7J.5-2.

Table 7.7J.5-1: Spurious response parameters for ATG UE for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration2 | dBm | REFSENS + 6 dB | REFSENS +  7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| 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 6.2J.2.  NOTE 2: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.7J.5-1a: Spurious response parameters for ATG UE for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Power in transmission bandwidth configuration | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + 9 dB |
| 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 6.2J.2. | | | | |

Table 7.7J.5-2: Spurious response for ATG UE

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer  (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

## 7.8 Intermodulation characteristics

### 7.8.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

### 7.8.2 Wide band Intermodulation

7.8.2.1 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.

7.8.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.8.2.3 Minimum conformance requirements

The wide band intermodulation requirement is defined using a CW carrier and modulated NR signal as interferer 1 and interferer 2 respectively.

The throughput 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 7.8.2.3-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Table 7.8.2.3-2 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.8.2.3-1: Wide band intermodulation parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC5 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| PInterferer 1 (CW) | dBm | -46 | | |
| PInterferer 2 (Modulated) | dBm | -46 | | |
| BWInterferer 2 | MHz | 5 | | |
| FInterferer 1 (Offset) | MHz | -BWchannel/2 – 7.5  /  +BWchannel/2 + 7.5 | | |
| 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.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.  NOTE 5: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.8.2.3-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 6dB |
| PInterferer 1 (CW) | dBm | -46 |
| PInterferer 2  (Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | BWchannel |
| FInterferer 1  (Offset) | MHz | -2BWchannel  /  +2BWchannel |
| 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. | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8.2.

7.8.2.4 Test description

7.8.2.4.1 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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 7.8.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL (NOTE 3) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Additional test points selected according to asymmetric channel bandwidths specified in clause 5.3.6. DL channel bandwidth shall be selected first.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.3 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, C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.8.2.4.1-1.

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 content are defined in clause 7.8.2.4.3.

7.8.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.8.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.8.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8.2.5-1 or Table 7.8.2.5-2. 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 7.8.2.5-1 or Table 7.8.2.5-2 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.

4. Set the Interfering signal levels to the values as defined in Table 7.8.2.5-1 or Table 7.8.2.5-2 and frequency below the wanted signal.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

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.

7.8.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with DFT-s-OFDM condition in Table 4.6.3-118 PUSCH-Config.

7.8.2.5 Test requirement

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 7.8.2.5-1 or Table 7.8.2.5-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8.2.5-1: Wide band intermodulation parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC5 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| PInterferer 1 (CW) | dBm | -46 | | |
| PInterferer 2 (Modulated) | dBm | -46 | | |
| BWInterferer 2 | MHz | 5 | | |
| FInterferer 1 (Offset) | MHz | -BWchannel/2 – 7.5  /  +BWchannel/2 + 7.5 | | |
| 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.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.  NOTE 5: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.8.2.5-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 6dB |
| PInterferer 1 (CW) | dBm | -46 |
| PInterferer 2  (Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | BWchannel |
| FInterferer 1  (Offset) | MHz | -2BWchannel  /  +2BWchannel |
| 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. | | |

Table 7.8.2.5-3: Void

## 7.8A Intermodulation characteristics for CA

### 7.8A.1 General

### 7.8A.2 Wide band Intermodulation for CA

#### 7.8A.2.0 Minimum conformance requirements

##### 7.8A.2.0.1 Wide band Intermodulation for Intra-band contiguous CA

Table 7.8A.2.0.1-1: 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 | | |
| BC | 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 | BWChannel\_CA20 | 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.2.0.1-2: 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 + 19 |
| 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.2.0.2 Wide band intermodulation for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two or more downlink sub-blocks, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.8.2 and 7.8A.2.0.1 for one component carrier and two component carriers per sub-block, respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

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).

##### 7.8A.2.0.3 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 UE shall meet the requirements specified in subclause 7.8 for each component carrier while all downlink carriers are active.

For the UE which supports inter-band CA configuration in Table 7.3A.0.3.2.1-1, Pinterferer power defined in Table 7.8.2.3-1 and 7.8.2.3-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

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).

