**3GPP TSG-RAN WG4 #95-e R4-2008437**

Electronic Meeting, May 25th – June 5th, 2020

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| *CR-Form-v11.2* | | | | | | | | |
| **Draft CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **TS38.101-1** | **CR** |  | **rev** | **-** | **Current version:** | **16.3.0** |  |
|  | | | | | | | | |
| *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:*** | Introduction of NR-based access to unlicensed spectrum | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Core | | | | |  | | ***Date:*** | | 2020-05-12 |
|  |  | | | |  | | |  | |  |
| ***Category:*** | **B** |  | | | | | | ***Release:*** | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add NR-U UE requirements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | |  | | | |
| ***Other specs*** | |  | **X** | Other core specifications | | |  | | | |
| ***affected:*** | | **x** |  | Test specifications | | | 38.521-1 | | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | |  | | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Compared to R4-2004727 changes are   1. Use Annex F for NR-U since Annex E is to be used for V2X 2. MPR updated based on WF agreement in R4- 3. NS\_51 and NS\_52 for US requirements for Band n97 4. Added in-band emission requirement 5. Include occupied bandwidth requirement 6. Add a note to SEM that MBW/2 on the edge of each frequency range is excluded 7. ACLR measurement bandwidth same as NR rather than 100% 8. Remove sub-clauses XXX since the general requirements apply. There is no unique NR-U requirement. 9. Additional spurious emission requirements for US 6 GHz band, NS\_51 and NS\_52 and PSD limit 10. Inter-band CA reference sensitivity 11. ACS reflects 18 dB at 20 MHz baseline with interferer bandwidth fixed to 20 MHz 12. In-band blocking updated to same baseline as LAA, 9 dB | | | | | | | | |

**<<< Start of Changes >>>**

## 4.3 Specification suffix information

Unless stated otherwise the following suffixes are used for indicating at 2nd level clause, shown in Table 4.3-1.

Table 4.3-1: Definition of suffixes

|  |  |
| --- | --- |
| Clause suffix | Variant |
| None | Single Carrier |
| A | Carrier Aggregation (CA) |
| B | Dual-Connectivity (DC) |
| C | Supplement Uplink (SUL) |
| D | UL MIMO |
| E | [Reserved for V2X] |
| F | Shared spectrum channel access |

A terminal which supports the above features needs to meet both the general requirements and the additional requirement applicable to the additional clause (suffixes A to F) in clauses 5, 6 and 7. Where there is a difference in requirement between the general requirements and the additional clause requirements (suffixes A to F) in clauses 5, 6 and 7, the tighter requirements are applicable unless stated otherwise in the additional clause.

A terminal which supports more than one feature in clauses 5, 6 and 7 shall meet all of the separate corresponding requirements.

For a terminal that supports operation in shared spectrum, the current version of this specification assumes in the uplink 10 or 20 MHz sub-bands within a wideband channel shall be contiguously allocated to the UE. The uplink requirements for one or more non-transmitted 10 or 20 MHz sub-bands between two transmitted 10 or 20 MHz sub-bands does not form a part of the current version of this specification.

For a terminal that supports SUL for the band combination specified in Table 5.2C-1, the current version of the specification assumes the terminal is configured with active transmission either on UL carrier or SUL carrier at any time in one serving cell and the UE requirements for single carrier shall apply for the active UL or SUL carrier accordingly. For a terminal that supports SUL, the current version of the specification assumes the terminal is not configured with UL MIMO on SUL carrier.

**<<< Unchanged sections omitted >>>**

## 5.2 Operating bands

NR is designed to operate in the FR1 operating bands defined in Table 5.2-1.

Table 5.2-1: NR operating bands in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | Uplink (UL) *operating band* BS receive / UE transmit  FUL\_low  – FUL\_high | Downlink (DL) *operating band* BS transmit / UE receive  FDL\_low – FDL\_high | Duplex Mode |
| n1 | 1920 MHz – 1980 MHz | 2110 MHz – 2170 MHz | FDD |
| n2 | 1850 MHz – 1910 MHz | 1930 MHz – 1990 MHz | FDD |
| n3 | 1710 MHz – 1785 MHz | 1805 MHz – 1880 MHz | FDD |
| n5 | 824 MHz – 849 MHz | 869 MHz – 894 MHz | FDD |
| n7 | 2500 MHz – 2570 MHz | 2620 MHz – 2690 MHz | FDD |
| n8 | 880 MHz – 915 MHz | 925 MHz – 960 MHz | FDD |
| n12 | 699 MHz – 716 MHz | 729 MHz – 746 MHz | FDD |
| n14 | 788 MHz – 798 MHz | 758 MHz – 768 MHz | FDD |
| n18 | 815 MHz – 830 MHz | 860 MHz – 875 MHz | FDD |
| n20 | 832 MHz – 862 MHz | 791 MHz – 821 MHz | FDD |
| n25 | 1850 MHz – 1915 MHz | 1930 MHz – 1995 MHz | FDD |
| n26 | 814 MHz – 849 MHz | 859 MHz – 894 MHz | FDD |
| n28 | 703 MHz – 748 MHz | 758 MHz – 803 MHz | FDD |
| n29 | N/A | 717 MHz – 728 MHz | SDL |
| n303 | 2305 Mhz – 2315 MHz | 2350 MHz – 2360 MHz | FDD |
| n34 | 2010 MHz – 2025 MHz | 2010 MHz – 2025 MHz | TDD |
| n38 | 2570 MHz – 2620 MHz | 2570 MHz – 2620 MHz | TDD |
| n39 | 1880 MHz – 1920 MHz | 1880 MHz – 1920 MHz | TDD |
| n40 | 2300 MHz – 2400 MHz | 2300 MHz – 2400 MHz | TDD |
| n41 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | TDD |
| n46 | 5150 MHz – 5925 MHz | 5150 MHz – 5925 MHz | TDD10 |
| n48 | 3550 MHz – 3700 MHz | 3550 MHz – 3700 MHz | TDD |
| n50 | 1432 MHz – 1517 MHz | 1432 MHz – 1517 MHz | TDD1 |
| n51 | 1427 MHz – 1432 MHz | 1427 MHz – 1432 MHz | TDD |
| n53 | 2483.5 MHz – 2495 MHz | 2483.5 MHz – 2495 MHz | TDD |
| n65 | 1920 MHz – 2010 MHz | 2110 MHz – 2200 MHz | FDD4 |
| n66 | 1710 MHz – 1780 MHz | 2110 MHz – 2200 MHz | FDD |
| n70 | 1695 MHz – 1710 MHz | 1995 MHz – 2020 MHz | FDD |
| n71 | 663 MHz – 698 MHz | 617 MHz – 652 MHz | FDD |
| n74 | 1427 MHz – 1470 MHz | 1475 MHz – 1518 MHz | FDD |
| n75 | N/A | 1432 MHz – 1517 MHz | SDL |
| n76 | N/A | 1427 MHz – 1432 MHz | SDL |
| n77 | 3300 MHz – 4200 MHz | 3300 MHz – 4200 MHz | TDD |
| n78 | 3300 MHz – 3800 MHz | 3300 MHz – 3800 MHz | TDD |
| n79 | 4400 MHz – 5000 MHz | 4400 MHz – 5000 MHz | TDD |
| n80 | 1710 MHz – 1785 MHz | N/A | SUL |
| n81 | 880 MHz – 915 MHz | N/A | SUL |
| n82 | 832 MHz – 862 MHz | N/A | SUL |
| n83 | 703 MHz – 748 MHz | N/A | SUL |
| n84 | 1920 MHz – 1980 MHz | N/A | SUL |
| n86 | 1710 MHz – 1780 MHz | N/A | SUL |
| n89 | 824 MHz – 849 MHz | N/A | SUL |
| n90 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | TDD5 |
| n91 | 832 MHz – 862 MHz | 1427 MHz – 1432 MHz | FDD9 |
| n92 | 832 MHz – 862 MHz | 1432 MHz – 1517 MHz | FDD9 |
| n93 | 880 MHz – 915 MHz | 1427 MHz – 1432 MHz | FDD9 |
| n94 | 880 MHz – 915 MHz | 1432 MHz – 1517 MHz | FDD9 |
| n958 | 2010 MHz – 2025 MHz | N/A | SUL |
| NOTE 1: UE that complies with the NR Band n50 minimum requirements in this specification shall also comply with the NR Band n51 minimum requirements.  NOTE 2: UE that complies with the NR Band n75 minimum requirements in this specification shall also comply with the NR Band n76 minimum requirements.  NOTE 3: Uplink transmission is not allowed at this band for UE with external vehicle-mounted antennas.  NOTE 4: A UE that complies with the NR Band n65 minimum requirements in this specification shall also comply with the NR Band n1 minimum requirements.  NOTE 5: Unless otherwise stated, the applicability of requirements for Band n90 is in accordance with that for Band n41; a UE supporting Band n90 shall meet the requirements for Band n41. A UE supporting Band n90 shall also support band n41.  NOTE 6: A UE that supports NR Band n66 shall receive in the entire DL operating band.  NOTE 7: A UE that supports NR Band n66 and CA operation in any CA band shall also comply with the minimum requirements specified for the DL CA configurations CA\_n66B and CA\_n66(2A) in the current version of the specification.  NOTE 8: This band is applicable in China only.  NOTE 9: Variable duplex operation does not enable dynamic variable duplex configuration by the network, and is used such that DL and UL frequency ranges are supported independently in any valid frequency range for the band.  NOTE 10: This band is restricted to operation with shared spectrum channel access as defined in [37.213]. | | | |

**<<< Unchanged sections omitted >>>**

### 5.2A.1 Intra-band CA

NR intra-band carrier aggregation is designed to operate in the operating bands defined in Table 5.2A.1-1 and Table 5.2A.1-2, where all operating bands are within FR1.

