**3GPP TSG-RAN WG4 Meeting #104-e *R4-22xxxxx***

**Electronic meeting, August 15th – 26th, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-1** | **CR** | **-** | **rev** | **-** | **Current version:** | **16.12.1** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Big CR for 38.101-1 maintenance part2 (Rel-16) |
|  |  |
| ***Source to WG:*** | MCC, Samsung |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core, NR\_RF\_FR1-Core, NR\_CA\_R16\_3BDL\_1BUL-Core, LTE\_NR\_B41\_Bn41\_PC29dBm |  | ***Date:*** | 2022-08-29 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | This big CRs merge the multiple endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.**R4-2214198 Draft CR for updating the note of mandatory simultaneous Rx/Tx capability for FR1 NR-CA combinations**The notes of mandatory simultaneous Rx/Tx capability for the following FR1 NR-CA configurations are missing.- CA\_n28-n40- CA\_n1-n40-n78**R4-2211621 Correction of A-MPR for NS\_50**The A-MPR value “A9” for NS\_50 is defined in Rel-15 but is missing in Rel-16 & 17.**R4-2213732 draft CR for TS 38.101-1: correction on intra-band UL CA contiguous CA requirement (Rel-16)**1. There are 2 definitions for BWRB\_alloc in 6.2A.2.1 that need to be clarified.
2. There is statement on MPR for contiguous CA when different waveform on UL CCs are applied

**R4-2213362 Correction to intra-band CA requirements**There are some editorial mistakes or incorrect references in current intra-band CA requirements, which need to be corrected.**R4-2212018 Cat F Rel-16 Draft CR to 38.101-1 to correct the typo of CA carrier leakage**Correct the error of intra-band contiguous and non-contiguous CA carrier leakage in clause 6.4A.2.1.3 and 6.4A.2.2.3, in which the reference table 6.4A.2.4.3-1 does not exist.**R4-2212603 Draft CR to 38.101-1: Corrections on Pcmax for UL MIMO to support PC1.5 29dBm**PC1.5 for UL MIMO has been introduced from R16, but the Pcmax in Pcmax tolerance table only supports up to 26dBm.**R4-2213224 draftCR to 38.101-1 Corrections to tables with wrong unit declarations**Several tables in Section 7.6 through 7.8 have wrong units defined.**R4-2214966 Correction to EVM measurement point for DFTs-OFDM DM-RS Type 2**DFTs-OFDM DMRS Type-2 to achieve Low-PAPR by Pi/2 shift BPSK is newly defined from 38.211 Release 16. Conventional DMRS has its modulated symbols mapped directly to the frequency domain in a UE, but DFTs-OFDM DM-RS Type 2 has its modulated symbols mapped to the frequency domain after DFT instead. This is the same process as DFT-s-OFDM PUSCH and PUCCH.Calculating the EVM of DFTs-OFDM DM-RS Type 2 according to the current EVM measurement block diagram in Figure F.1-1 cannot provide a correct EVM result, the constellation of modulated symbols (Pi/2 shift BPSK) being incorrectly calculated prior to IDFT. It is appropriate to correct the EVM measurement block diagram to calculate EVM by the constellation after IDFT, similarly to DFT-s-OFDM PUSCH. |
|  |  |
| ***Summary of change:*** | The summary of change in each endorsed draft CR is copied below.**R4-2214198 Draft CR for updating the note of mandatory simultaneous Rx/Tx capability for FR1 NR-CA combinations**Update the note of mandatory simultaneous Rx/Tx capability for the following FR1 NR-CA configurations. * CA\_n28-n40
* CA\_n1-n40-n78

**R4-2211621 Correction of A-MPR for NS\_50**Copy the A-MPR value “A9” from Rel-15 to Rel-16.**R4-2213732 draft CR for TS 38.101-1: correction on intra-band UL CA contiguous CA requirement (Rel-16)**1. Remove redudent BWRB\_alloc definition
2. Clarify MPR for CP-OFDM is used when different waveform on UL CCs are applied.

**R4-2213362 Correction to intra-band CA requirements**Correcting the references across the intra-band CA requirements.**R4-2212018 Cat F Rel-16 Draft CR to 38.101-1 to correct the typo of CA carrier leakage**Correct “Table 6.4A.2.4.3-1” to “Table 6.4A.2.1.3-1” in clause 6.4A.2.1.3 and 6.4A.2.2.3**R4-2212603 Draft CR to 38.101-1: Corrections on Pcmax for UL MIMO to support PC1.5 29dBm**Revise the upper limit of Pcmax in Table 6.2D.4-1 to 29dBm **R4-2213224 draftCR to 38.101-1 Corrections to tables with wrong unit declarations**Corrected values in table to indicate dB and dBm where applicable according to same practice in the many correct tables.**R4-2214966 Correction to EVM measurement point for DFTs-OFDM DM-RS Type 2**Figure F.1-1 was corrected as follows:* “DFT-s-OFDM DM-RS Type 2” was added to the input of DFT in DUT section.
* “DM-RS” at the input of Tone map in DUT section was replaced by “CP-OFDM DM-RS, DFT-s-OFDM DM-RS Type 1”.
* “DFT-s-OFDM DM-RS Type 2” was added to the output of IDFT in Test equipment section.
* “DM-RS” at the output of Tx-Rx chain equalizer in Test equipment section was replaced by “CP-OFDM DM-RS, DFT-s-OFDM DM-RS Type 1”.
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|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are copied below.**R4-2214198 Draft CR for updating the note of mandatory simultaneous Rx/Tx capability for FR1 NR-CA combinations**The notes of mandatory simultaneous Rx/Tx capability for following FR1 NR-CA configurations remain missing and the specification remains unclear. * CA\_n28-n40
* CA\_n1-n40-n78

**R4-2211621 Correction of A-MPR for NS\_50**The A-MPR requirements for NS\_50 is incomplete.**R4-2213732 draft CR for TS 38.101-1: correction on intra-band UL CA contiguous CA requirement (Rel-16)**The spec for intra-band UL CA contiguous CA MPR is not correct.**R4-2213362 Correction to intra-band CA requirements**The specification quality is unstatisfied.**R4-2212018 Cat F Rel-16 Draft CR to 38.101-1 to correct the typo of CA carrier leakage**Error still exists, no table for reference.**R4-2212603 Draft CR to 38.101-1: Corrections on Pcmax for UL MIMO to support PC1.5 29dBm**The requirements for PC1.5 UL MIMO are incomplete **R4-2213224 draftCR to 38.101-1 Corrections to tables with wrong unit declarations**Worst case 5MHz narrow band blocking testing would be done with Pwanted at 16dBm**R4-2214966 Correction to EVM measurement point for DFTs-OFDM DM-RS Type 2**No proper EVM can be calculated as used symbols are fully corrupted (due to missing IDFT block in the TE section of the block diagram in Figure F.1-1). May lead to the wrong interpretation by readers that a DFT block for DFTs-OFDM DM-RS Type 2 is not used by UEs (as missing in the DUT section of the block diagram in Figure F.1-1). |
|  |  |
| ***Clauses affected:*** | 5.2A.2, 6.2.3.19, 6.2A.2.1, 6.2A.3.1.1, 6.2D.4, 6.4A.1.1, 6.4A.2.1.1, 6.4A.2.1.2, 6.4A.2.1.3, 6.4A.2.2.3, 7.6 through 7.8, F.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-1  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## << Start of change1 >>

### 5.2A.2 Inter-band CA

NR inter-band carrier aggregation is designed to operate in the operating bands defined in Table 5.2A.2.1-1, 5.2A.2.2-1 and Table 5.2A.2.3-1, where all operating bands are within FR1.