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8A.2.

#### 7.8A.2.1 Wide band Intermodulation for CA (2DL CA)

7.8A.2.1.1 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.2.1.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 2DL CA.

7.8A.2.1.3 Minimum conformance requirements

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

7.8A.2.1.4 Test description

7.8A.2.1.4.1 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.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3. 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.2.1.4.1-1: 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 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

Table 7.8A.2.1.4.1-2: 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 | | | NOTE 4 except for the following cases:  CA\_n48-n77: Low range for PCC in band 77. | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.3.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 5  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 4: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range test frequencies.  NOTE 5: 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 6: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | |

Table 7.8A.2.1.4.1-3: Test configuration table for Intraband 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 | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.2-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg, NOTE 1, NOTE 3 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCC RB allocation | CC  Mod'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.1.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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. | | | | | |

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.2.1.4.1-1, Table 7.8A.2.1.4.1-2 or Table 7.8A.2.1.4.1-3.

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.2.1.4.3*.*

7.8A.2.1.4.2 Test procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 7.8A.2.1.4.3.

3. SS activates SCC 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.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3 on both PCC and SCC. 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.2.1.4.1-1, 7.8A.2.1.4.1-2 or 7.8A.2.1.4.1-3 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.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2 and frequency below the CA Band for intra-band CA, or below the SCC’s operating band for inter-band CA according to Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2, 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.2.1.5.3-1 and 7.8A.2.1.5.3-2 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 SCC to the value as defined in Table 7.8A.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2. 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.2.1.5.1-1, 7.8A.2.1.5.1-2, 7.8A.2.1.5.3-1 or 7.8A.2.1.5.3-2 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 SCC for a duration sufficient to achieve statistical significance according to Annex H.2A for inter-band CA. Measure the average throughput of both 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 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.2.1.4.3 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.2.1.5 Test requirement

7.8A.2.1.5.1 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.2.1.5.1-1 or 7.8A.2.1.5.1-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8A.2.1.5.1-1: 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 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 10 | REFSENS + 6 |
| PInterferer 1 (CW) | dBm | -46 | |
| PInterferer 2  (Modulated) | dBm | -46 | |
| BWInterferer 2 | MHz | 20 | BWChannel\_CA |
| FInterferer 1  (Offset) | MHz | -Foffset-30  /  Foffset+30 | -2BWChannel\_CA  /  +2BWChannel\_CA |
| 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.2.1.5.1-2: 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 + 19 |
| 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.2.1.5.2 Wide band intermodulation for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3A.0.2.3-1. For this uplink configuration, the UE shall meet the requirements for each carrier as specified in subclause 7.8.2 for each component carrier respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

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.2.1.5.3-1 or 7.8A.2.1.5.3-2.

7.8A.2.1.5.3 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.2.1.5.3-1 or 7.8A.2.1.5.3-2.

Table 7.8A.2.1.5.3-1: Wide band intermodulation 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 | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| 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.2.1.5.3-1 and 7.8A.2.1.5.3-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.1.5.3-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth | | | | | | | |
| 10 MHz | 20 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90  MHz | 100 MHz |
| 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. | | | | | | | | | |

#### 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 range  Inter-band: NOTE 3  Intra-band contiguous + Inter-band: NOTE 3  Intra-band non-contiguous + Inter-band: NOTE 3  Intra-band non-contiguous: NOTE 3  Intra-band contiguous + 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\_agg  NOTE 4  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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 7.3.2.4.1-2.  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: 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.  NOTE 5: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  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 | | | | | | | | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90  MHz | 100 MHz |
| 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 | | | | | | | |
| 10 MHz | 20 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90  MHz | 100 MHz |
| 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. | | | | | | | | | |

#### 7.8A.2.3 Wide band Intermodulation for CA (4DL CA)

7.8A.2.3.1 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.2.3.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that supports 4DL CA.