Table 5.2A.1-1: Intra-band contiguous CA operating bands in FR1

|  |  |
| --- | --- |
| NR CA Band | NR Band  (Table 5.2-1) |
| CA\_n1 | n1 |
| CA\_n7 | n7 |
| CA\_n40 | n40 |
| CA\_n411 | n41 |
| CA\_n461 | n46 |
| CA\_n48 | n48 |
| CA\_n66 | n66 |
| CA\_n71 | n71 |
| CA\_n771 | n77 |
| CA\_n781 | n78 |
| CA\_n791 | n79 |
| NOTE 1: The minimum requirements only apply for non simultaneous Tx/Rx between all carriers. | |

Table 5.2A.1-2: Intra-band non-contiguous CA operating bands in FR1

|  |  |
| --- | --- |
| NR CA Band | NR Band  (Table 5.2-1) |
| CA\_n3(\*) | n3 |
| CA\_n7(\*) | n7 |
| CA\_n25(\*) | n25 |
| CA\_n41(\*) | n41 |
| CA\_n48(\*) | n48 |
| CA\_n66(\*) | n66 |
| CA\_n77(\*) | n77 |
| CA\_n78(\*) | n78 |
| NOTE 1: The minimum requirements only apply for non simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 2: The notation CA\_nX(\*) in this table indicates intra-band non-contiguous CA for band nX. The configurations for each band are in 5.5A.2. | |

### 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 and Table 5.2A.2-2, where all operating bands are within FR1.

Table 5.2A.2-1: Inter-band CA operating bands involving FR1 (two bands)

|  |  |
| --- | --- |
| NR CA Band | NR Band  (Table 5.2-1) |
| CA\_n1-n3 | n1, n3 |
| CA\_n1-n7 | n1, n7 |
| CA\_n1-n8 | n1, n8 |
| CA\_n1-n28 | n1, n28 |
| CA\_n1-n41 | n1, n41 |
| CA\_n1-n77 | n1, n77 |
| CA\_n1-n78 | n1, n78 |
| CA\_n1-n79 | n1, n79 |
| CA\_n2-n5 | n2, n5 |
| CA\_n2-n48 | n2, n48 |
| CA\_n2-n66 | n2, n66 |
| CA\_n2-n78 | n2, n78 |
| CA\_n3-n8 | n3, n8 |
| CA\_n3-n28 | n3, n28 |
| CA\_n3-n38 | n3, n38 |
| CA\_n3-n40 | n3, n40 |
| CA\_n3-n41 | n3, n41 |
| CA\_n3-n771 | n3, n77 |
| CA\_n3-n781 | n3, n78 |
| CA\_n3-n791 | n3, n79 |
| CA\_n5-n66 | n5, n66 |
| CA\_n5-n78 | n5, n78 |
| CA\_n5-n79 | n5, n79 |
| CA\_n7-n25 | n7, n25 |
| CA\_n7-n28 | n7, n28 |
| CA\_n7-n66 | n7, n66 |
| CA\_n7-n78 | n7, n78 |
| CA\_n8-n391 | n8, n39 |
| CA\_n8-n40 | n8, n40 |
| CA\_n8-n41 | n8, n41 |
| CA\_n8-n751 | n8, n75 |
| CA n8-n781 | n8, n78 |
| CA\_n8-n791 | n8, n79 |
| CA\_n20-n282 | n20, n28 |
| CA\_n20-n75 | n20, n75 |
| CA\_n20-n78 | n20, n78 |
| CA\_n25-n41 | n25, n41 |
| CA\_n25-n66 | n25, n66 |
| CA\_n25-n71 | n25, n71 |
| CA\_n25-n78 | n25,n78 |
| CA\_n28-n41 | n28, n41 |
| CA\_n28-n50 | n28, n50 |
| CA\_n28-n752 | n28, n75 |
| CA\_n28-n77 | n28, n77 |
| CA\_n28-n781 | n28, n78 |
| CA\_n29-n66 | n29, n66 |
| CA\_n29-n70 | n29, n70 |
| CA\_n38-n66 | n38, n66 |
| CA\_n39-n40 | n39, n40 |
| CA\_n39-n41 | n39, n41 |
| CA\_n39-n791 | n39, n79 |
| CA\_n40-n41 | n40, n41 |
| CA\_n40-n78 | n40, n78 |
| CA\_n40-n791,4 | n40, n79 |
| CA\_n41-n501 | n41, n50 |
| CA\_n41-n66 | n41, n66 |
| CA\_n41-n711 | n41, n71 |
| CA\_n41-n78 | n41, n78 |
| CA\_n41-n793 | n41, n79 |
| CA\_n48-n66 | n48, n66 |
| CA\_n50-n78 | n50, n78 |
| CA\_n66-n70 | n66, n70 |
| CA\_n66-n71 | n66, n71 |
| CA\_n66-n78 | n66, n78 |
| CA\_n70-n71 | n70, n71 |
| CA\_n75-n781 | n75, n78 |
| CA\_n76-n781 | n76, n78 |
| CA\_n77-n79 | n77, n79 |
| CA\_n78-n79 | n78, n79 |
| 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. | |

**<<< Unchanged sections omitted >>>**

### 5.3.3 Minimum guardband and transmission bandwidth configuration

The minimum guardband for each UE channel bandwidth and SCS is specified in Table 5.3.3-1,

Table 5.3.3-1: Minimum guardband for each UE channel bandwidth and SCS (kHz)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| 15 | 242.5 | 312.5 | 382.5 | 452.5 | 522.5 | 592.5 | 552.5 | 692.5 | N/A | N/A | N/A | N/A | N/A |
| 30 | 505 | 665 | 645 | 805 | 785 | 945 | 905 | 1045 | 825 | 965 | 925 | 885 | 845 |
| 60 | N/A | 1010 | 990 | 1330 | 1310 | 1290 | 1610 | 1570 | 1530 | 1490 | 1450 | 1410 | 1370 |

NOTE: The minimum guardbands have been calculated using the following equation: (BWChannel x 1000 (kHz) - NRB x SCS x 12) / 2 - SCS/2, where NRB are from Table 5.3.2-1.

Figure 5.3.3-1: Void

The number of RBs configured in any channel bandwidth shall ensure that the minimum guardband specified in this clause is met.

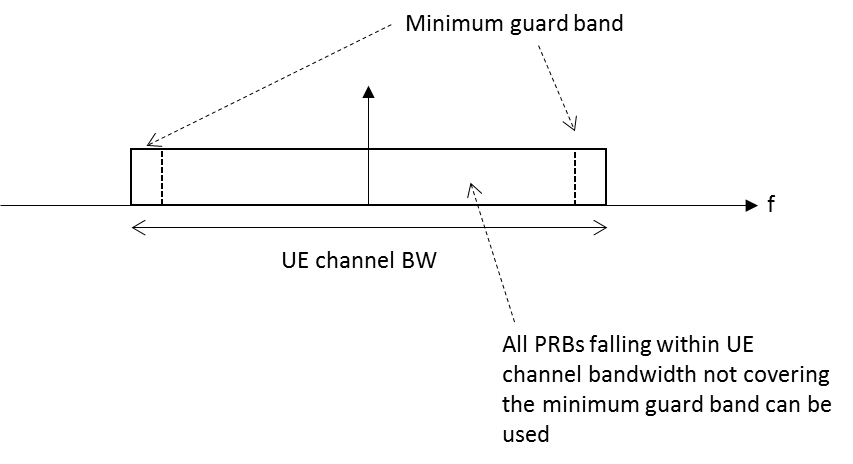


Figure 5.3.3-2: UE PRB utilization

In the case that multiple numerologies are multiplexed in the same symbol due to BS transmission of SSB, the minimum guardband on each side of the carrier is the guardband applied at the configured channel bandwidth for the numerology that is received immediately adjacent to the guard.

