**3GPP TSG-RAN WG4 Meeting #94-e  *R4-2002908***

**Online, Feb. 24th – March 6th, 2020**

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| *CR-Form-v11.4* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | 0239 | **rev** | 1 | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *For* ***HE******LP*** *on using this form: comprehensive instructions can be found at  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:*** | CR for TS 38.101-1: Corrections for n48 receiver requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MediaTek Inc. | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR1 | | | | |  | ***Date:*** | | | 2020-03-02 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP TR 21.900. | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. The minium requirements specified in clauses 7.5, 7.6, 7.7 and 7.8 for NR band n48 are referred to the minimum requirements for NR bands < 2.7 GHz accorging to the general requirement defined in Clause 7.1. However, the current n48 in-band blocking and out-of-band blocking requirements are listed in Table 7.6.2-4 and Table 7.6.3-4 which are for NR bands ≥ 3300 MHz. 2. n48 OOB range 3 blocker power level needs to be revised to -20 dBm for frequency range > 2700 MHz and < 4800 MHz to take into account of RF FE filter sharing with n77/n78. 3. n48 should be included in Table 7.6.4-1 for Narrow Band Blocking requirements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Remove n48 from Table 7.6.2-4 and Table 7.6.3-4. 2. Add n48 to Table 7.6.2-2 and Table 7.6.3-2 which are for NR bands < 2.7 GHz. 3. Add NOTE 3 to Table 7.6.2-2 to indicate that n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. 4. Add NOTE 5 to Table 7.6.3-2 to indicate that n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1 and the frequency range for revised OOB blocker power level in Range 3. 5. Add n48 to Table 7.6.4-1. 6. Add NOTE 5 to Table 7.6A.3-2 to indicate the frequency range for revised OOB blocker power level in Range 3 for n48. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | n48 in-band blocking and out-of-band blocking requirements are not correctly defined and narrow band blocking requirement is missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.6.2, 7.6.3, 7.6.4, 7.6A.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.521-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

## <<< Start of changed sections>>>

### 7.6.2 In-band blocking

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.2-1 and Table 7.6.2-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.2-1: In-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | 6 | 7 | 9 | 10 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| RX parameter | Units | Channel bandwidth | | | | |
| 30 MHz | 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 |
| BWinterferer | MHz | 5 | | | | |
| FIoffset, case 1 | MHz | 7.5 | | | | |
| FIoffset, case 2 | MHz | 12.5 | | | | |
| 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 |  |  |  |
| BWinterferer | MHz | 5 | |  |  |  |
| FIoffset, case 1 | MHz | 7.5 | |  |  |  |
| FIoffset, case 2 | MHz | 12.5 | |  |  |  |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 and 15 kHz SCS. | | | | | | |

Table 7.6.2-2: In-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 | Case 3 | Case 4 |
| Pinterferer | dBm | -56 | -44 | -15 | -38 |
| Finterferer (offset) | MHz | -CBW/2 –  FIoffset, case 1  and  CBW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |  | -CBW/2-11 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28,n34, n38,n39, n40, n41, n483, n50, n51, n65, n66, n70, n74, n75, n76 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |  |
| n30 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  | FDL\_low – 11 |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12 to FDL\_high + 15 | FDL\_low – 12 |  |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. | | | | | | |

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz in-band blocking (IBB) is defined for an unwanted interfering signal falling into the UE receive band or into an immediately adjacent frequency range up to 3CBW below or above the UE receive band where CBW is the bandwidth of the wanted signal. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1)] with parameters specified in Table 7.6.2-3 and Table 7.6.2-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.2-3: In-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 10 | 15 | 20 | 25 | 30 |
| FIoffset, case 1 | MHz | 15 | 22.5 | 30 | 37.5 | 45 |
| FIoffset, case 2 | MHz | 25 | 37.5 | 50 | 62.5 | 75 |
| RX parameter | Units | Channel bandwidth | | | | |
| 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | | | | |
| dB | 6 | | | | |
| BWinterferer | MHz | 40 | 50 | 60 | 70 | 80 |
| FIoffset, case 1 | MHz | 60 | 75 | 90 | 105 | 120 |
| FIoffset, case 2 | MHz | 100 | 125 | 150 | 175 | 200 |
| RX parameter | Units | Channel bandwidth | | | | |
| 90 MHz | 100 MHz |  |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel bandwidth specific value below | |  |  |  |
| dB | 6 | |  |  |  |
| BWinterferer | MHz | 90 | 100 |  |  |  |
| FIoffset, case 1 | MHz | 135 | 150 |  |  |  |
| FIoffset, case 2 | MHz | 225 | 250 |  |  |  |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 | | | | | | |