If the mandatory simultaneous Rx/Tx capability applies for a band combination, the mandatory simultaneous Rx/Tx capability also applies for the band combination when the applicable band combination is a subset of a higher order band combination.

Table 5.2A.2-1: Void

Table 5.2A.2-2: Void

Table 5.2A.2-3: Void

#### 5.2A.2.1 Inter-band CA (two bands)

Table 5.2A.2.1-1: Inter-band CA operating bands involving FR1 (two bands)

|  |  |  |
| --- | --- | --- |
| NR CA Band | NR Band(Table 5.2-1) | DL interruption allowed (Note 8) |
| CA\_n1-n3 | n1, n3 |  |
| CA\_n1-n7 | n1, n7 |  |
| CA\_n1-n8 | n1, n8 |  |
| CA\_n1-n28 | n1, n28 |  |
| CA\_n1-n40 | n1, n40 |  |
| CA\_n1-n411 | n1, n41 |  |
| CA\_n1-n771 | n1, n77 | No |
| CA\_n1-n781 | n1, n78 | No |
| CA\_n1-n791 | n1, n79 | No |
| CA\_n2-n5 | n2, n5 |  |
| CA\_n2-n48 | n2, n48 |  |
| CA\_n2-n66 | n2, n66 |  |
| CA\_n2-n77 | n2, n77 |  |
| CA\_n2-n78 | n2, n78 |  |
| CA\_n3-n7 | n3, n7 |  |
| CA\_n3-n8 | n3, n8 |  |
| CA\_n3-n28 | n3, n28 |  |
| CA\_n3-n38 | n3, n38 |  |
| CA\_n3-n401 | n3, n40 |  |
| CA\_n3-n411 | n3, n41 | No |
| CA\_n3-n771 | n3, n77 | No |
| CA\_n3-n781 | n3, n78 | No |
| CA\_n3-n791 | n3, n79 | No |
| CA\_n5-n7 | n5, n7 |  |
| CA\_n5-n66 | n5, n66 |  |
| CA\_n5-n771 | n5, n77 |  |
| CA\_n5-n781 | n5, n78 | No |
| CA\_n5-n791 | n5, n79 | No |
| CA\_n7-n25 | n7, n25 |  |
| CA\_n7-n28 | n7, n28 |  |
| CA\_n7-n66 | n7, n66 |  |
| CA\_n7-n781 | n7, n78 |  |
| CA\_n8-n391 | n8, n39 |  |
| CA\_n8-n401 | n8, n40 |  |
| CA\_n8-n411 | n8, n41 | No |
| CA\_n8-n751 | n8, n75 |  |
| CA n8-n781 | n8, n78 | No |
| CA\_n8-n791 | n8, n79 | No |
| CA\_n20-n282 | n20, n28 |  |
| CA\_n20-n75 | n20, n75 |  |
| CA\_n20-n78 | n20, n78 |  |
| CA\_n25-n41 | n25, n41 |  |
| CA\_n25-n466 | n25, n46 |  |
| CA\_n25-n66 | n25, n66 |  |
| CA\_n25-n71 | n25, n71 |  |
| CA\_n25-n78 | n25,n78 |  |
| CA\_n28-n401 | n28, n40 |  |
| CA\_n28-n411 | n28, n41 |  |
| CA\_n28-n50 | n28, n50 |  |
| CA\_n28-n752 | n28, n75 |  |
| CA\_n28-n771 | n28, n77 | No |
| CA\_n28-n781 | n28, n78 | No |
| CA\_n29-n66 | n29, n66 |  |
| CA\_n29-n70 | n29, n70 |  |
| CA\_n38-n66 | n38, n66 |  |
| CA\_n38-n781 | n38, n78 |  |
| CA\_n39-n40 | n39, n40 |  |
| CA\_n39-n41 | n39, n41 | No |
| CA\_n39-n791 | n39, n79 | No |
| CA\_n40-n41 | n40, n41 |  |
| CA\_n40-n781 | n40, n78 |  |
| CA\_n40-n791,4 | n40, n79 | No |
| CA\_n41-n501 | n41, n50 |  |
| CA\_n41-n66 | n41, n66 |  |
| CA\_n41-n711 | n41, n71 |  |
| CA\_n41-n781 | n41, n78 |  |
| CA\_n41-n791,3 | n41, n79 | No |
| CA\_n46-n486 | n46, n48 |  |
| CA\_n46-n666 | n46, n66 |  |
| CA\_n48-n66 | n48, n66 |  |
| CA\_n50-n78 | n50, n78 |  |
| CA\_n66-n70 | n66, n70 |  |
| CA\_n66-n71 | n66, n71 |  |
| CA\_n66-n77 | n66, n77 |  |
| CA\_n66-n78 | n66, n78 |  |
| CA\_n70-n71 | n70, n71 |  |
| CA\_n75-n781 | n75, n78 |  |
| CA\_n76-n781 | n76, n78 |  |
| CA\_n77-n797 | n77, n79 |  |
| CA\_n78-n795 | n78, n79 |  |
| CA\_n78-n92 | n78, n92 |  |
| NOTE 1: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability.NOTE 2: The frequency range in band n28 is restricted for this band combination to 703-733 MHz for the UL and 758-788 MHz for the DL.NOTE 3: The frequency range below 2506 MHz for Band n41 is not used in this combination.NOTE 4: Applicable for frequency range above 4800 MHz for Band n79 in this combination.NOTE 5: For UEs supporting band n77, the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n78-n79 NR carriers. This restriction applies also for these carriers when applicable NR CA configuration is part of a higher order configuration.NOTE 6: The PCell is allocated in the licensed band in this combination.NOTE 7: The minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. This restriction applies also for these carriers when applicable NR CA configuration is part of a higher order configuration.NOTE 8: Applicable when dynamic switching between two uplink carriers is conducted. The DL interruption requirement is specified in clause 8.2.2.2.10 of 38.133 [13]. |

#### 5.2A.2.2 Inter-band CA (three bands)

Table 5.2A.2.2-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |
| --- | --- |
| NR CA Band | NR Band(Table 5.2-1) |
| CA\_n1-n3-n7 | n1, n3, n7 |
| CA\_n1-n3-n8 | n1, n3, n8 |
| CA\_n1-n3-n28 | n1, n3, n28 |
| CA\_n1-n3-n413 | n1, n3, n41 |
| CA\_n1-n3-n783 | n1, n3, n78 |
| CA\_n1-n7-n28 | n1, n7, n28 |
| CA\_n1-n7-n783 | n1，n7, n78 |
| CA\_n1-n8-n783 | n1, n8, n78 |
| CA\_n1-n28-n783 | n1, n28, n78 |
| CA\_n1-n40-n783 | n1, n40, n78 |
| CA\_n3-n7-n28 | n3, n7, n28 |
| CA\_n3-n7-n783 | n3, n7, n78 |
| CA\_n3-n8-n783 | n3, n8, n78 |
| CA\_n3-n28-n773 | n3, n28, n77 |
| CA\_n3-n28-n783 | n3, n28, n78 |
| CA\_n3-n40-n41 | n3, n40, n41 |
| CA\_n3-n41-n793 | n3, n41, n79 |
| CA\_n5-n66-n78 | n5, n66, n78 |
| CA\_n7-n25-n66 | n7, n25, n66 |
| CA\_n7-n28-n78 | n7, n28, n78 |
| CA\_n7-n66-n78 | n7, n66, n78 |
| CA\_n8-n39-n41 | n8, n39, n41 |
| CA\_n8-n41-n793 | n8, n41, n79 |
| CA\_n20-n28-n78 | n20, n28, n78 |
| CA\_n25-n41-n66 | n25, n41, n66 |
| CA\_n25-n41-n71 | n41, n66, n71 |
| CA\_n25-n66-n71 | n25, n66, n71 |
| CA\_n25-n66-n78 | n25, n66, n78 |
| CA\_n28-n40-n78 | n28, n40, n78 |
| CA\_n28-n41-n783 | n28, n41, n78 |
| CA\_n29-n66-n70 | n29, n66, n70 |
| CA\_n39-n41-n79 | n39, n41, n79 |
| CA\_n40-n41-n791,2 | n40, n41, n79 |
| CA\_ n41-n66-n71 | n41, n66, n71 |
| CA\_n66-n70-n71 | n66, n70, n71 |
| NOTE 1: The frequency range below 2506 MHz for Band n41 is not used in this band combination.NOTE 2: Applicable for frequency range above 4800 MHz for Band n79 in this band combination.NOTE 3: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability. |