If multiple numerologies are multiplexed in the same symbol and the UE channel bandwidth is >50 MHz, the minimum guardband applied adjacent to 15 kHz SCS shall be the same as the minimum guardband defined for 30 kHz SCS for the same UE channel bandwidth.

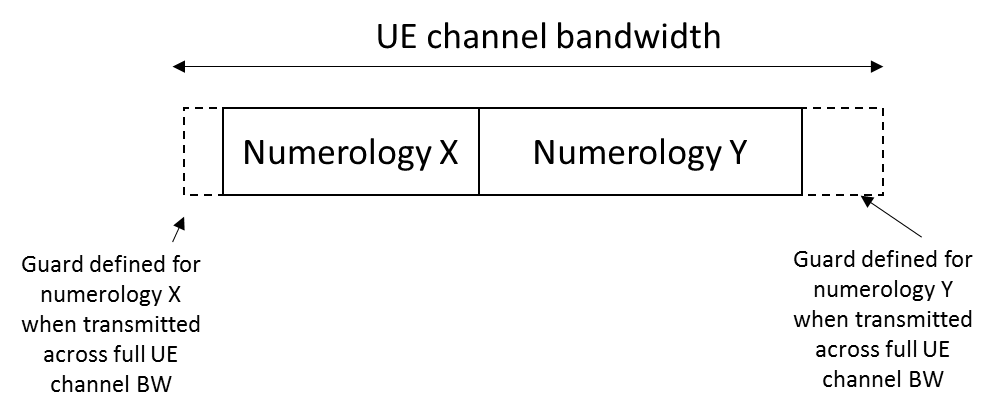


Figure 5.3.3-3 Guard band definition when transmitting multiple numerologies

NOTE: Figure 5.3.3-3 is not intended to imply the size of any guard between the two numerologies. Inter-numerology guard band within the carrier is implementation dependent.

If a UE supporting wideband operation is configured with channel bandwidths of 20 MHz or greater as specified in 38.214, the nominal intra-cell guard bands and the corresponding sizes (transmission bandwidth configuration) of the RB sets separated by the said guard bands are as specified in Table 5.3.3-2 for each UE channel bandwidth and sub-carrier spacing for the downlink and uplink. The intra-cell guard band configuration in Table 5.3.3-2 is applicable when the IE *intraCellGuardBand* in TS 38.331 is not provided.

Table 5.3.3-2: Nominal intra-cell guard bands for wideband operation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SCS  (kHz) | 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| 15 | 106  (106) | 105-6-105  (216) | N/A | N/A |
| 30 | 51  (51) | 50-6-50  (106) | 50-6-50-6-50  (162) | 50-6-50-5-50-6-50  (217) |
| 60 | TBD | TBD | TBD | TBD |
| NOTE 1: The intra-cell guard band is denoted TBW0-GB0-…-GBN\_RBset-2-TBWN\_RBset-1 for N\_RBset > 1 number of RB-sets with TBW*r* the maximum transmission bandwidth (PRB) of RB-set *r* and GB*r* the guard band (PRB) above the upper edge of RB-set *r*. The RB-set 0 is starting at the first common resource block (CRB) of the carrier as indicated by *offsetToCarrier*. The total transmission bandwidth configuration (size of resource grid) including guard bands is given in between parentheses. | | | | |

For each UE channel bandwidth and sub-carrier spacing given by Table 5.3.3-2, the maximum transmission bandwidth configuration including intra-cell guard band(s), if configured by IE *intraCellGuardBands* in TS 38.331 in the uplink and/or downlink, and corresponding RB-set(s) shall be in accordance with clause 5.3.2 with a minimum inter-cell guard band of the UE channel bandwidth as specified in Table 5.3.3-1 for the uplink and downlink. Minimum requirements specified for wideband operation in Clause 6 and Clause 7 also apply for intra-cell guard bands larger than the nominal sizes in Table 5.3.3-2 as listed in Table 5.3.3-3 for each sub-carrier spacing; each guard band in order of CRB index must be larger than or equal to the corresponding nominal guard band specified in Table 5.3.3-2 for each channel bandwidth.

Table 5.3.3-3: Applicable intra-cell guard bands for wideband operation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | SCS | | |
|  |  | 15 kHz | 30 kHz | 60 kHz |
| Intra-cell guard band (size) | PRB | 6,7 | 5,6,7 | TBD |
| Transmission bandwidth (size) of RB-set | PRB | 104,105 | 49,50,51 | TBD |

If the UE is configured with zero intra-cell guard bands by IE *intraCellGuardBands* in 38.331 in the uplink and/or downlink on a carrier greater than 20 MHz, the maximum transmission bandwidth configuration for the uplink and downlink shall be in accordance with clause 5.3.2 with a minimum inter-cell guard band of the UE channel bandwidth as specified in Table 5.3.3-1.

**<<< Unchanged sections omitted >>>**

### 5.3.5 UE channel bandwidth per operating band

The requirements in this specification apply to the combination of channel bandwidths, SCS and operating bands shown in Table 5.3.5-1. The transmission bandwidth configuration in Table 5.3.2-1 shall be supported for each of the specified channel bandwidths. The channel bandwidths are specified for both the TX and RX path.

Table 5.3.5-1 Channel bandwidths for each NR band

|  |  | | NR band / SCS / UE Channel bandwidth | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | SCS  kHz | 5 MHz | | 10 MHz | 15 MHz | 20MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 70 MHz | 80 MHz | 90 MHz | 100 MHz |
| n1 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n2 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n3 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| n5 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n7 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n8 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n12 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n14 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n18 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n20 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n25 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n26 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n28 | 15 | Yes | | Yes | Yes | Yes7 |  | Yes7 |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes7 |  | Yes7 |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n29 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n30 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n34 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| n38 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n39 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n40 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  | Yes |  |  |
| n41 | 15 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n46 | 15 |  | | Yes5 |  | Yes |  |  | Yes |  |  |  |  |  |  |
| 30 |  | | Yes5 |  | Yes |  |  | Yes |  | Yes |  | Yes |  |  |
| 60 |  | | Yes5 |  | Yes |  |  | Yes |  | Yes |  | Yes |  |  |
| n48 | 15 | Yes5 | | Yes | Yes | Yes |  |  | Yes | Yes6 |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes | Yes6 | Yes6 |  | Yes6 | Yes6,4 | Yes6 |
| 60 |  | | Yes | Yes | Yes |  |  | Yes | Yes6 | Yes6 |  | Yes6 | Yes6,4 | Yes6 |
| n50 | 15 | Yes | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes3 |  |  |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes3 |  |  |
| n51 | 15 | Yes | |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n53 | 15 | Yes | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes |  |  |  |  |  |  |  |  |  |  |  |
| n65 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n66 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |
| n70 | 15 | Yes | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes3 | Yes3 |  |  |  |  |  |  |  |  |
| n71 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n74 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n75 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| n76 | 15 | Yes | |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n77 | 15 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes4 | Yes |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes4 | Yes |
| n78 | 15 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes4 | Yes | Yes | Yes |
| n79 | 15 |  | |  |  |  |  |  | Yes | Yes |  |  |  |  |  |
| 30 |  | |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| 60 |  | |  |  |  |  |  | Yes | Yes | Yes |  | Yes |  | Yes |
| n80 | 15 | Yes | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes | Yes | Yes |  |  |  |  |  |  |  |
| n81 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n82 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n83 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n84 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| n86 | 15 | Yes | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| 60 |  | | Yes | Yes | Yes |  |  | Yes |  |  |  |  |  |  |
| n89 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n90 | 15 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| 60 |  | | Yes | Yes | Yes |  | Yes | Yes | Yes | Yes |  | Yes | Yes | Yes |
| n91 | 15 | Yes | | Yes8 |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n92 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n93 | 15 | Yes | | Yes8 |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n94 | 15 | Yes | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes | Yes |  |  |  |  |  |  |  |  |  |
| 60 |  | |  |  |  |  |  |  |  |  |  |  |  |  |
| n95 | 15 | Yes | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 30 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| 60 |  | | Yes | Yes |  |  |  |  |  |  |  |  |  |  |
| NOTE 1: Void.  NOTE 2: Void.  NOTE 3: This UE channel bandwidth is applicable only to downlink.  NOTE 4: This UE channel bandwidth is optional in this release of the specification.  NOTE 5: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as an SCell part of DC or CA configuration.  NOTE 6: For this bandwidth, the minimum requirements are restricted to operation when carrier is configured as an downlink SCell part of CA configuration.  NOTE 7: For the 20 MHz bandwidth, the minimum requirements are specified for NR UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz. For the 30MHz bandwidth, the minimum requirements are specified for NR UL transmission bandwidth configuration confined to either 703-733 or 718-748 MHz.  NOTE 8: This UE channel bandwidth is applicable only to uplink. | | | | | | | | | | | | | | | |

**<<< Unchanged sections omitted >>>**

### 5.3A.5 UE channel bandwidth per operating band for CA

The requirements for carrier aggregation in this specification are defined for carrier aggregation configurations.