7.8A.2.3.3 Minimum conformance requirements

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

7.8A.2.3.4 Test description

7.8A.2.3.4.1 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.2.3.4.1-1. 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.2.3.4.1-1: 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 : Mid range for PCC and SCCs (NOTE 5)  Intra-band contiguous + Inter-band: Mid range for PCC and SCCs (NOTE 5)  Intra-band non-contiguous + Inter-band: Mid range for PCC and SCCs with 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\_agg  NOTE 3  NOTE 6 | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | CC  Mod'n | PCC RB allocation | SCCs RB allocation | CC  Mod'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, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 5: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.3.4.1-1. 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.3.3. DL channel bandwidth shall be selected first. | | | | | |

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.2.3.4.1-1.

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.2.3.4.3*.*

7.8A.2.3.4.2 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.2.3.4.3.

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.2.3.4.1-1 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.2.3.4.1-1 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.2.3.5.2-1 or Table 7.8A.2.3.5.1-2 and frequency below each SCC’s operating band for inter-band CA according to Table 7.8A.2.3.5.2-1 or Table 7.8A.2.3.5.1-2, 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.2.3.5.1-1 and 7.8A.2.3.5.1-2 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.2.3.5.2-1 or Table 7.8A.2.3.5.1-2. 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.2.3.5.2-1 or Table 7.8A.2.3.5.1-2 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.

9. Repeat steps from 6 to 8, using an interfering signal 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.2.3.4.3 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.2.3.5 Test requirement

7.8A.2.3.5.1 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.2.3.5.1-1 or 7.8A.2.3.5.1-2.

Table 7.8A.2.3.5.1-1: Wide band intermodulation 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 | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90  MHz | 100 MHz |
| 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.2.3.5.1-1 and 7.8A.2.3.5.1-2 is increased by the amount given by ΔRIB,c in Table 7.3A.0.3.2.1-1.

Table 7.8A.2.3.5.1-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth | | | | | | | |
| 10 MHz | 20 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90  MHz | 100 MHz |
| 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. | | | | | | | | | |

## 7.8B Intermodulation characteristics for NR-DC

For inter-band NR-DC configurations, the intermodulation characteristics for the corresponding inter-band CA configuration as specified in clause 7.8A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.8A.

## 7.8D Intermodulation characteristics for UL MIMO

### 7.8D.1 General

Intermodulation response rejection for UL MIMO is a measure of the capability of the receiver of an UE that support UL MIMO to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

### 7.8D.2 Wide band Intermodulation for UL MIMO

7.8D.2.1 Test purpose

Wide band Intermodulation for UL MIMO tests the ability of UE that support UL MIMO 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.

An 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.

7.8D.2.2 Test applicability

This test case applies to all types of NR UE release 15 and forward that support UL MIMO on FDD bands.

7.8D.2.3 Minimum conformance requirements

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.8 shall be met with the UL MIMO configurations described in sub-clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8D.

7.8D.2.4 Test description

7.8D.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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8D.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.8D.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3D.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.6 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, C.3.1, and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.8D.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 content are defined in clause 7.8D.2.4.3.

7.8D.2.4.2 Test procedure

Same test procedure as specified in 7.8.2.4.2.

7.8D.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 ensuring Table 4.6.3-182 with condition 2TX\_UL\_MIMO.

7.8D.2.5 Test requirement

Same test requirement as specified in 7.8.2.5.

Table 7.8D.2.5-1: Void

### 7.8D.2\_1 Wide band Intermodulation for SUL with UL MIMO

7.8D.2\_1.1 Test purpose

Same test purpose as in clause 7.8D.2.1.

7.8D.2\_1.2 Test applicability

This test applies to all types of NR UE release 17 and forward that support SUL and UL MIMO operating on the SUL bands.

7.8D.2\_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 7.8D.2.3.

7.8D.2\_1.4 Test description

7.8D.2\_1.4.1 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 operating bands specified in table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8D.2\_1.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. 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 7.8D.2\_1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 for SUL and NUL  With following exceptions:  SUL\_n78-n80: High in band n78 | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest for Non-SUL carrier  For SUL band:  n80: 30 MHz  n84: 20 MHz  n95: 15 MHz | | |
| Test SCS as specified in Table 5.3.5-1 | | | 15kHz for SUL carrier  Lowest for Non-SUL carrier | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | CP-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-2.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, Figure A.3.1.1.5 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 uplink signals according to Annex G.0, G.1, G.2 and G.3.0 with consideration of supplementary uplink physical channels.