## << End of change1>>

## << Start of change2 >>

#### 6.2.3.19 A-MPR for NS\_50

Table 6.2.3.19-1: A-MPR regions for NS\_50

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth (MHz) | RBstart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 25 MHz | ≤ LCRB\*12\*SCS - 5 | > 5 | A7 |
|  | ≤ 6.48 | ≤ 1.44 | A8 |
|  | ≤ 3.6 | A9 |
| 30 MHz | ≤ LCRB\*12\*SCS - 5 | > 5 | A7 |
|  | ≤ 8.64 | ≤ 1.44 | A8 |
|  |  | ≤ 3.6 | A9 |
| 40 MHz | ≤ 4.32 | > 0 | A1 |
|  | > 4.32, ≤ 10.44 | ≤ 10.8 | A3 |
|  | > 4.32, ≤ 18 | > 10.8 | A2 |
|  | > 18, ≤ 31.68 | > max (31.68 – RBstart\*12\*SCS, 0) | A6 |
|  | > 31.68 | > 0 | A5 |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.19-2. |

Table 6.2.3.19-2: A-MPR for NS\_50

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | A1 (dB) | A2 (dB) | A3 (dB) | A5 (dB) | A6 (dB) | A7 (dB) | A8 (dB) | A9 (dB) |
|  | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 4 | ≤ 2 |  |
|  | QPSK | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 5 | ≤ 2 |  |
|  | 16 QAM | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 | ≤ 2 | ≤ 5 | ≤ 2.5 |  |
|  | 64 QAM | ≤ 11 | ≤ 7 | ≤ 3 | ≤ 5 |  | ≤ 5 |  |  |
|  | 256 QAM | ≤ 11 | ≤ 7 |  | ≤ 5 |  | ≤ 5 |  |  |
| CP-OFDM | QPSK | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 | ≤ 3.5 | ≤ 6.5 |  | ≤ 3.0 |
|  | 16 QAM | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 | ≤ 3.5 | ≤ 6.5 |  | ≤ 3.0 |
|  | 64 QAM | ≤ 12 | ≤ 8 | ≤ 4.5 | ≤ 5 |  | ≤ 6.5 |  |  |
|  | 256 QAM | ≤ 12 | ≤ 8 |  |  |  | ≤ 6.5 |  |  |

## << End of change2>>

## << Start of change3 >>

### 6.2A.2 UE maximum output power reduction for CA

#### 6.2A.2.1 UE maximum output power reduction for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2A.1.1-1 with contiguous RB allocation is specified in Table 6.2A.2.1-1 for UE power class 3 CA bandwidth classes B and C.

In case the modulation format or waveform is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations, or CP-OFDM waveform.

Unless otherwise specified, pi/2 BPSK in following MPR tables refers to both variants of pi/2 BPSK referenced in 6.2.2 tables 6.2.2-1.

Table 6.2A.2.1-1: Contiguous RB allocation for Power Class 3

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
|  | inner | outer | inner | outer |
| DFT-s-OFDM | Pi/2 BPSK | 1.0 | 3.5 | 2.5 | 7 |
|  | QPSK | 1.0 | 3.5 | 2.5 | 7 |
|  | 16QAM | 1.5 | 3.5 | 2.5 | 7 |
|  | 64QAM | 3.0 | 4.0 | 5 | 7 |
|  | 256QAM | 5.5 | 6.0 | 7 | 7.5 |
| CP-OFDM | QPSK | 2.0 | 4.0 | 3.5 | 8 |
|  | 16QAM | 2.5 | 4.0 | 3.5 | 8 |
|  | 64QAM | 3.5 | 4.0 | 5 | 8 |
|  | 256QAM | 6.5 | 6.5 | 7 | 8 |

For CA bandwidth class B and bandwidth class C with contiguous RB allocation, the following parameters are defined to specify valid RB allocation ranges for Inner and Outer RB allocations:

An RB allocation is contiguous if LCRB1 = 0 or LCRB2 = 0 or (LCRB1 ≠ 0 and LCRB2 ≠ 0 and RBStart1 + LCRB1 = NRB1 andRBStart2 = 0), where RBStart1, LCRB1, and NRB1 are for CC1, RBStart2, LCRB2, and NRB2 are for CC2, CC1 is the component carrier with lower frequency.

In contiguous CA, a contiguous allocation is an inner allocation if

RBStart,Low ≤ RBStart\_CA ≤ RBStart,High,and NRB\_alloc ≤ ceil(NRB,agg /2),

where

RBStart,Low = max(1, floor(NRB\_alloc /2))

RBStart,High = NRB,agg – RBStart,Low – NRB,alloc,

with

NRB\_alloc= (NRB1 - RBStart1)∙ 2^µ1 + (RBStart2 + LCRB2 ) ∙ 2^µ2,

NRB,agg=NRB1∙2^µ1+ NRB2∙2^µ2.

If LCRB1 =0, RBStart\_CA = NRB1∙2^µ1+ RBStart2∙2^µ2,

if LCRB1 > 0, RBStart\_CA = RBStart1∙2^µ1.

A contiguous allocation that is not an Inner contiguous allocation is an Outer contiguous allocation.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2A.1.1-1 with non-contiguous RB allocation is specified in Table 6.2A.2.1-2 for UE power class 3 CA bandwidth classes B and C.

Table 6.2A.2.1-2: non-contiguous RB allocation for Power Class 3

|  |  |  |
| --- | --- | --- |
| Modulation | MPR for bandwidth class B(dB) | MPR for bandwidth class C(dB) |
|  | inner | Outer11 | Outer22 | inner | Outer11 | Outer22 |
| DFT-s-OFDM | Pi/2 BPSK | 2 | 5.5 | 11.5 | 2.5 | 6 | 13 |
|  | QPSK | 2 | 5.5 |  | 2.5 | 6 |  |
|  | 16QAM | 2.5 | 5.5 |  | 3 | 6 |  |
|  | 64QAM | 4.5 | 6 |  | 5 | 6 |  |
|  | 256QAM | 6 | 6.5 |  | 6.5 | 6.5 |  |
| CP-OFDM | QPSK | 2.5 | 6.5 | 12 | 3.5 | 7 | 14 |
|  | 16QAM | 3 | 7 |  | 3.5 | 7 |  |
|  | 64QAM | 5 | 7 |  | 5 | 7 |  |
|  | 256QAM | 7.5 | 7.5 |  | 7.5 | 7.5 |  |
| NOTE 1: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz NOTE 2: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz |

For CA bandwidth classes B and C with non-contiguous RB allocation, the following parameters are defined to specify valid RB allocation ranges for Inner, Outer1 and Outer2 RB allocations:

Non-Contiguous RB allocation is defined as RBStart1 + LCRB1 < NRB1, orRBStart2 > 0, when both uplink CCs are activated and allocated with RB(s), where RBStart1, LCRB1, and NRB1 are for CC1, RBStart2, LCRB2, and NRB2 are for CC2, CC1 is the component carrier with lower frequency.