For intra-band contiguous carrier aggregation, a carrier aggregation configuration is a single operating band supporting a carrier aggregation bandwidth class with associated bandwidth combination sets specified in clause 5.5A.1. For each carrier aggregation configuration, requirements are specified for all aggregated channel bandwidths contained in a bandwidth combination set, a UE can indicate support of several bandwidth combination sets per carrier aggregation configuration. For intra-band non-contiguous carrier aggregation, a carrier aggregation configuration is a single operating band supporting two or more sub-blocks, each supporting a carrier aggregation bandwidth class.

For inter-band carrier aggregation, a carrier aggregation configuration is a combination of operating bands, each supporting a carrier aggregation bandwidth class.

Table 5.3A.5-1: NR CA bandwidth classes

|  |  |  |  |
| --- | --- | --- | --- |
| NR CA bandwidth class | Aggregated channel bandwidth | Number of contiguous CC | Fallback group |
| A | BWChannel ≤ BWChannel,max | 1 | 1, 2, 3 |
| B | 20 MHz ≤ BWChannel\_CA ≤ 100 MHz | 2 | 2, 3 |
| C | 100 MHz < BWChannel\_CA ≤ 2 x BWChannel,max | 2 | 1, 3 |
| D | 200 MHz < BWChannel\_CA ≤ 3 x BWChannel,max | 3 | 1 |
| E | 300 MHz < BWChannel\_CA ≤ 4 x BWChannel,max | 4 |
| G | 100 MHz < BWChannel\_CA ≤ 150 MHz | 3 | 2 |
| H | 150 MHz < BWChannel\_CA ≤ 200 MHz | 4 |
| I | 200 MHz < BWChannel\_CA ≤ 250 MHz | 5 |
| J | 250 MHz < BWChannel\_CA ≤ 300 MHz | 6 |
| K | 300 MHz < BWChannel\_CA ≤ 350 MHz | 7 |
| L | 350 MHz < BWChannel\_CA ≤ 400 MHz | 8 |
| M3 | 50 MHz < BWChannel\_CA ≤ [180] MHz | 3 | 3 |
| N3 | 80 MHz < BWChannel\_CA ≤ [240] MHz | 4 |
| O3 | 100 MHz ≤ BWChannel\_CA ≤ [300] MHz | 5 |
| NOTE 1: BWChannel, max is maximum channel bandwidth supported among all bands in a release  NOTE 2: It is mandatory for a UE to be able to fallback to lower order NR CA bandwidth class configuration within a fallback group. It is not mandatory for a UE to be able to fallback to lower order NR CA bandwidth class configuration that belong to a different fallback group  NOTE 3: This bandwidth class is only applicable to bands identified for use with shared spectrum channel access in Table 5.2-1. | | | |

**<<< Unchanged sections omitted >>>**

#### 5.4.2.3 Channel raster entries for each operating band

The RF channel positions on the channel raster in each NR operating band are given through the applicable NR-ARFCN in Table 5.4.2.3‑1, using the channel raster to resource element mapping in clause 5.4.2.2.

For NR operating bands with 100 kHz channel raster, ΔFRaster = 20 × ΔFGlobal. In this case every 20th NR-ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in Table 5.4.2.3‑1 is given as <20>.

For NR operating bands with 15 kHz channel raster below 3GHz, ΔFRaster = *I* × ΔFGlobal, where *I ϵ {3,6}*. Every *Ith* NR‑ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in Table 5.4.2.3‑1 is given as < *I* >.

For NR operating bands with 15 kHz channel raster above 3GHz, ΔFRaster = *I* × ΔFGlobal, where *I ϵ {1,2}.* Every *Ith* NR‑ARFCN within the operating band are applicable for the channel raster within the operating band and the step size for the channel raster in table 5.4.2.3-1 is given as <*I*>.

In frequency bands with two ΔFRaster, the higher ΔFRaster applies to channels using only the SCS that is equal to or larger than the higher ΔFRaster and SSB SCS is equal to the higher ∆FRaster .

Table 5.4.2.3-1: Applicable NR-ARFCN per operating band

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | ΔFRaster  (kHz) | Uplink  Range of NREF  (First – <Step size> – Last) | Downlink  Range of NREF  (First – <Step size> – Last) |
| n1 | 100 | 384000 – <20> – 396000 | 422000 – <20> – 434000 |
| n2 | 100 | 370000 – <20> – 382000 | 386000 – <20> – 398000 |
| n3 | 100 | 342000 – <20> – 357000 | 361000 – <20> – 376000 |
| n5 | 100 | 164800 – <20> – 169800 | 173800 – <20> – 178800 |
| n7 | 100 | 500000 – <20> – 514000 | 524000 – <20> – 538000 |
| n8 | 100 | 176000 – <20> – 183000 | 185000 – <20> – 192000 |
| n12 | 100 | 139800 – <20> – 143200 | 145800 – <20> – 149200 |
| n14 | 100 | 157600 – <20> – 159600 | 151600 – <20> – 153600 |
| n18 | 100 | 163000 – <20> – 166000 | 172000 – <20> – 175000 |
| n20 | 100 | 166400 – <20> – 172400 | 158200 – <20> – 164200 |
| n25 | 100 | 370000 – <20> – 383000 | 386000 – <20> – 399000 |
| n26 | 100 | 162800 – <20> – 169800 | 171800 – <20> – 178800 |
| n28 | 100 | 140600 – <20> – 149600 | 151600 – <20> – 160600 |
| n29 | 100 | N/A | 143400 – <20> – 145600 |
| n30 | 100 | 461000 – <20> – 463000 | 470000 – <20> – 472000 |
| n34 | 100 | 402000 – <20> – 405000 | 402000 – <20> – 405000 |
| n38 | 100 | 514000 – <20> – 524000 | 514000 – <20> – 524000 |
| n39 | 100 | 376000 – <20> – 384000 | 376000 – <20> – 384000 |
| n40 | 100 | 460000 – <20> – 480000 | 460000 – <20> – 480000 |
| n41 | 15 | 499200 – <3> – 537999 | 499200 – <3> – 537999 |
| 30 | 499200 – <6> – 537996 | 499200 – <6> – 537996 |
| n462 | 15 | 743333 – <1> – 795000 | 743333 – <1> – 795000 |
| n48 | 15 | 636667 – <1> – 646666 | 636667 – <1> – 646666 |
| 30 | 636668 – <2> – 646666 | 636668 – <2> – 646666 |
| n50 | 100 | 286400 – <20> – 303400 | 286400 – <20> – 303400 |
| n51 | 100 | 285400 – <20> – 286400 | 285400 – <20> – 286400 |
| n53 | 100 | 496700 – <20> – 499000 | 496700 – <20> – 499000 |
| n65 | 100 | 384000 – <20> – 402000 | 422000 – <20> – 440000 |
| n66 | 100 | 342000 – <20> – 356000 | 422000 – <20> – 440000 |
| n70 | 100 | 339000 – <20> – 342000 | 399000 – <20> – 404000 |
| n71 | 100 | 132600 – <20> – 139600 | 123400 – <20> – 130400 |
| n74 | 100 | 285400 – <20> – 294000 | 295000 – <20> – 303600 |
| n75 | 100 | N/A | 286400 – <20> – 303400 |
| n76 | 100 | N/A | 285400 – <20> – 286400 |
| n77 | 15 | 620000 – <1> – 680000 | 620000 – <1> – 680000 |
| 30 | 620000 – <2> – 680000 | 620000 – <2> – 680000 |
| n78 | 15 | 620000 – <1> – 653333 | 620000 – <1> – 653333 |
| 30 | 620000 – <2> – 653332 | 620000 – <2> – 653332 |
| n79 | 15 | 693334 – <1> – 733333 | 693334 – <1> – 733333 |
| 30 | 693334 – <2> – 733332 | 693334 – <2> – 733332 |
| n80 | 100 | 342000 – <20> – 357000 | N/A |
| n81 | 100 | 176000 – <20> – 183000 | N/A |
| n82 | 100 | 166400 – <20> – 172400 | N/A |
| n83 | 100 | 140600 – <20> –149600 | N/A |
| n84 | 100 | 384000 – <20> – 396000 | N/A |
| n86 | 100 | 342000 – <20> – 356000 | N/A |
| n89 | 100 | 164800 – <20> – 169800 | N/A |
| n90 | 15 | 499200 – <3> – 537999 | 499200 – <3> – 537999 |
| 30 | 499200 – <6> – 537996 | 499200 – <6> – 537996 |
| 100 | 499200 – <20> – 538000 | 499200 – <20> – 538000 |
| n91 | 100 | 166400 – <20> – 172400 | 285400 – <20> – 286400 |
| n92 | 100 | 166400 – <20> – 172400 | 286400 – <20> – 303400 |
| n93 | 100 | 176000 – <20> – 183000 | 285400 – <20> – 286400 |
| n94 | 100 | 176000 – <20> – 183000 | 286400 – <20> – 303400 |
| n95 | 100 | 402000 – <20> – 405000 | N/A |
| NOTE 1: The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used.  NOTE 2: The following NREF are allowed for operation in Band n46   |  |  | | --- | --- | | **Channel Bandwidth** | **Allowed NREF** | | 10 MHz | 782000, 788668 | | 20 MHz | 744000, 745332, 746668, 748000, 749332, 750668, 752000, 753332, 754668, 756000, 765332, 766668, 768000, 769332, 770668, 772000, 773332, 774668, 776000, 777332, 778668, 780000, 781332, 783000, 784332, 785668, 787000, 788332, 789668, 791000, 792332, 793668 | | 40 MHz | 744668, 746000, 748668, 751332, 754000, 755332, 766000, 767332, 770000, 772668, 775332, 778000, 780668, 783668, 786332, 787668, 790332, 793000 | | 60 MHz | 745332, 746668, 748000, 752000, 753332, 754668, 766668, 768000, 769332, 773332, 774668, 778668, 780000, 784332, 785668, 787000, 791000, 792332 | | 80 MHz | 746000, 747332, 752668, 754000, 767332, 768668, 774000, 779332, 785000, 786332, 791668 | | NOTE: 10 MHz channel bandwidth shall only apply in certain regions where the absence of non 3GPP technologies can be guaranteed on a long-term basis in this version of specification. | | | | | |