4. The UL Reference Measurement Channel is set according to Table 7.3D.2\_1.4.1.

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 content are defined in clause 7.8D.2\_1.4.1.3.

7.8D.2\_1.4.1.2 Test procedure

Same test procedure as specified in 7.8.2.4.2.

7.8D.2\_1.4.1.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.3.6.1.1.2 ensuring UL/SUL indicator in Table 4.3.6.1.1.2-1 with condition SUL, subclause 4.6 ensuring Table 4.6.1-28 with condition SUL AND (RF OR RRM), Tables 4.6.3-14 with condition SUL\_SUL for SUL carrier, Table 4.6.3-167 with condition PUSCH\_PUCCH\_ON\_SUL, and Table 4.6.3-182 with the condition 2TX\_UL\_MIMO.

7.8D.2\_1.5 Test requirement

Same test requirement as specified in 7.8.2.5.

## 7.8E Intermodulation characteristics for V2X

### 7.8E.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

### 7.8E.2 Wide band Intermodulation for V2X

#### 7.8E.2.0 Minimum conformance requirements

7.8E.2.0.1 Wide band Intermodulation

The wide band intermodulation requirement is defined using modulated NR carrier and a CW signal as interferer 1 and interferer 2 respectively. When UE is configured for NR V2X reception non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.7.2 with parameters specified in Table 7.8E.2.0.1-1 for NR V2X bands. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.8E.2.0.1-1: Wide band intermodulation parameters for NR V2X

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Rx parameter | Units | Channel bandwidth | | | |
|  |  |  | 10 MHz | 20 MHz | 30 MHz | 40 MHz |
| n38, n47 | Power in Transmission Bandwidth Configuration | dBm | PREFSENS\_V2X + channel bandwidth specific value below | | | |
|  | 6 | 9 | 11 | 12 |
|  | PInterferer 1 (CW) | dBm | -46 | | | |
|  | PInterferer 2 (Modulated) | dBm | -46 | | | |
|  | BWInterferer 2 | MHz | 10MHz | | | |
|  | FInterferer 1 (Offset) | MHz | -BW/2 – 15  /  +BW/2 + 15 | | | |
|  | FInterferer 2 (Offset) | MHz | 2 \* FInterferer 1 | | | |
| NOTE 1: Reference measurement channel is A.7.2  NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. | | | | | | |

7.8E.2.0.2 Intermodulation for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.8E.2.0.1 shall apply for the NR sidelink reception in the operating bands in Table 5.2E.2-1 and the requirements specified in clause 7.8 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8E.

#### 7.8E.2.1 Wide band Intermodulation for V2X / non-concurrent operation

FFS

#### 7.8E.2.2 Wide band Intermodulation for V2X / con-current operation

FFS

## 7.8F Intermodulation characteristics for shared spectrum channel access

### 7.8F.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

### 7.8F.2 Wide band Intermodulation for shared spectrum channel access

7.8.2.1 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.

7.8F.2.2 Test applicability

This test case applies to all types of NR UE release 16 and forward that support NR standalone shared spectrum channel access.

7.8F.2.3 Minimum conformance requirements

The wide band intermodulation requirement is defined using a CW carrier and modulated NR signal as interferer 1 and interferer 2 respectively.

Instead of the general wideband intermodulation requirements specified in clause 7.8.2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, 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 7.8F.2.3-1. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.8F.2.3-1: Wide band intermodulation parameters for shared spectrum channel access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | |
|  |  | 9 | 12 | 13.8 | 15 |
| PInterferer 1 (CW) | dBm | -46 | | | |
| PInterferer 2  (Modulated) | dBm | -46 | | | |
| BWInterferer 2 | MHz | 20 | | | |
| FInterferer 1  (Offset) | MHz | -BW/2 - 30  /  +BW/2 + 30 | | | |
| 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 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: Reference measurement channel is specified in Annexes A.2.2, 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 center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer. | | | | | |

7.8F.2.4 Test description

7.8F.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.8F.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8F.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3F.2.4.1-2 and Table 7.3F.2.4.1-3.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3F.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.3 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 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.8F.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 content are defined in clause 7.8F.2.4.3.