In contiguous CA, a non-contiguous RB allocation is a non-contiguous Inner RB allocation if the following conditions are met:

RBStart,Low ≤ RBStart\_CA ≤ RBStart,High and NRB\_alloc ≤ ceil((BWChannel\_CA / 3 – BWgap ) / 0.18MHz),

where

NRB\_alloc = (NRB1 - RBStart1)∙ 2^µ1 + (RBStart2 + LCRB2 ) ∙ 2^µ2, RBStart\_CA = RBStart1∙2^μ1

RBStart,Low = max(1, floor(NRB\_alloc + (BWgap – BWGB,low)/0.18MHz))

RBStart,High = floor((BWChannel\_CA – 2 ∙ BWgap – BWGB,low)/0.18MHz – 2 ∙ NRB\_alloc)

BWGB,low =Foffset,low – (NRB1∙12+1)∙SCS1/2

BWgap is the bandwidth of the gap between NRB1 and NRB2 possible allocations of CC1 and CC2 respectively.

In contiguous CA, a non-contiguous RB allocation is a non-contiguous outer 1 RB allocation if the following conditions are met:

RBStart,Low ≤ RBStart\_CA ≤ RBStart,High and NRB\_alloc ≤ ceil((3 BWChannel\_CA / 5 – BWgap) / 0.18MHz)

where

RBStart,Low = max(1, 2 ∙ NRB\_alloc – floor( (BWChannel\_CA – 2 ∙ BWgap + BWGB,low)/0.18MHz)),

RBStart,High = floor((2 ∙ BWChannel\_CA – 3 ∙ BWgap – BWGB,low) / 0.18MHz – 3 ∙ NRB\_alloc)

NRB\_alloc , RBStart\_CA , BWgap and BWGB,low are as defined for the Inner region.

In contiguous CA, a non-contiguous allocation is an Outer 2 allocation if it is neither a non-contiguous Inner allocation nor an Outer 1 allocation.

### <Unchanged Text Skipped>

#### 6.2A.3.1.1 UE additional maximum output power reduction for Intra-band contiguous CA

Additional emission requirements can be signalled by the network. Each additional emission requirement is associated with a unique network signalling (NS) value indicated in RRC signalling by an NR frequency band number of the applicable operating band and an associated value in the field *additionalSpectrumEmission.* Throughout this specification, the notion of indication or signalling of an NS value refers to the corresponding indication of an NR frequency band number of the applicable operating band, the IE field *freqBandIndicatorNR* and an associated value of *additionalSpectrumEmission* in the relevant RRC information elements [7]*.* Relation between NR CA band and NR frequency band is specified in Table 5.2A.1-1.

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2A.1.5-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2A.2.4. In absense of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2A.3.1.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable CA band(s) for each CA\_NS value. The mapping of NR CA band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2A.3.1.1-2.

Table 6.2A.3.1.1-1: Additional maximum power reduction (A-MPR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network signalling label | Requirements (clause) | NR CA Band | Aggregated channel bandwidth (MHz) | Resources blocks (*N*RB) | A-MPR (dB) |
| CA\_NS\_01 |  | Table 5.2A.1-1 | All applicaple NR CA bands | All applicaple NR CA configurations | N/A |
| CA\_NS\_04 | 6.5A.2.3.1.16.5A.3.3.1.1 | CA\_n41 | Table 5.5A.1-1 | 6.2A.3.1.1.1 | 6.2A.3.1.1.1 |
| CA\_NS\_27 | 6.5A.2.3.1.26.5A.3.3.1.2 | CA\_n48 | Table 5.5A.1-1 | 6.2A.3.1.1.2 | 6.2A.3.1.1.2 |
| CA\_NS\_46 | 6.5A.3.3.1.3 | CA\_n7 | Table 5.5A.1-1 | 6.2A.3.1.1.3 | 6.2A.3.1.1.3 |
|  |

[The CA\_NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.]

Table 6.2A.3.1.1-2: Mapping of network signaling label

|  |  |
| --- | --- |
| NR CA band | Value of additionalSpectrumEmission |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| CA\_n41 | CA\_NS\_01 | CA\_NS\_04 |  |  |  |  |  |  |
| CA\_n48 | CA\_NS\_01 | CA\_NS\_27 |  |  |  |  |  |  |
| CA\_n7 | CA\_NS\_01 | CA\_NS\_46 |  |  |  |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. |

##### 6.2A.3.1.1.1 A-MPR for CA\_NS\_04

6.2A.3.1.1.1.1 Contiguous allocations

For all waveform type, modulations and scs when Fedge, low - BWChannel\_CA ≥ 2490.5 MHz, A-MPR = MPR

For all modulations and SCS when Fedge, low - BWChannel\_CA < 2490.5 MHz

if the RB allocation is an inner allocation as defined in clause 6.2A.2.1, then A-MPR = MPR

Except for RBstart ≤ 0.33\*BWchannel\_CA/0.18MHz, AMPR= max (MPR, AMPRcc).

if the RB allocation is an outer allocation as defined in clause 6.2A.2.1,

then A-MPR = MPR+1.5dB for BW Class B A-MPR = MPR for BW class C.

Where

- MPR is the MPR as defined in Table 6.2A.2.1-1 for the respective CA bandwidth class

- AMPRcc is defined as the PC3\_A2 AMPR in table 6.2.3.2-2.

6.2A.3.1.1.1.2 Non-contiguous allocations

For intra-band contiguous CA\_n41B and CA\_n41C and it receives IE CA\_ NS\_04, the UE determines the allowed Additional Maximum Power Reduction (AMPR) for the maximum output power as specified in this clause. The AMPR is specified by AMPRIM3 to meet -25dBm/MHz when IM3 falls in -25dBm/MHz region of Table 6.5A.2.3.1.1-1 or Table 6.5A.3.3.1.1-1. And uses MPR for all other cases.

The UE determines the AMPR type as follows:

For all waveform types, modulations and SCS when Fedge, low - BWChannel\_CA ≥ 2490.5 MHz,

if allocation is an inner or outer 1 allocation as defined in Table 6.2A.2.1-2 then A-MPR = MPR

if allocation is an outer 2 allocation as defined in Table 6.2A.2.1-2 then A-MPR = MPR-1dB

For all waveform types, modulations and SCS when Fedge, low - BWChannel\_CA < 2490.5 MHz

If AND( MIN(FIM3,low\_block,high, SEM-13,low) < Ffilter,low , MAX( SEM-13,high, FIM3,high\_block,low ) > Ffilter,high )

 if RB allocation is an inner or outer 1 allocation as defined in Table 6.2A.2.1-2 then A-MPR = MPR

 if RB allocation is an outer 2 allocation as defined in Table 6.2A.2.1-2 then A-MPR = MPR-1dB

Else

 A-MPR = A-MPRIM3 defined in Clause 6.2A.3.1.1.1.3

where

- MPR is the MPR as defined in Table 6.2A.2.1-2 for the respective CA bandwidth class

- FIM3,low\_block,high =(2 \* Flow\_alloc,high\_edge ) – Fhigh\_alloc,low\_edge

- FIM3,high\_block,low = (2 \* Fhigh\_alloc,low\_edge) – Flow\_alloc,high\_edge

- Flow\_alloc,low\_edge is the lowermost frequency of lower transmission bandwidth allocation.