**<<< Unchanged sections omitted >>>**

#### 5.4.3.3 Synchronization raster entries for each operating band

The synchronization raster for each band is give in Table 5.4.3.3-1. The distance between applicable GSCN entries is given by the <Step size> indicated in Table 5.4.3.3-1.

Table 5.4.3.3-1: Applicable SS raster entries per operating band

|  |  |  |  |
| --- | --- | --- | --- |
| NR operating band | SS Block SCS | SS Block pattern1 | Range of GSCN  (First – <Step size> – Last) |
| n1 | 15 kHz | Case A | 5279 – <1> – 5419 |
| n2 | 15 kHz | Case A | 4829 – <1> – 4969 |
| n3 | 15 kHz | Case A | 4517 – <1> – 4693 |
| n5 | 15 kHz | Case A | 2177 – <1> – 2230 |
| 30 kHz | Case B | 2183 – <1> – 2224 |
| n7 | 15 kHz | Case A | 6554 – <1> – 6718 |
| n8 | 15 kHz | Case A | 2318 – <1> – 2395 |
| n12 | 15 kHz | Case A | 1828 – <1> – 1858 |
| n14 | 15 kHz | Case A | 1901 – <1> – 1915 |
| n18 | 15 kHz | Case A | 2156 – <1> – 2182 |
| n20 | 15 kHz | Case A | 1982 – <1> – 2047 |
| n25 | 15 kHz | Case A | 4829 – <1> – 4981 |
| n26 | 15 kHz | Case A | 2153 – <1> – 2230 |
| n28 | 15 kHz | Case A | 1901 – <1> – 2002 |
| n29 | 15 kHz | Case A | 1798 – <1> – 1813 |
| n30 | 15 kHz | Case A | 5879 – <1> – 5893 |
| n34 | 15 kHz | Case A | 5030 – <1> – 5056 |
| n38 | 15 kHz | Case A | 6431 – <1> – 6544 |
| n39 | 15 kHz | Case A | 4706 – <1> – 4795 |
| n40 | 15 kHz | Case A | 5756 – <1> – 5995 |
| n41 | 15 kHz | Case A | 6246 – <3> – 6717 |
| 30 kHz | Case C | 6252 – <3> – 6714 |
| n46**2** | 30 kHz | [Case C] | 8993 – <1> – 9530 |
| n48 | 30 kHz | Case C | 7884 – <1> – 7982 |
| n50 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n51 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n53 | 15 kHz | Case A | 6215 – <1> – 6232 |
| n65 | 15 kHz | Case A | 5279 – <1> – 5494 |
| n66 | 15 kHz | Case A | 5279 – <1> – 5494 |
| 30 kHz | Case B | 5285 – <1> – 5488 |
| n70 | 15 kHz | Case A | 4993 – <1> – 5044 |
| n71 | 15 kHz | Case A | 1547 – <1> – 1624 |
| n74 | 15 kHz | Case A | 3692 – <1> – 3790 |
| n75 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n76 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n77 | 30 kHz | Case C | 7711 – <1> – 8329 |
| n78 | 30 kHz | Case C | 7711 – <1> – 8051 |
| n79 | 30 kHz | Case C | 8480 – <16> – 8880 |
| n90 | 15 kHz | Case A | 6246 – <1> – 6717 |
| 30 kHz | Case C | 6252 – <1> – 6714 |
| n91 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n92 | 15 kHz | Case A | 3584 – <1> – 3787 |
| n93 | 15 kHz | Case A | 3572 – <1> – 3574 |
| n94 | 15 kHz | Case A | 3584 – <1> – 3787 |
| NOTE 1: SS Block pattern is defined in clause 4.1 in TS 38.213 [8]  NOTE 2: The following GSCN are allowed for operation in band n46:  GSCN = 8996, 9010, 9024, 9038, 9051, 9065, 9079, 9093, 9107, 9121, 9218, 9232, 9246, 9260, 9274, 9288, 9301, 9315, 9329, 9343, 9357, 9371, 9385, 9402, 9416, 9430, 9444, 9458, 9472, 9485, 9499, 9513. | | | |

**<<< Unchanged sections omitted >>>**

## 6.2F Transmitter power for shared spectrum channel access

### 6.2F.1 UE maximum output power

The following UE Power Classes define the maximum output power for any transmission bandwidth within the channel bandwidth of shared spectrum channel access carrier unless otherwise stated. The period of measurement shall be at least one sub frame (1ms).

Table 6.2F.1-1: UE Power Class

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
| n46 |  |  |  |  |  |  | 20 | +2/-3 |
| NOTE 1: PPowerClass is the maximum UE power specified without taking into account the tolerance  NOTE 2: Powerclass 5 is default power class unless otherwise stated | | | | | | | | |

The UE operating in Band n46 shall meet the following additional requirements for transmission within the frequency ranges 5150-5350 MHz and 5470-5725 MHz:

- a maximum mean power density of 10 dBm in any 1 MHz band when the network signaling value NS\_28 or NS\_29 is indicated;

- a maximum mean power density of 11 dBm in any 1 MHz band when the network signaling value NS\_30 is indicated;

the following additional requirements for transmission within the frequency range 5230-5250 MHz:

- a maximum mean power density of 4 dBm in any 1 MHz band when the network signaling value NS\_31 is indicated;

the following additional requirements for transmission within the frequency ranges 5150-5230 MHz, 5250-5350 MHz, 5470-5725 MHz and 5725-5850 MHz:

- a maximum mean power density of 10 dBm in any 1 MHz band when the network signaling value NS\_31 is indicated.

### 6.2F.2 UE maximum output power reduction

UE is allowed to reduce the maximum output power due to higher order modulations and transmit bandwidth configurations. The allowed MPR for power class 3 is given in Table 6.2F.2-1

Table 6.2F.2-1 Maximum power reduction (MPR) for NR-U UE power class 5,

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | |
| Full | Partial |
| DFT-s-ODFM | QPSK | ≤ [1.5] | ≤ [2.5] |
| 16 QAM | ≤ [2.0] | ≤ [3.0] |
| 64 QAM | ≤ [3.5] | ≤ [4.5] |
| 256 QAM | ≤ [5.0] | ≤ [5.5] |
| CP-OFDM | QPSK | ≤ [3.5] | ≤ [3.5] |
| 16 QAM | ≤ [4.0] | ≤ [4.0] |
| 64 QAM | ≤ [5.5] | ≤ [5.5] |
| 256 QAM | ≤ [7.0] | ≤ [7.0] |
| NOTE 1. The MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel. Full RB allocation indicates that all RB’s in all sub-bands are fully allocated. Partial RB allocation indicates that a fraction of RB’s in one or more sub-bands are not allocated. | | | |

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2F.4 apply.

### 6.2F.3 UE additional maximum output power reduction

#### 6.2F.3.1 General

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]*.*

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2F.1-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2F.2.