7.8F.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.8F.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.8F.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8F.2.5-1. 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 7.8F.2.5-1 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.

4. Set the Interfering signal levels to the values as defined in Table 7.8F.2.5-1 and frequency below the wanted signal.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

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.

7.8F.2.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6 with DFT-s-OFDM condition in Table 4.6.3-118 PUSCH-Config.

7.8F.2.5 Test requirement

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 7.8F.2.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8F.2.5-1: Wide band intermodulation parameters for shared spectrum channel access

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth | | | |
|  |  | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below | | | |
|  |  | 9 | 12 | 13.8 | 15 |
| PInterferer 1 (CW) | dBm | -46 | | | |
| PInterferer 2  (Modulated) | dBm | -46 | | | |
| BWInterferer 2 | MHz | 20 | | | |
| FInterferer 1  (Offset) | MHz | -BW/2 - 30  /  +BW/2 + 30 | | | |
| 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 7.3F.2.4.1-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: Reference measurement channel is specified in Annexes A.2.2, A.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 center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and Finterferer 2 (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer. | | | | | |

## 7.8J Intermodulation characteristics for ATG

### 7.8J.1 General

Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its

assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

### 7.8J.2 Wide band intermodulation for ATG

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Annex F MU/TT is FFS.

- Message contents are TBC pending on Rel-18 ASN.1 freeze.

7.8J.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.

7.8J.2.2 Test applicability

This test case applies to all types of NR ATG UE release 18 and forward.

7.8J.2.3 Minimum conformance requirements

For ATG UE, the minimum conformance requirements shall be the same as in clause 7.8.2.3.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.8J.2.

7.8J.2.4 Test description

7.8J.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in Table 7.8J.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8J.2.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Lowest, Mid, Highest  Lowest UL / Lowest DL, Lowest UL / Highest DL | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | CP-OFDM QPSK | NOTE 1 | | DFT-s-OFDM QPSK | NOTE 1 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.4.3 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, C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.8J.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 content are defined in clause 7.8J.2.4.3.

7.8J.2.4.2 Test procedure

1. SS transmits PDSCH via PDCCH DCI format 1\_1 for C\_RNTI to transmit the DL RMC according to Table 7.8J.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.

2. 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 7.8J.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

3. Set the Downlink signal level to the value as defined in Table 7.8J.2.5-1 or Table 7.8J.2.5-2. 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 7.8J.2.5-1 or Table 7.8J.2.5-2 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.

4. Set the Interfering signal levels to the values as defined in Table 7.8J.2.5-1 or Table 7.8J.2.5-2 and frequency below the wanted signal.

5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex H.2.

6. Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 4.

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.

7.8J.2.4.3 Message contents

FFS

7.8J.2.5 Test requirement

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 7.8J.2.5-1 or Table 7.8J.2.5-2 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8J.2.5-1: Wide band intermodulation parameters for ATG UE for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) | | |
|  |  | 5, 10 | 15 | 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC5 | dBm | REFSENS + 6 dB | REFSENS + 7 dB | REFSENS + (9 + 10log10(BWChannel /20)) dB |
| PInterferer 1 (CW) | dBm | -46 | | |
| PInterferer 2 (Modulated) | dBm | -46 | | |
| BWInterferer 2 | MHz | 5 | | |
| FInterferer 1 (Offset) | MHz | -BWchannel/2 – 7.5  /  +BWchannel/2 + 7.5 | | |
| 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 6.2J.2.  NOTE 2: Reference measurement channel is specified in Annexes A.2.2, 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.  NOTE 5: 10log10(x) is rounded to the next higher 0.5dB value. | | | | |

Table 7.8J.2.5-2: Wide band intermodulation parameters for ATG UE for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | Channel bandwidth (MHz) |
|  |  | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 6dB |
| PInterferer 1 (CW) | dBm | -46 |
| PInterferer 2  (Modulated) | dBm | -46 |
| BWInterferer 2 | MHz | BWchannel |
| FInterferer 1  (Offset) | MHz | -2BWchannel  /  +2BWchannel |
| 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 6.2J.2.  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. | | |

## 7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Test purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9.3.