- Flow\_alloc,high\_edge is the uppermost frequency of lower transmission bandwidth allocation.

- Fhigh\_alloc,low\_edge is the lowermost frequency of upper transmission bandwidth allocation.

- Fhigh\_alloc,high\_edge is the uppermost frequency of upper transmission bandwidth allocation.

- Ffilter,low = 2480 MHz

- Ffilter,high = 2745 MHz

- SEM-13,high = Threshold frequency where upper spectral emission mask for upper channel drops from -13 dBm / 1MHz to -25 dBm / 1MHz, as specified in Clause 6.5A.2.3.1.1

- SEM-13,low = Threshold frequency where lower spectral emission mask below the lower channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.3.1.1

6.2A.3.1.1.1.3 AMPRIM3 to meet -25dBm/MHz

AMPR in this clause is for intra-band contiguous CA\_n41B and CA\_n41C. The allowed maximum output power reduction is defined as:

AMPRIM3=MA, Where MA is defined as follows

MA = 13; 0 ≤ B < 2.16

 11.5; 2.16 ≤ B < 3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04 ≤ B < 10.08

 8; 10.08 ≤ B < 16.56

 7; 16.56 ≤ B < 21.96

 6; 21.96 ≤ B

Where:

B=(LCRB1\* 12\* SCS1 + LCRB2 \* 12 \* SCS2)/1,000,000

and LCRB1, SCS1 are for CC1, LCRB2, SCS2 are for CC2, CC1 is the component carrier with lower frequency.

### <Unchanged Text Skipped>

### 6.2D.4 Configured transmitted power for UL MIMO

For UE supporting UL MIMO, the transmitted power is configured per each UE.

The definitions of configured maximum output power PCMAX,*c*, the lower bound PCMAX\_L,*c*, and the higher bound PCMAX\_H,*c* specified in clause 6.2.4 shall apply to UE supporting UL MIMO, where

- PPowerClass, ΔPPowerClass and ∆TC,c are specified in clause 6.2.4 unless otherwise stated;

- MPRc is specified in clause 6.2D.2;

- A-MPRc is specified in clause 6.2D.3.

The measured configured maximum output power PUMAX,*c* for serving cell *c* shall be within the following bounds:

PCMAX\_L,*c*– MAX{TL, T LOW(PCMAX\_L,*c*)} ≤ PUMAX,*c* ≤ PCMAX\_H,*c*+ T HIGH(PCMAX\_H,*c*)

where TLOW(PCMAX\_L,*c*) and THIGH(PCMAX\_H,*c*) are defined as the tolerance and applies to PCMAX\_L,*c* and PCMAX\_H,*c* separately, while TL is the absolute value of the lower tolerance in Table 6.2D.1-1 for the applicable operating band.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the tolerance is specified in Table 6.2D.4-1. The requirements shall be met with UL MIMO configurations specified in Table 6.2D.1-2.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the tolerance is specified in Table 6.2D.4-1. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode.

Table 6.2D.4-1: PCMAX,*c* tolerance in closed-loop spatial multiplexing scheme

|  |  |  |
| --- | --- | --- |
| PCMAX,*c*(dBm) | ToleranceTLOW(PCMAX\_L,*c*) (dB) | ToleranceTHIGH(PCMAX\_H,*c*) (dB) |
|  |  |  |
| 23 ≤ PCMAX,*c* ≤ 29 | 3.0 | 2.0 |
| 22 ≤ PCMAX,*c* < 23 | 5.0 | 2.0 |
| 21 ≤ PCMAX,*c* < 22 | 5.0 | 3.0 |
| 20 ≤ PCMAX,*c* < 21 | 6.0 | 4.0 |
| 16 ≤ PCMAX,*c* < 20 | 5.0 |
| 11 ≤ PCMAX,*c* < 16 | 6.0 |
| -40 ≤ PCMAX,*c* < 11 | 7.0 |

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.2.4 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling.

## 6.2E Transmitter power for V2X

### <Unchanged Text Skipped>

#### 6.4A.1.1 Frequency error for intra-band contiguous CA

For intra-band contiguous carrier aggregation the UE modulated carrier frequencies per band shall be accurate to within ±0.1 PPM observed over a period of 1 ms of cumulated measurement intervals compared to the carrier frequency of primary component carrier received in the corresponding band

### <Unchanged Text Skipped>

### 6.4A.2 Transmit modulation quality for CA

#### 6.4A.2.1 Transmit modulation quality for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the requirements in clauses 6.4A.2.1.1, 6.4A.2.1.2 and 6.4A.2.1.3 applies.

The requirements in this clause apply with PCC and SCC in the UL configured and activated: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

In case the parameter 3300 or 3301 is reported from UE via *txDirectCurrentLocation-r16* or *txDirectCurrentLocation* (as defined in TS 38.331 [7]) or UE does not indicate the DC location parameters, carrier leakage measurement requirement in clause 6.4A.2.1.2 and 6.4A.2.1.3 shall be waived, and the RF correction with regard to the carrier leakage and IQ image shall be omitted during the calculation of transmit modulation quality.

##### 6.4A.2.1.1 Error Vector Magnitude

For the intra-band contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers. Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-clause 6.4.2.1.

When a single component carrier is configured Table 6.4.2.1-1 apply.

The EVM requirements are according to Table 6.4A.2.1.1-1 if CA is configured in uplink with the parameters defined in Table 6.4.2.1-2.

Table 6.4A.2.1.1-1: Minimum requirements for Error Vector Magnitude

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Average EVM Level per CC |
| Pi/2-BPSK  | % | 30 |
| QPSK | % | 17.5 |
| 16 QAM  | % | 12.5 |
| 64 QAM  | % | 8 |
| 256 QAM | % | 3.5 |

##### 6.4A.2.1.2 In-band emissions

For intra-band contiguous carrier aggregation, the requirements in Table 6.4A.2.1.2-1 and 6.4A.2.1.2-2 apply within the aggregated transmission bandwidth configuration with both component carrier (s) active and one single contiguous PRB allocation of bandwidth  at the edge of the aggregated transmission bandwidth configuration.

The inband emission is defined as the interference falling into the non allocated resource blocks for all component carriers. The measurement method for the inband emissions in the component carrier with PRB allocation is specified in annex F.3. For a non allocated component carrier a spectral measurement is specified.

Table 6.4A.2.1.2-1: Minimum requirements for in-band emissions (allocated component carrier)

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter  | Unit | Limit | Applicable Frequencies |
| General | dB |  | Any non-allocated (NOTE 2) |
| IQ Image | dB | -28 | Output power > 10 dBm | Image frequencies(NOTE 3) |
|  |  | -25 | 0≤ Output power ≤ 10 dBm |  |
| Carrier leakage | dBc | -28 | Output power > 10 dBm | Carrier leakage frequency (NOTE 4,5) |
|  |  | -25 | 0 dBm ≤ Output power ≤ 10 dBm |  |
|  |  | -20 | -30 dBm ≤ Output power ≤ 0 dBm |  |
|  |  | -10 | -40 dBm ≤ Output power < -30 dBm |  |
| NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of $\overline{P\_{RB}}$- 30 dB dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. $\overline{P\_{RB}}$ is defined in NOTE 10. The limit is evaluated in each non-allocated RB. NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBsNOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs.NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.NOTE 5: The applicable frequencies for this limit depend on the parameter *txDirectCurrentLocation-r16* in *UplinkTxDirectCurrentTwoCarrierList* IE indicated in active uplink carrier(s). For band combinations with supporting additional DC location reporting for intra-band CA, the applicable LO leakage frequency depend on the *txDirectCurrentLocation-r16* indicated in the additional reporting IE, and are those that are enclosed either in the RB containing the carrier leakage frequency, or in the two RBs immediately adjacent to the carrier leakage frequency but excluding any allocated RB. Otherwise, the applicable frequencies for this limit depend on the parameter *txDirectCurrentLocation-r16* in *UplinkTxDirectCurrentTwoCarrierList* IE. For only one uplink carrier is activated, the applicable LO leakage frequency follow definition in clause 6.4.2.NOTE 6:  is the Transmission Bandwidth (see clause 5.3) not exceeding  .NOTE 7:  is the Transmission Bandwidth Configuration (see clause 5.3) of the component carrier with RBs allocated. NOTE 8:  is the limit specified in Table 6.4.2.1-1 for the modulation format used in the allocated RBs. NOTE 9:  is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g.  or  for the first adjacent RB outside of the allocated bandwidth). NOTE 10:  is an average of the transmitted power over 10 sub-frames normalized by the number of allocated RBs, measured in dBm. |