Table 6.2F.3.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable operating band(s) for each NS value. The mapping of NR frequency band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2F.3.1-1A.

Table 6.2F.3.1-1: Additional maximum power reduction (A-MPR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network signalling label | Requirements (clause) | NR Band | Channel bandwidth (MHz) | Resources blocks (*N*RB) | A-MPR (clause) |
| NS\_01 |  | n46, n96, n97 | 20, 40, 60, 80 |  | N/A |
| NS\_28 |  | n46 | 20, 40, 60, 80 |  | 6.2F.3.2 |
| NS\_29 |  | n46 | 20, 40, 60, 80 |  | 6.2F.3.3 |
| NS\_30 |  | n46 | 20, 40, 60, 80 |  | 6.2F.3.4 |
| NS\_31 |  | n46 | 20, 40, 60, 80 |  | 6.2F.3.5 |
| NOTE 1: The A-MPR shall apply to all active 20 MHz sub-bands contiguously allocated in the channel. | | | | | |

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

Table 6.2F.3.1-1A: Mapping of network signaling label

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Value of additionalSpectrumEmission | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| n46 | NS\_01 | NS\_28 | NS\_29 | NS\_30 | NS\_31 |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

#### 6.2F.3.2 A-MPR for NS\_28

#### 6.2F.3.3 A-MPR for NS\_29

#### 6.2F.3.4 A-MPR for NS\_30

#### 6.2F.3.5 A-MPR for NS\_31

### 6.2F.4 Configured transmitted power

The requirements for configured maximum output power in sub-clause 6.2.4 apply.

**<<< Unchanged sections omitted >>>**

## 6.4F Transmit signal quality for shared spectrum channel access

### 6.4F.1 Frequency error

The requirements for frequency error in sub-clause 6.4.1 apply.

### 6.4F.2 Transmit modulation quality

Transmit modulation quality defines the modulation quality for expected in-channel RF transmissions from the UE. The transmit modulation quality is specified in terms of:

- Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)

- EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process

- Carrier leakage

- In-band emissions for the non-allocated RB

All the parameters defined in clause 6.4.2 are defined using the measurement methodology specified in Annex F.

In case the parameter 3300 or 3301 is reported from UE via *txDirectCurrentLocation* IE (as defined in TS 38.331 [7]), carrier leakage measurement requirement in clause 6.4F.2.2 and 6.4F.2.3 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.

#### 6.4F.2.1 Error Vector Magnitude

The requirements for Error Vector Magnitude in sub-clause 6.4.2.1 apply.

#### 6.4F.2.2 Carrier leakage

The requirements for carrier leakage in sub-clause 6.4.2.2 apply.

#### 6.4F.2.3 In-band emissions

The in-band emission is defined as the average emission across 12 sub-carriers and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB.

The basic in-band emissions measurement interval is defined over one slot in the time domain; however, the minimum requirement applies when the in-band emission measurement is averaged over 10 sub-frames. When the PUSCH or PUCCH transmission slot is shortened, the in-band emissions measurement interval is reduced by one or more symbols, accordingly. The requirement applies for power class 5 UE for 20 MHz channel bandwidth and 15 kHz SCS,

The average of the basic in-band emission measurement over 10 sub-frames shall not exceed the values specified in Table 6.4F.2.3-1.

Table 6.4F.2.3-1: Minimum requirements for in-band emissions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter description | Unit | Limit (NOTE 1) | | Applicable Frequencies |
| General | dB |  | | Any non-allocated (NOTE 2) |
| IQ Image | dB | -28 | Image frequencies when output power > 10 dBm | Image frequencies (NOTES 2, 3) |
| -25 | Image frequencies when output power ≤ 10 dBm |
| Carrier leakage | dBc | -28 | Output power > 10 dBm | Carrier frequency (NOTES 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 *PRB* - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. *PRB* is defined in NOTE 10.  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 RBs. The requirement applies with  for any non-allocated RB with *RIV*=1 and *RIV*=5 in the uplink scheduling grant where *RIV* is specified in [10].  NOTE 3: [The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated RBs, based on symmetry with respect to the reported carrier frequency location in *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP*, but excluding any allocated RBs. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, applicable frequencies shall be calculated with an assumed carrier frequency location at the center of the channel.]  NOTE 4: [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 total power in all allocated RBs with *RIV*=1 and *RIV*=5 in the uplink scheduling grant.]  NOTE 5: [The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if  is odd, or in the two RBs immediately adjacent to the DC frequency if  is even, but excluding any allocated RB. The location of the DC frequency is given by *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP*. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, applicable frequencies shall be those that are enclosed in the RB(s) in the center of the channel.]  NOTE 6:  is the Transmission Bandwidth Configuration (see Figure 5.6-1).  NOTE 7:  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 the transmitted power per 180\*2 kHz in allocated RBs, measured in dBm. | | | | |

#### 6.4F.2.4 EVM equalizer spectrum flatness

The requirements for EVM equalizer spectrum flatness in sub-clause 6.4.2.4 apply.

**<<< Unchanged sections omitted >>>**

## 6.5F Output RF spectrum emissions

### 6.5F.1 Occupied bandwidth

The requirements for occupied bandwidth in sub-clause 6.5.1 apply for the specified NR-U channel bandwidths in Table 5.3.5-1.

### 6.5F.2 Out of band emission

#### 6.5F.2.1 General

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an adjacent channel leakage power ratio.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

#### 6.5F.2.2 Spectrum emission mask

Nokia text goes here

The relative power of any UE emission shall not exceed the levels specified in Table 6.5F.2.2-1 for the specified channel bandwidth. The spectrum emission mask is defined relative to the maximum power density in a 1 MHz measurement bandwidth within the channel bandwidth.

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR-U channel bandwidth. For frequencies offset greater than FOOB defined in Table 6.5.3.1-1, the spurious requirements in clause 6.5F.3 are applicable.

Table 6.5F.2.2-1: General spectrum emission mask for NR-U

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Spectrum emission limit (dBr) / Channel bandwidth | | | | | | | | | |
| ΔfOOB  (MHz) | 10 MHz | | 20 MHz | | 40 MHz | | 60 MHz | 80 MHz | Measurement bandwidth |
| ± 0-1 |  | | | | | | | | [100kHz]3 |
| ± 1-5 | NOTE 1 | NOTE 1 | | NOTE 1 | | NOTE 1 | | NOTE 1 | 1 MHz |
| ± 5-10 | NOTE 2 |
| ± 10-20 | -40 | NOTE 2 | |
| ± 20-30 |  | -40 | | NOTE 2 | |
| ± 30-40 |  |  | | NOTE 2 | |
| ± 40-50 |  |  | | -40 | | NOTE 2 |
| ± 50-60 |  |  | |  | |
| ± 60-70 |  |  | |  | | -40 | |
| ± 70-80 |  |  | |  | |  | |
| ± 80-100 |  |  | |  | |  | | -40 |
| NOTE 1: Given as: where  NOTE 2: Given as: where  NOTE 3: The measured value shall be scaled by a factor equal to the ratio of the reference bandwidth (1 MHz) to the measurement bandwidth before the emission limit (dBr) is applied. | | | | | | | | | |

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the frequency range.

#### For channels assigned where one or more 20 MHz sub-bands at the edge of the channel is not scheduled for transmission, the maximum of -28 dBr and the spectrum emission mask requirements of Table 6.5F.2.2-1 apply to the remaining 20 MHz sub-bands inside the channel where the channel bandwidth is replaced by the transmission bandwidth configuration. For frequencies offset greater than the channel bandwidth, the minimum of the requirement calculated at the respective edges of the channel and the general spectrum emission mask applies

#### 6.5F.2.3 Additional spectrum emission mask

##### 6.5F.2.3.1 Requirements for network signalled value "NS\_28"

*Editor’s note: This sub-clause to be updated pending ETSI decision.*

##### 6.5F.2.3.2 Requirements for network signalled value "NS\_29"

##### 6.5F.2.3.3 Requirements for network signalled value "NS\_30"

##### 6.5F.2.3.4 Requirements for network signalled value "NS\_31"

#### 6.5F.2.4 Adjacent channel leakage ratio

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

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

##### 6.5F.2.4.1 Shared spectrum channel access ACLR

The Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned channel power and adjacent channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5.2.4.1-1.

If the measured adjacent channel power is greater than –47 dBm then the ACLR shall be higher than the value specified in Table 6.5F.2.4.1-1.

Table 6.5F.2.4.1-1: Shared spectrum channel acess ACLR requirement

|  |  |
| --- | --- |
|  | Power class 5 |
| ACLR | 27 dB |

### 6.5F.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with SM.329 [9] and NR operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

#### 6.5F.3.1 General spurious emissions

The requirements for general spurious emission requirements in sub-clause 6.5.3.1 apply.