Excess spurious emissions increase the interference to other systems.

7.9.2 Test applicability

This test applies to all types of NR UE release 15 and forward.

7.9.3 Minimum conformance requirements

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.3-1

Table 7.9.3-1: General receiver spurious emission requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Measurement  bandwidth | Maximum level | NOTE |
| 30 MHz ≤ f < 1 GHz | 100 kHz | -57 dBm |  |
| 1 GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm |  |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | 2 |
| 12.75 GHz – 26 GHz | 1 MHz | -47 dBm | 3 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in Annex C.3.1.  NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz.  NOTE 3: Applies for Band that the upper frequency edge of the DL Band more than 5.2 GHz. | | | |

The normative reference for this requirement is TS 38.101-1 [2] clause 7.9.

7.9.4 Test description

7.9.4.1 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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.9.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.9.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | Low range, Mid range, High range (NOTE 4) | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest (NOTE 3) | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | N/A | 0 | | N/A | 0 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: For n70, highest test channel bandwidth shall be Highest UL / Highest DL according to asymmetric channel bandwidths specified in clause 5.3.6.  NOTE 4: For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.5.1 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 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.9.4.1-1.

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 content are defined in clause 7.5.4.3.

7.9.4.2 Test procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

2. Repeat step 1 for all NR Rx antennas of the UE.

7.9.4.3 Message contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.9.5 Test requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1.

Table 7.9.5-1: General receiver spurious emission requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Measurement  bandwidth | Maximum level | NOTE |
| 30 MHz ≤ f < 1 GHz | 100 kHz | -57 dBm |  |
| 1 GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm |  |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | 2 |
| 12.75 GHz – 26 GHz | 1 MHz | -47 dBm | 3 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in Annex C.3.1.  NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz.  NOTE 3: Applies for Band that the upper frequency edge of the DL Band more than 5.2 GHz. | | | |

## 7.9A Spurious emissions for CA

### 7.9A.0 Minimum conformance requirements

For inter-band carrier aggregation including an operating band without uplink band, the UE shall meet the Rx spurious emissions requirements specified in subclause 7.9 for each component carrier while all downlink carriers are active.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.9A.3.

### 7.9A.1 Spurious emissions for CA (2DL CA)

7.9A.1.1 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9A.1.3.

Excess spurious emissions increase the interference to other systems.

7.9A.1.2 Test Applicability

This test case applies to all types of NR UE release 15 and forward that support inter-band 2DL CA with a DL-only band.

7.9A.1.3 Minimum Conformance Requirements

The minimum conformance requirements are defined in clause 7.9A.0.

7.9A.1.4 Test Description

7.9A.1.4.1 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 CA bands specified in clause 5.5A. All of these configurations shall be tested with applicable test parameters for each CA Configuration, and are shown in Table 7.9A.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexe A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.9A.1.4.1-1: Test Configuration Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Initial 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 3 | | | |
| Test CC Combination setting (NRB\_agg) as specified in Table 5.5A.1-1 for the CA Configuration across bandwidth combination sets supported by the UE. | | | Highest NRB\_agg  NOTE 4  NOTE 5 | | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | | |
| Test Parameters for CA Configurations | | | | | | |
| Ch Configuration / NRB\_agg | | Downlink Configuration | | | Uplink Configuration | |
| PCC NRB | SCCs NRB | Mod'n | PCC & SCC RB allocation | | Mod'n | PCC RB allocation |
| 100 | 100 | N/A | 0 | 0 | N/A | 0 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements.  NOTE 3: Test frequency is set to Mid Range for PCC and SCC with exceptions defined in Table 7.3A.1.4.1-2. For NR band n28, 30MHz test channel bandwidth is tested with Low range and High range test frequencies.  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  NOTE 5: For nXA PCC, each of Highest UL and Highest DL shall be selected according to clause 5.5A.3.1. DL channel bandwidth shall be selected first. | | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.5.2 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 for PCC are initially set up according to Annex C.0, C.1, C.2.