Table 6.4A.2.1.2-2: Minimum requirements for in-band emissions (not allocated component carrier)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Para-meter | Unit | Meas BWNOTE 1 | Limit | remark | Applicable Frequencies |
| General | dB | BW of 1 RB |  | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier.The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB | NOTE 2 | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the contiguous non-allocated RBs are unknown.The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
|  |  |  | -28 | Output power > 10 dBm |  |  |
|  |  |  | -25 | 0≤ Output power ≤ 10 dBm |  |  |
| Carrier leakage | dBc | BW of 1 RB | NOTE 3 | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown.The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
|  |  |  | -28 | Output power > 10 dBm |  |  |
|  |  |  | -25 | 0 dBm ≤ Output power ≤ 10 dBm |  |  |
|  |  |  | -20 | -30 dBm ≤ Output power ≤ 0 dBm |  |  |
|  |  |  | -10 | -40 dBm ≤ Output power < -30 dBm |  |  |
| NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.NOTE 2: Exceptions to the general limit is are allowed for up to +1 RBs within a contiguous width of +1 non-allocated RBs. NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBsNOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.4A.2.1.1-1 apply for Table 6.4A.2.1.2-2 as well.NOTE 5:  for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB. |

##### 6.4A.2.1.3 Carrier leakage

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. For intra-band contiguous CA, the carrier leakage requirement is defined with applicable frequencies dependent on parameter *txDirectCurrentLocation-r16* or *txDirectCurrentLocation* (as defined in TS 38.331 [7]). For only one uplink carrier is activated, the applicable LO leakage frequency follow definition in clause 6.4.2.The measurement interval is one slot in the time domain.

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.4A.2.1.3-1. Carrier leakage frequencies are those that are enclosed either in the RB containing the carrier leakage frequency, or in the two RBs immediately adjacent to the carrier leakage frequency but excluding any allocated RB.

Table 6.4A.2.1.3-1: Minimum requirements for Relative Carrier Leakage Power

|  |  |
| --- | --- |
| Parameters | Relative Limit (dBc) |
| Output power > 10 dBm  | -28 |
| 0 dBm ≤ Output power ≤ 10 dBm | -25 |
| -30 dBm ≤ Output power < 0 dBm | -20 |
| -40 dBm ≤ Output power < -30 dBm | -10 |

### <Unchanged Text Skipped>

##### 6.4A.2.2.3 Carrier leakage

For intra-band non-contiguous CA, if UE indicates *uplinkTxDC-TwoCarrierReport-r16*, the carrier leakage requirement is defined with applicable frequencies dependent on parameter *txDirectCurrentLocation-r16* in *UplinkTxDirectCurrentTwoCarrierList* IE indicated in activated uplink carrier(s), otherwise, the carrier leakage requirement is defined with applicable frequencies dependent on parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrent* IE. The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.4A.2.1.3-1. Carrier leakage frequencies are those that are enclosed either in the RB containing the carrier leakage frequency, or in

## << End of change3 >>

## << Start of change4 >>

7.6.4 Narrow band blocking

This requirement is measure of 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 relative 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 7.6.4-1. 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 7.6.4-1: Narrow Band Blocking

|  |  |  |  |
| --- | --- | --- | --- |
| NR band | Parameter | Unit | 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 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n26, n28, n30, n34, n38, n39, n40, n41, n48, n50, n51, n53, n65, n66, n70, n71, n74, n75, n76 | Pw | dBm |  | PREFSENS + channel-bandwidth specific value below |
|  |  | dB | 16 | 13 | 14 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
|  | Puw (CW) | dBm | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 |
|  | Fuw (offset SCS= 15 kHz) | MHz | 2.7075 | 5.2125 | 7.7025 | 10.2075 | 13.0275 | 15.6075 | 20.5575 | 25.7025 | NA | NA | NA | NA |
|  | Fuw (offset SCS= 30 kHz) | MHz | NA | NA | NA | NA | NA | NA | NA | NA | 30.855 | 40.935 | 45.915 | 50.865 |
| 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 6.2.4NOTE 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 7.3.2-1 and Table 7.3.2-2 for two and four antenna ports, respectively. |

7.6A Blocking characteristics for CA

7.6A.1 General

7.6A.2 In-band blocking for CA

7.6A.2.1 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.2.1-1 and 7.6A.2.1-1a 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.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.2.1-1: 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 | dBm | REFSENS + CA bandwidth class specific value below |
|  | dB | 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 Pattrn 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.2.1-1a: 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 |
|  | dB | 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 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.2.1-2: 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 1andBWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2and≥ BWchannel CA/2 +FIoffset, case 2 |
|  | Finterferer | MHz | NOTE 2 | FDL\_low – 3BWchannel CAtoFDL\_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 1NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal |

Table 7.6A.2.1-2a: 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 |  |
| n41, n66, n484,n40 | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1andBWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2and≥ BWchannel CA/2 +FIoffset, case 2 |  |
|  | Finterferer | MHz | NOTE 2 | FDL\_low – 15toFDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12toFDL\_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 1NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signalNOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. |

7.6A.2.2 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 clause 7.6.2 and 7.6A.2.1 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.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.2.3 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 clause 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.3.2, Pinterferer power defined in Table 7.6.2-2 and 7.6.2-4 is increased by the amount given by ΔRIB,c in Table 7.3A.3.2.

For E-UTRA 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 Table 7.6A.2.3-1.

Table 7.6A.2.3-1: 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/2 – FIoffset, case 1andBWChannel/2 + FIoffset, case 1 | ≤ -BWChannel/2 – FIoffset, case 2and≥ BWChannel/2 + FIoffset, case 2 |
| n29 | Finterferer | MHz | NOTE 2 | FDL\_low – 15toFDL\_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 bandNOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWChannel/2 – FIoffset, case 1; b: BWChannel/2 + FIoffset, case 1NOTE 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 signalNOTE 4: BWChannel denotes the channel bandwidth of the wanted 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.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 Out-of-band blocking for CA

7.6A.3.1 Out-of-band blocking for Intra-band contiguous CA

For intra-band contiguous carrier aggreagation 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 Table 7.6A.3-1 and Table 7.6A.3-2 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.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.3-1: 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 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.6A.3-1a: Void

Table 7.6A.3-2: Out of-band blocking for intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -45 | -30 | -15 |
| n41,n66,n71,n485,n40 | Finterferer (CW) | MHz | -60 < f – FDL\_low < -15or15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60or60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85orFDL\_high + 85 ≤ f≤ 12750 |
| n77, n78(NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)orFDL\_high+ MAX(200,3\*BWChannel\_CA)≤ f ≤ 12750 |
| n79(NOTE 4) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(150,3\*BWChannel\_CA)orFDL\_high + MAX(150,3\*BWChannel\_CA)≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz.NOTE 2: BWChannel\_CA denotes the aggregated channel bandwidth of the wanted signalNOTE 3: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 2700 MHz and FInterferer < 4800 MHz. For BWChannel\_CA > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3\*BWChannel\_CA from the band edge. For BWChannel\_CA > 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 |

Table 7.6A.3-2a: Void

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.3.2 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.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in clauses 7.6.3 and 7.6A.3.1 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.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.3.3 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. 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 clause 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 clauses 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 clauses 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 clause 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.3.2.1-1, Pinterferer power defined in Table 7.6.3-2 and 7.6.3-4 is increased by the amount given by ΔRIB,c in Table 7.3A.3.2.1-1.