#### 6.5F.3.2 Spurious emissions for UE co-existence

This clause specifies the requirements for NR-U bands for coexistence with protected bands.

Table 6.5F.3.2-1: Requirements for spurious emissions for UE co-existence

| Operating Band | Spurious emission for UE co-existence | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n46 | TBD | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

NOTE: To simplify Table 6.5F.3.2-1, E-UTRA band numbers are listed for bands which are specified only for E-UTRA operation or both E-UTRA and NR operation. NR band numbers are listed for bands which are specified only for NR operation.

#### 6.5F.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

##### 6.5F.3.3.1 Requirement for network signalled value "NS\_28"

*Editor’s note: This sub-clause to be updated pending ETSI decision.*

##### 6.5F.3.3.2 Requirement for network signalled value "NS\_29"

When "NS\_29" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5350 and 5470-5725 MHz shall not exceed the levels specified in Table 6.5F.3.3.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.2-1: Additional requirements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Centre  Frequency Fc  [MHz] | Protected range  [MHz] | Frequency difference Δf between centre frequency –  5240 (for Fc=5180, 5200, 5220, 5240)  5260 (for Fc=5260, 5280, 5300, 5320) (MHz) | Minimum requirement  [dBm] | Measurement bandwidth |
| 5180, 5200, 5220, 5240 | 5135 ≤ f ≤ 5142 | - | -26 | 1 MHz |
| 5142 < f ≤ 5150 | - | -18 |
| 5250 ≤ f < 5251 | ≥ 10 and < 11 | 10(10 - Δf) |
| 5251 ≤ f < 5260 | ≥ 11 and < 20 | -10 – 8/9(Δf – 11) |
| 5260 ≤ f < 5266.7 | ≥ 20 and < 26.7 | -18 – 1.2(Δf – 20) |
| 5266.7 ≤ f ≤ 5365 | - | -26 |
| 5260, 5280, 5300, 5320 | 5135 ≤ f ≤ 5233.3 | - | -26 |
| 5233.3 < f ≤ 5240 | ≥ 20 and < 26.7 | -18 – 1.2(Δf – 20) |
| 5240 < f ≤ 5249 | ≥ 11 and < 20 | -10 – 8/9(Δf – 11) |
| 5249 < f ≤ 5250 | ≥ 10 and < 11 | 10(10 - Δf) |
| 5350 ≤ f ≤ 5365 | - | -26 |
| 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5700 | 5455 ≤ f ≤ 5460 | - | -26 |
| 5460 < f ≤ 5470 | - | -19 |
| 5725 ≤ f < 5740 | - | -19 |
| 5740 ≤ f ≤ 5745 | - | -26 |

##### 6.5F.3.3.3 Requirement for network signalled value "NS\_30"

When "NS\_30" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5350 MHz, 5470-5725 MHz and 5725-5850 MHz shall not exceed the levels specified in Table 6.5F.3.3.3-1-1, Table 6.5F.3.3.3-1-2 and Table 6.5F.3.3.3-1-3, respectively. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.3-1: Additional requirements for NR-U channels assigned within 5150-5350 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| 4500 ≤ f ≤ 5150 | -41 | 1 MHz |
| 5350 ≤ f ≤ 5460 | -41 |

Table 6.5F.3.3.3-2: Additional requirements for NR-U channels assigned within 5470-5725 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| 4500 ≤ f ≤ 5150 | -41 | 1 MHz |
| 5350 ≤ f ≤ 5460 | -41 |
| 5460 < f ≤ 5470 | -27 |
| 5725 ≤ f | -27 |

Table 6.5F.3.3.3-3: Additional requirements for NR-U channels assigned within 5725-5850 MHz

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement  [dBm] | Measurement bandwidth |
| 0 MHz ≤ Δf < 5 MHz | 0.5 MHz ≤ f\_offset < 5.5 MHz | 27 – 2.28(f\_offset/MHz – 0.5) | 1 MHz |
| 5 MHz ≤ Δf < 25 MHz | 5.5 MHz ≤ f\_offset < 25.5 MHz | 15.6 – 0.28(f\_offset/MHz – 0.5) | 1 MHz |
| 25 MHz ≤ Δf < 75 MHz | 25.5 MHz ≤ f\_offset < 75.5 MHz | 10 – 0.74(f\_offset/MHz – 0.5) | 1 MHz |
| 75 MHz ≤ Δf | 75.5 MHz ≤ f\_offset | -27 | 1 MHz |
| NOTE 1: The frequency offset f\_offset is below and above the range 5725-5850 MHz; the measurement filter ‑3dB point is that closest to the range 5725-5850 MHz  NOTE 2: The requirement applies when the offset of the measurement filter centre frequency is such that both -3 dB points of the measurement filter are confined within the frequency range 5725-5850 MHz. | | | |

##### 6.5F.3.3.4 Requirement for network signalled value "NS\_31"

When "NS\_31" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5250 MHz, 5250-5350 MHz, 5470-5725 MHz and 5725-5850 MHz shall not exceed the levels specified in Table 6.5F.3.3.4-1, Table 6.5F.3.3.4-2, Table 6.5F.3.3.4-3 and Table 6.5F.3.3.4-4, respectively. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.4-1: Additional requirements for NR-U channels assigned within 5150-5250 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| f ≤ 5150 | -27 | 1 MHz |
| f ≥ 5250 | -27 |

Table 6.5F.3.3.4-2: Additional requirements for NR-U channels assigned within 5250-5350 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| f ≤ 5250 | -27 | 1 MHz |
| f ≥ 5350 | -27 |

Table 6.5F.3.3.4-3: Additional requirements for NR-U channels assigned within 5470-5725 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| f ≤ 5470 | -27 | 1 MHz |
| f ≥ 5725 | -27 |

Table 6.5F.3.3.4-4: Additional requirements for NR-U channels assigned within 5725-5850 MHz

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 20 MHz |
| f ≤ 5725 | -27 | 1 MHz |
| f ≥ 5850 | -27 |

**<<< Unchanged sections omitted >>>**

## 7.3F Reference sensitivity for shared spectrum channel access

### 7.3F.1 General

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel. For reference sensitivity, it is assumed that all 20 MHz sub-bands and all RB’s of each sub-band within the channel are allocated with intra-cell guard bands configured to zero.

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

### 7.3F.2 Reference sensitivity power level

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, 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 7.3F.2-1, Table 7.3F.2-2, and Table 7.3F.2-3.

Table 7.3F.2-1: Two antenna port reference sensitivity QPSK PREFSENS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Operating band / SCS / Channel bandwidth | | | | | |
| Operating Band | SCS kHz | 20 MHz (dBm) | 40 MHz (dBm) | 60 MHz (dBm) | 80 MHz (dBm) |
| n46 | 15 | -89.7 | -86.6 |  |  |
| 30 | -89.9 | -86.7 | -84.8 | -83.6 |
| 60 | -90.1 | -86.9 | -85.0 | -83.6 |

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

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

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

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

Table 7.3F.2-3: Uplink configuration for reference sensitivity

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

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

Table 7.3F.2-4: Network signaling value for reference sensitivity

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

### 7.3F.3 ΔRIB,c

For a UE supporting CA or DC band combination, the minimum requirement for reference sensitivity in Table 7.3F.2-1 shall be increased by the amount given by ΔRIB,c defined in Table 7.3F.3-1. Unless otherwise stated, ΔRIB,c is set to zero.

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

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

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

### 7.3F.4 Intra-band contiguous shared spectrum channel access CA

For intra-band contiguous carrier aggregation, the throughput of each component carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3F.2-1, Table 7.3F.2-2, and Table 7.3F.2-3.

### 7.3F.5 Inter-band CA with shared spectrum channel access

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one NR band the throughput of the NR carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1 with parameters specified in Table 7.3.2-1, Table 7.3.2-2 and Table 7.3.2-3 modified in accordance with clause 7.3F.3. The throughput of the NR-U carrier shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2.2, A.2.3.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3F.2-1, Table 7.3F.2-2, and Table 7.3F.2-3 modified in accordance with clause 7.3F.3. The reference sensitivity is defined to be met with all downlink component carriers active and the PCell uplink carrier active. Exceptions to reference sensitivity are allowed in accordance with clause 7.3F.5.1 and clause 7.3F.5.2.

### 7.3F.5.1 Reference sensitivity exceptions due to UL harmonic interference

The reference sensitivity for the shared access band does not apply when there is at least one individual RE within the shared access downlink transmission bandwidth which falls into the reference sensitivity exclusion region as specified in Table 7.3F.5.1-1.