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

5. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR* according to TS 38.508-1 [5] clause 4.5. Message contents are defined in clause 7.9A.1.4.3.

7.9A.1.4.2 Test Procedure

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

2. The SS shall configure SCC as per TS 38.508-1 [5] clause 5.5.1. Message contents are defined in clause 6.5A.2.2.1.4.3.

3. SS activates SCC 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], clause9.3).

4. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement SS sends no uplink scheduling information to the UE. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

5. Repeat step 1 for all NR Rx antennas of the UE.

7.9A.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [5] subclause 4.6.

7.9A.1.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1.

## 7.9B Spurious emissions for NR-DC

For inter-band NR-DC configurations, the spurious emissions for the corresponding inter-band CA configuration as specified in clause 7.9A applies.

Note: For NR-DC testing, replace CA by NR-DC, PCC by PCell, and SCC by PSCell in clause 7.9A.

## 7.9J Spurious emissions for ATG

Editor’s Note: This test is incomplete. The following aspects are not yet determined:

- Annex F MU/TT is FFS.

- Message contents are TBC pending on Rel-18 ASN.1 freeze.

7.9J.1 Test purpose

Test verifies the ATG UE's spurious emissions meet the requirements described in clause 7.9J.3.

Excess spurious emissions increase the interference to other systems.

7.9J.2 Test applicability

This test case applies to all types of NR ATG UE release 18 and forward.

7.9J.3 Minimum conformance requirements

For ATG UE, the minimum conformance requirements shall be the same as in clause 7.9.3.

The normative reference for this requirement is TS 38.101-1 [2] clause 7.9J.

7.9J.4 Test description

7.9J.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 operating bands specified in Table 5.3.5-1. All of these configurations shall be tested with applicable test parameters for each combination of channel bandwidth and sub-carrier spacing, are shown in table 7.9J.4.1-1. The details of the uplink and downlink reference measurement channels (RMC) are specified in Annexes A.2 and A.3. Configuration of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.9J.4.1-1: Test Configuration Table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | Low range, Mid range, High range | | |
| Test Channel Bandwidths as specified in TS 38.508-1 [5] subclause 4.3.1 | | | Highest | | |
| Test SCS as specified in Table 5.3.5-1 | | | Highest | | |
| Test Parameters | | | | | |
|  | Downlink Configuration | | | Uplink Configuration | |
| Test ID | Mod'n | RB allocation | | Mod'n | RB allocation |
| 1 | N/A | 0 | | N/A | 0 |
| NOTE 1: The specific configuration of uplink and downlink are defined in Table 7.3.2.4.1-1.  NOTE 2: In a band where UE supports 4Rx, the test shall be performed only with 4Rx antennas ports connected and 4Rx REFSENS requirement (Table 7.3.2.5-2) is used in the test requirements. | | | | | |

1. Connect the SS to the UE antenna connectors as shown in TS 38.508-1 [5] Annex A, in Figure A.3.1.5.1 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 , C.3.1 , and uplink signals according to Annex G.0, G.1, G.2, G.3.1.

4. The DL and UL Reference Measurement channels are set according to Table 7.9J.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 content are defined in clause 7.9J.4.3.

7.9J.4.2 Test procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement the spectrum analyser shall be set to 'Detector' = RMS.

2. Repeat step 1 for all NR Rx antennas of the UE.

7.9J.4.3 Message contents

FFS

7.9J.5 Test requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9J.5-1.

Table 7.9J.5-1: General receiver spurious emission requirements for ATG UE

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Measurement  bandwidth | Maximum level | NOTE |
| 30 MHz ≤ f < 1 GHz | 100 kHz | -57 dBm |  |
| 1 GHz ≤ f ≤ 12.75 GHz | 1 MHz | -47 dBm |  |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | 1 MHz | -47 dBm | 2 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in Annex C.3.1.  NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz. | | | |