For inter-band CA combination listed in Table 7.6A.3.3-1, exceptions to the requirement specified in Table 7.6A.3.3-2 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.3.3-1: CA band combination with exceptions allowed

|  |
| --- |
| CA band combination |
| CA\_n5-n77 |
| CA\_n5-n78 |
| CA\_n5-n79 |
| CA\_n8-n78 |
| CA\_n8-n79 |
| CA\_n20-n78 |
| CA\_n28-n77 |
| CA\_n28-n78 |
| CA\_n78-n92 |

Table 7.6A.3.3-2: Requirement for out-of-band blocking exceptions

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

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 throughput of each carrier 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).

7.6A.4 Narrow band blocking for CA

7.6A.4.1 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.4.1-1 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. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.6A.4.1-1 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, 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.4.1-1.

Table 7.6A.4.1-1: Narrow-band blocking for intra-band contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| NR band | Parameter | Unit | NR CA bandwidth class |
|  |  |  | B | C |
| n1, n41, n66, n71,n48, n40 | Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + NR CA Bandwidth Class specific value below |
|  |  | dB | 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 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 7.3.2-1 and Table 7.3.2-2 for two and four antenna ports, respectively.NOTE 4: The Fuw (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to MHz to be offset from the sub-carrier raster. |

7.6A.4.2 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.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in clauses 7.6.4 and 7.6A.4.1 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.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.4.3 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. 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 clause 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.3.2.1-1, PUW power defined in Table 7.6.4-1 is increased by the amount given by ΔRIB,c in Table 7.3A.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.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).

7.6B Blocking characteristics for NR-DC

For inter-band NR-DC configurations, the blocking characterstics for the corresponding inter-band CA configuration as specified in clause 7.6A applies.

7.6C Blocking characteristics for SUL

7.6C.1 General

7.6C.2 In-band blocking for SUL

For SUL operation, the in-band blocking requirement for downlink bands specified in clause 7.6.2 shall be met.

For SUL operation with downlink CA, the in-band blocking requirement for downlink bands specified in clause 7.6A.2 shall be met.

7.6C.3 Out-of-band blocking for SUL

For SUL operation, the out-of-band blocking requirement for downlink bands specified in clause 7.6.3 shall be met. 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, exceptions to the requirement specified in Table 7.6C.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: SUL operating band combination with exceptions allowed

|  |
| --- |
| NR Band combination for SUL |
| SUL\_n78-n81 |
| SUL\_n78-n82 |
| SUL\_n78-n83 |
| SUL\_n79-n81 |

Table 7.6C.3-2: Requirement for out-of-band blocking exceptions

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -441 |
| NOTE 1: The requirement applies when$ |f\_{Interferer}\pm f\_{SUL}- f\_{DL}|\leq (BW\_{SUL}+ BW\_{DL})/2$, where $BW\_{SUL} $and $BW\_{DL} $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.

7.6C.4 Narrow band blocking for SUL

Narrow band blocking is not specified for SUL band combination.

7.6D Blocking characteristics for UL MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in clause 7.6 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

7.6E 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

7.6E.2.1 General

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.2.1-1 and Table 7.6E.2.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.2.1-1: 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.2.1-2: 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 1andBW/2 + FIoffset, case 1 | ≤ -BW/2 – FIoffset, case 2and≥ BW/2 + FIoffset, case 2 |
|  | Finterferer | MHz | NOTE 2 | FDL\_low – 30toFDL\_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 andb. the carrier frequency +BW/2 + FIoffset, case 1NOTE 3: FInterferer range values for unwanted modulated interfering signal are interferer center 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.2.2 In-band blocking for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.6E.2.1 shall apply for the NR sidelink reception in the operating Bands in Table 5.2E.1-1 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.

7.6E.3 Out-of-band blocking

7.6E.3.1 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. 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.3.1-1 and Table 7.6E.3.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6E.3.1-1: 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.3.1-2: 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 toFDL\_low -60 | FDL\_low -60 toFDL\_low -85 | FDL\_low -85 to1 MHz |
|  |  |  | FDL\_high +30 toFDL\_high + 60 | FDL\_high +60 toFDL\_high +85 | FDL\_high +85 to+12750 MHz |
| n38 | Pinterferer | dBm | -44 | -30 | -15 |
|  | Finterferer (CW) | MHz | FDL\_low -30 toFDL\_low -60 | FDL\_low -60 toFDL\_low -85 | FDL\_low -85 to1 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.3.2 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.3.1 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.

7.6F Blocking characteristics

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 General

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.2.1-1 and Table 7.6F.2.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.2.1-1: 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.2.1-2: 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 1andCBW/2 +FIoffset, case 1 | ≤ -CBW/2 –FIoffset, case 2and≥ CBW/2 +FIoffset, case 2 |
| n46, n96  | Finterferer |  | NOTE 2 | FDL\_low – 3\*CBWtoFDL\_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 1NOTE 3: CBW denotes the channel bandwidth of the wanted signalNOTE 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 Intra-band contiguous shared spectrum channel access CA

In-band blocking for intra-band contiguous shared access CA requirements are specified in Table 7.6F.2.2-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.6F.2.2-2, 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.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 7.6F.2.2-1: In-band blocking parameters for intra-band contiguous shared access CA

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Shared access CA bandwidth class |
|  |  | B, C, D, E, M, N, O |
| Pw in Transmission Bandwidth Configuration, per CC  | dBm | REFSENS + aggregated channel bandwidth value below |
|  | dB | 9 + 10log10(BWChannel\_CA/20) |
| BWInterferer  | MHz | 20 |
| FIoffset, case 1  | MHz | 30 |
| FIoffset, case 2  | MHz | ≥ 50 |
| 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 7.6F.2.2-2: In-band blocking for intra-band contiguous shared access CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Case 1 | Case 2 |
|  | Pinterferer | dBm | -56 | -44 |
|  | Finterferer (offset) | MHz | -BWchannel CA/2 –FIoffset, case 1andBWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2and≥ BWchannel CA/2 +FIoffset, case 2 |
| n46 | Finterferer | MHz | NOTE 2 | FDL\_low – 3\* BWchannel CAtoFDL\_high + 3\* BWchannel CANOTE 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 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 1NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signalNOTE 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 - BWchannel CA /2 – FIoffset, case 2 and BWchannel CA /2 + FIoffset, case 2 |

7.6F.3 Out-of-band blocking

7.6F.3.1 General

ut-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.3.1-1 and Table 7.6F.3.1-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6F.3.1-1: 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.3.1-2: 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\*CBWor3\*CBW ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*CBW)orFDL\_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.3-2, 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.