Table 7.6.2-4: In-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Case 1 | Case 2 |
| Pinterferer | dBm | -56 | -44 |
| n77, n78, n79 | Finterferer (offset) | MHz | -CBW/2 –  FIoffset, case 1  and  BW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |
| Finterferer |  | NOTE 2 | FDL\_low – 3CBW  to  FDL\_high + 3CBW |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: CBW denotes the channel bandwidth of the wanted signal | | | | |

### 7.6.3 Out-of-band blocking

For NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 15 MHz below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3-1 and Table 7.6.3-2. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal. For operating bands with an unpaired DL part (as noted in Table 5.2-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.3-1: Out-of-band blocking parameters for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + channel 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: 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 7.6.3-2: Out of-band blocking for NR bands with FDL\_high < 2700 MHz and FUL\_high < 2700 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR band | Parameter | Unit | Range 1 | Range 2 | Range 3 |
| n1, n2, n3, n5, n7, n8, n12, n14, n18, n20, n25, n28, n30,  n34, n38,  n39, n40, n41, n485, n50, n51, n65, n66, n70, n71, n74, n75, n76 | Pinterferer | dBm | -44 | -30 | -15 |
| Finterferer (CW) | MHz | -60 < f – FDL\_low < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 6000 MHz.  NOTE 2: For band 51 the FDL\_high of band 50 is applied as FDL\_high for band 51. For band 50, the FDL\_low of band 51 is applied as FDL\_low for band 50.  NOTE 3: For band 76 the FDL\_high of band 75 is applied as FDL\_high for band 76. For band 75, the FDL\_low of band 76 is applied as FDL\_low for band 75.  NOTE 4: For UEs supporting both bands 38 and 41, the FDL\_high and FDL\_low of band 41 is applied as FDL\_high and FDL\_low for band 38.  NOTE 5: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1. The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm for FInterferer > 2700 MHz and FInterferer < 4800 MHz. | | | | | |

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3-2, 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 7.7 apply.

For NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range up to 3CBW below or from 3CBW above the UE receive band, where CBW is the channel bandwidth. The throughput of the wanted signal shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3-3 and Table 7.6.3-4. The relative throughput requirement shall be met for any SCS specified for the channel bandwidth of the wanted signal.

Table 7.6.3-3: Out-of-band blocking parameters for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | | |
| 10 MHz | 15 MHz | 20 MHz | 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: 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 7.6.3-4: Out of-band blocking for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

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

For interferer frequencies across ranges 1, 2 and 3 in Table 7.6.3-4, a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz withthe number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and *n* = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

### 7.6.4 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.2.3, A.3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.4-1. 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, n28, n30, n34, n38, n39, n40, n41, n48, n50, n51, n65, n66, n70, n71, n74, n75, n76 | Pw | dBm |  | PREFSENS + channel-bandwidth specific value below | | | | | | | | | | |
| 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 6.2.4  NOTE 2: Reference measurement channel is specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.  NOTE 3: The PREFSENS power level is specified in Table 7.3.2-1 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.6A.2.1-1: In-band blocking parameters for intra-band contiguous CA with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR CA bandwidth class | | | |
| B | C |  |  |
| Pw in Transmission Bandwidth Configuration, per CC | dB | REFSENS + CA bandwidth class specific value below | | | |
| 10.0 | 6 |  |  |
| BWInterferer | MHz | 20 | BWchannel CA |  |  |
| FIoffset, case 1 | MHz | 30 | BWchannel CA+ BWchannel CA/2 |  |  |
| FIoffset, case 2 | MHz | 50 | BWInterferer + FIoffset, case 1 |  |  |
| NOTE 1: The transmitter shall be set to 4dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The interferer consists of the Reference measurement channel specified in Annexes A.3.2 and A.3.3 with one sided dynamic OCNG 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 | |
| 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 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |
| Finterferer | MHz | NOTE 2 | FDL\_low – 3BWchannel CA  to  FDL\_high + 3BWchannel CA |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal | | | | |

Table 7.6A.2.1-2a: 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 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |  |
| Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |  |
| n71 | Finterferer | MHz | NOTE 2 | FDL\_low – 12  to  FDL\_high + 15 | FDL\_low – 12 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with 15 kHz SCS.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -BWchannel CA/2 – FIoffset, case 1; b: BWchannel CA/2 + FIoffset, case 1  NOTE 3: BWchannel CA denotes the aggregated channel bandwidth of the wanted signal  NOTE 4: n48 follows the requirement in this frequency range according to the general requirement defined in Clause 7.1A. | | | | | |

#### 7.6A.2.2 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

#### 7.6A.2.3 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 | -CBW/2 –  FIoffset, case 1  and  CBW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |
| n29 | Finterferer | MHz | NOTE 2 | FDL\_low – 15  to  FDL\_high + 15 |
| NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal  NOTE 4: CBW 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

### 7.6A.3 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.6A.3-1: Out-of-band blocking parameters for intra-band contiguous CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | CA bandwidth class | | | |
| B | C |  |  |
| Power in transmission bandwidth configuration | dBm | REFSENS + CA bandwidth class specific value below | | | |
| dB | 9 | 9 | 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 < -15  or  15 < f – FDL\_high < 60 | -85 < f – FDL\_low ≤ -60  or  60 ≤ f – FDL\_high < 85 | 1 ≤ f ≤ FDL\_low – 85  or  FDL\_high + 85 ≤ f  ≤ 12750 |
| n77, n78  (NOTE 3) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(200,3CBWchannel CA)  or  FDL\_high+ MAX(200,3CBWchannel CA)  ≤ f ≤ 12750 |
| n79  (NOTE 4) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – MAX(150,3CBWchannel CA)  or  FDL\_high + MAX(150,3CBWchannel 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: CBW denotes the channel bandwidth of the wanted signal  NOTE 3: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 2700 MHz and FInterferer < 4800 MHz. For CBW > 15 MHz, the requirement for Range 1 is not applicable and Range 2 applies from the frequency offset of 3CBW from the band edge. For CBW larger than 60 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3CBW 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 CBW ≥ 40 MHz, the requirement for Range 2 is not applicable and Range 3 applies from the frequency offset of 3CBW 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

#### 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

#### 7.6A.3.3 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 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\_n8-n78 |
| CA\_n8-n79 |
| CA\_n28-n78 |

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 , where and are the carrier frequencies for lower frequency band UL and higher frequency band DL, respectively. and are the channel bandwidths configured for lower frequency band UL carrier and higher frequency band DL carrier in MHz, respectively. | | |

For all interferer frequency ranges specified in clause 7.6.3 a maximum of



exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a step size of  MHz with *NRB* the number of resource blocks in the downlink transmission bandwidth configuration, *CBW* the bandwidth of the frequency channel in MHz and n = 1, 2, 3 for SCS = 15, 30, 60 kHz, respectively. For these exceptions, the requirements in clause 7.7 apply.

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

### 7.6A.4 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, A.2.3, A3.2 and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6A.4.1-1.

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 | |
| 16 | 16 |
| Puw (CW) | dBm | -55 | -55 |
| Fuw (offset for*f* = 15 kHz) | MHz | - Foffset – 0.2  /  + Foffset + 0.2 | - Foffset – 0.2  /  + Foffset + 0.2 |
| Fuw (offset for*f* = 30 kHz) | MHz |  |  |
| 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

#### 7.6A.4.3 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.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

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