7.6F.3.2 Intra-band contiguous shared spectrum channel access CA

Out-of-band blocking for intra-band contiguous shared access CA requirements are specified in Table 7.6F.3.2-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.6F.3.2-2, 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.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 7.6F.3.2-1: Out-of-band blocking parameters for intra-band contiguous shared access CA

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units  | Shared access CA bandwidth class |
|  |  | B, C, D, E, M, N, O |
| Pw in Transmission Bandwidth Configuration, per CC  | dBm | REFSENS + CA bandwidth class specific value below |
|  | dB | 9 |
| 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. |

Table 7.6F.3.2-2: Out of-band blocking for intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band | Parameter | Unit | Range1 | Range 2 | Range 3 |
|  | Pinterferer | dBm | -45 | -30 | -15 |
| n46 | Finterferer (CW) | MHz | N/A | -200 < f – FDL\_low ≤ -3\*BWChannel\_CAor3\*BWChannel\_CA ≤ f – FDL\_high < 200 | 1 ≤ f ≤ FDL\_low – MAX(200,3\*BWChannel\_CA)orFDL\_high + MAX(200,3\*BWChannel\_CA)≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 4200 MHz. |

7.7 Spurious response

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 clause 7.6.3 is not met.

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 for the wanted signal as specified in Table 7.7-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and in Table 7.7-1a for NR bands with FDL\_high ≥ 3300 MHz and FUL\_high ≥ 3300 MHz and for the interferer as specified in Table 7.7-2. 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 7.7-1: Spurious response 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 | 40 MHz | 50 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |
|  | dB | 11 | 12 | 13 | 14 | 15 |
| RX parameter | Units | Channel bandwidth |
|  |  | 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below |  |  |  |
|  | dB | 15.5 | 16 |  |  |  |
| 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 7.7.1-1a: Spurious response 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 bandwidth specific value below |
|  | dB | 6 | 7 | 9 | 9 | 9 |
| 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 | 9 | 9 | 9 | 9 | 9 |
| RX parameter | Units | Channel bandwidth |
|  |  | 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth 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 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.7-2: Spurious response

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

7.7A Spurious response for CA

7.7A.1 Spurious response for Intra-band contiguous CA

Table 7.7A-1: Spurious response parameters for intra-band contiguous CA

|  |  |  |
| --- | --- | --- |
| RX parameter | Units | NR 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 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.7A-2: Spurious response for CA

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

Table 7.7A-3: Void

Table 7.7A-4: void

7.7A.2 Spurious response 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.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.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.3 Spurious response 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 clause 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.3.2.1-1, Pinterferer power defined in Table 7.7-2 is increased by the amount given by ΔRIB,c in Table 7.3A.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.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).

7.7B 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.

7.7D Spurious response for UL MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements specified in clause 7.7 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

7.7E Spurious response for V2X

7.7E.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.3.1 is not met.

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.1-1 and Table 7.7E.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.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.1-2: Spurious response for NR V2X

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| PInterferer (CW) | dBm | -44 |
| FInterferer | MHz | Spurious response frequencies |

7.7E.2 Spurious response for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.7E.1 shall apply for the NR sidelink reception in the operating Bands in Table 5.2E.1-1 and the requirements specified in clause 7.7 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

7.7F Spurious response for shared spectrum channel access

7.7F.1 General

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.1-1 and Table 7.7F.1-2. 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.1-1: 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 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4. |

Table 7.7F.1-2: 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

For spurious responses, 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.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.2-1 and Table 7.7F.2-2. 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.3.2 is not met.

Table 7.7F.2-1: Spurious response parameters for intra-band contiguous shared access CA

|  |  |  |
| --- | --- | --- |
| Rx Parameter | Units | Shared access CA bandwidth class |
|  |  | B, C, D, E, I, M, N,O |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below |
| dB | 9 |
| 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. |

Table 7.7F.2-2: Spurious response for intra-band contiguous shared access CA

|  |  |  |
| --- | --- | --- |
| 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

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.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 7.8.2-1 for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz and Table 7.8.2-2 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 7.8.2-1: Wide band intermodulation parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units  | Channel bandwidth |
|  |  | 5MHz | 10MHz | 15MHz | 20MHz | 25MHz | 30MHz | 40MHz | 50MHz | 60MHz | 80MHz | 90MHz | 100MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + channel bandwidth specific value below |
|  | dB | 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 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.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 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. |

Table 7.8.2-2: Wide band intermodulation parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |
| --- | --- | --- |
| Rx parameter | Units | Channel bandwidth |
|  |  | 10MHz | 20MHz | 40MHz | 50MHz | 60MHz | 80MHz | 90MHz | 100MHz |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 6 dB |
| 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 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. |

7.8A Intermodulation characteristics for CA

7.8A.1 General

7.8A.2 Wide band intermodulation for CA

7.8A.2.1 Wide band intermodulation for Intra-band contiguous CA

Table 7.8A.2.1-1: 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 dB | REFSENS + 6 dB | REFSENS + 13.8 dB |  |
| 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 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 closest carrier.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. |

Table 7.8A.2.1-2: 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 dB | REFSENS + 19 dB |
| 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 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 15 kHz SCS.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. |

7.8A.2.2 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.2.2-1. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in clause 7.8.2 and 7.8A.2.1 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.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.2.3 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 clause 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.3.2.1-1, Pinterferer power defined in Table 7.8.2-1 and 7.8.2-2 is increased by the amount given by ΔRIB,c in Table 7.3A.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.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).

7.8B 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.

7.8D Intermodulation characteristics for UL MIMO

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in clause 7.8 shall be met with the UL MIMO configurations described in clause 6.2D.1. For UL MIMO, the parameter PCMAX\_L is defined as the total transmitter power over the two transmit antenna connectors.

7.8E 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

7.8E.2.1 General

The wide band intermodulation requirement is defined using modulated NR carrier and a CW 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.7.2 with parameters specified in Table 7.8E.2-1 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.2-1: 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 |
|  | dB | 6 | 9 | 11 | 12 |
|  | PInterferer 1 (CW) | dBm | -46 |
|  | PInterferer 2 (Modulated) | dBm | -46 |
|  | BWInterferer 2 | MHz | 10 |
|  | FInterferer 1 (Offset) | MHz | -BW/2 – 15/+BW/2 + 15 |
|  | FInterferer 2 (Offset) | MHz | 2 \* FInterferer 1 |
| NOTE 1: Reference measurement channel is A.7.2NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. |

7.8E.2.2 Wide band Intermodulation for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 7.8E.2.1 shall apply for the NR sidelink reception in the operating Bands in Table 5.2E.1-1 and the requirements specified in clause 7.8 shall apply for the NR downlink reception in licensed band while all downlink carriers are active.

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

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.2-1. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.8F.2-1: 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 |
|  | dB | 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. |

## << End of change4>>

## << Start of change5 >>

# F.1 Measurement Point

Figure F.1-1 shows the measurement point for the unwanted emission falling into non-allocated RB(s) and the EVM for the allocated RB(s).

DFT

IFFT

TX

Front

-

-end

Channel

RF

correction

FFT

Tx

-

Rx chain

equalizer

In

-

band

emissions

meas.

0

0

IDFT

DUT

Test equipment

EVM meas. of

CP-OFDM PUSCH, PUCCH, and CP-OFDM DM-RS, DFT-s-OFDM DMRS Type 1

CP-OFDM PUSCH, PUCCH, and CP-OFDM DM-RS, DFT-s-OFDM DM-RS Type 1

Tone map

DFT-s-OFDM PUSCH, PUCCH, and DFT-s-OFDM DM-RS Type 2

EVM meas. of DFT-s-OFDM PUSCH, PUCCH, and DFT-s-OFDM DM-RS Type 2

Figure F.1-1: EVM measurement points

## << End of change5>>