Table 7.3F.5.1-1: NR-U reference sensitivity measurement exclusion region in MHz.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR Band / Harmonic order / Channel BW in UL | | | | | | |
| Band | Harmonic order | 5MHz | 10MHz | 15MHz | 20 MHz | 40MHz |
| n25 | 3 | +/- 15 | +/- 23 | +/- 35 | +/- 45 | +/- 90 |
| n66 | 3 | +/- 15 | +/- 23 | +/- 35 | +/- 45 | +/- 90 |
| NOTE 1: Even though UL harmonic does not fall directly into NR-U band the exclusion region still applies.  NOTE 2: The center of the exclusion region is obtained by multiplying the UL channel center frequency by the harmonic order. | | | | | | |

### 7.3F.5.2 Reference sensitivity exceptions due to cross band isolation

For unsynchronized operation, Rx de-sensing in one band will be caused by another band due to lack of isolation in the band filters. Reference sensitivity exceptions for cross band are specified in Table 7.3F.5.2-1 with uplink configuration specified in Table 7.3F.5.2-2-2.

Table 7.3F.5.2-1: MSD for cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band / Channel bandwidth of the affected DL band | | | | | | | | | | | | | | |
| CA Configuration | UL band | DL band | 5 MHz (dB) | 10 MHz (dB) | 15 MHz (dB) | 20 MHz (dB) | 25 MHz (dB) | 30 MHz (dB) | 40 MHz (dB) | 50 MHz (dB) | 60 MHz (dB) | 80 MHz (dB) | 90 MHz (dB) | 100 MHz (dB) |
| CA\_n46A-n48A | n46 | n48 | [13.3] | [10.4] | [8.8] | [7.8] | - | - | [7.8] | [7] | [6.5] | [5.7] | [5.4] | [5.1] |
| n48 | n46 | - | - | - | [13.5] | - | - | [10.9] | - | [9.4] | [8.7] | - | - |

Table 7.3F.5.2-2: Uplink configuration for reference sensitivity exceptions due to cross band isolation

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operating Band / SCS / Channel bandwidth of the affected DL band | | | | | | | | | | | | | | |
| UL band | DL band | SCS of UL band (kHz) | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 25 MHz | 30 MHz | 40 MHz | 50 MHz | 60 MHz | 80 MHz | 90 MHz | 100 MHz |
| n46 | n48 | 30 | 216 | 216 | 216 | 216 |  |  | 216 | 216 | 216 | 216 | 216 | 216 |
| n48 | n46 | 15 |  |  |  | 216 |  |  | 216 |  | 216 | 216 |  |  |
| NOTE 1: The UL configuration applies regardless of the channel bandwidth of the UL band unless the UL resource blocks exceed that specified in Table 7.3.2-3 for the uplink bandwidth in which case the allocation according to Table 7.3.2-3 applies.  NOTE 2: Refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth in Table 5.3.2-1. | | | | | | | | | | | | | | |

**<<< Unchanged sections omitted >>>**

## 7.5F Adjacent channel selectivity

### 7.5F.1 General

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

The UE shall fulfil the minimum requirements specified in Table 7.5F.1-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.5F.1-2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1).

Table 7.5F.1-1: ACS for shared spectrum channel access bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
| 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| ACS | dB | 18 | 15 | 13.2 | 12 |

Table 7.5E.1-2: Test parameters for shared spectrum channel acess bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| RX parameter | Units | Channel bandwidth | | | |
| 20 MHz | 40 MHz | 60 MHz | 80 MHz |
| Power in transmission bandwidth configuration | dBm | REFSENS + 14 dB | | | |
| Pinterferer | dBm | REFSENS + 30.5 dB | REFSENS + 27.5 dB | REFSENS + 25.7 dB | REFSENS + 24.5 dB |
| BWinterferer | MHz | 20 | | | |
| Finterferer (offset) | MHz | 20 / -20 | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4.  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with  one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1. | | | | | |

### 7.5F.2 Intra-band contiguous shared spectrum channel access CA

ACS for intra-band contiguous shared access CA requirements are specified in Table 7.5F.2-1. These requirements apply for any SCS specified for the channel bandwidth of the wanted signal. For the test parameters specified in Table 7.5F.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.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 7.5F.2-1: ACS for intra-band contiguous shared access CA

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | NR-U CA bandwidth class | | | | | | | |
| Rx Parameter | Units | B | C | D | E | I | M | N | O |
| ACS | dB | 13 | 10 | 8 | 7 | 9 | 9 | 8 | 7 |

Table 7.5F.1-2: Test parameters for intra-band contiguous NR-U CA

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rx Parameter | Units | NR-U CA bandwidth class | | | |
| B | C | D | E |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | |
| PInterferer | dBm | Aggregated power + 11.5 dB | Aggregated power + 8.5 dB | Aggregated power + 6.5 dB | Aggregated power + 5.5 dB |
| BWInterferer | MHz | 20 | | | |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 - Foffset | | | |
| **Rx Parameter** | **Units** | **NR-U CA bandwidth class** | | | |
| **I** | **M** | **N** | **O** |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + 14 dB | | | |
| PInterferer | dBm | Aggregated power + 7.5 dB | Aggregated power + 7.5 dB | Aggregated power + 6.5 dB | Aggregated power + 5.5 dB |
| BWInterferer | MHz | 20 | | | |
| FInterferer (offset) | MHz | 10 + Foffset  /  -10 - Foffset | | | |
| NOTE 1: The transmitter shall be set to 4 dB below PCMAX\_L,f,c at the minimum UL configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c defined in clause 6.2.4 .  NOTE 2: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the carrier closest to the interferer in MHz. The interferer is an NR signal with an SCS equal to that of the closest carrier.  NOTE 3: The interferer consists of the RMC specified in Annexes A.3.2.2 and A.3.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1. | | | | | |

**<<< Unchanged sections omitted >>>**

## 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.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 7.6F.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 | 13.5 | 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 1  and  BW/2 +  FIoffset, case 1 | ≤ -CBW/2 –  FIoffset, case 2  and  ≥ CBW/2 +  FIoffset, case 2 |
| n46 | Finterferer |  | NOTE 2 | FDL\_low – 60  to  FDL\_high + 60,  NOTE 4 |
| NOTE 1: The absolute value of the interferer offset Finterferer (offset) shall be further adjusted to MHz with SCS the sub-carrier spacing of the wanted signal in MHz. The interferer is an NR signal with an SCS equal to that of the wanted signal.  NOTE 2: For each carrier frequency, the requirement applies for two interferer carrier frequencies: a: -CBW/2 – FIoffset, case 1; b: CBW/2 + FIoffset, case 1  NOTE 3: CBW denotes the channel bandwidth of the wanted signal  NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – FIoffset, case 2 and CBW/2 + FIoffset, case 2 | | | | |

#### 7.6F.2.2 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.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 7.6F.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 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below | | | |
| dB | 13 | 16 | 18 | 19 |
| BWInterferer | MHz | 20 | | | |
| FIoffset, case 1 | MHz | 30 | | | |
| FIoffset, case 2 | MHz | 50 | | | |
| Rx Parameter | Units | Shared access CA bandwidth class | | | |
| I | M | N | O |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below | | | |
| dB | 17 | 17 | 18 | 19 |
| 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 1  and  BWchannel CA/2 +FIoffset, case 1 | ≤ -BWchannel CA/2 –FIoffset, case 2  and  ≥ BWchannel CA/2 +FIoffset, case 2 |
| n46 | Finterferer | MHz | NOTE 2 | FDL\_low – 3\*(maximum aggregated bandwidth for the bandwidth class)  to  FDL\_high + 3\*(maximum aggregated bandwidth for the bandwidth class)  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 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  NOTE 4: Interferer carrier frequencies in the frequency range for Case 2 shall be located at discrete frequencies in integer multiples of 20 MHz offset from -CBW/2 – FIoffset, case 2 and CBW/2 + FIoffset, case 2 | | | | |

### 7.6F.3 Out-of-band blocking

#### 7.6F.3.1 General

Out-of-band band blocking is defined for an unwanted CW interfering signal falling outside a frequency range 60 MHz or greater below or above the UE receive band. The throughput of the wanted signal shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.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 7.6F.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: 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  (NOTE 5) | Finterferer (CW) | MHz | N/A | -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 |
| 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 > 4200 MHz. | | | | | |

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 7.7 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.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 7.6F.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 |
| Pw in Transmission Bandwidth Configuration, per CC | dBm | REFSENS + CA bandwidth class specific value below | | | |
| dB | 9 | | | |
| Rx Parameter | Units | Shared access CA bandwidth class | | | |
| 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 7.6F.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  (NOTE 1) | Finterferer (CW) | MHz | N/A | N/A | 1 ≤ f ≤ FDL\_low – 3\*(maximum aggregated bandwidth for the bandwidth class)  or  FDL\_high + 3\*maximum aggregated bandwidth for the bandwidth class)  ≤ f ≤ 12750 |
| NOTE 1: The power level of the interferer (PInterferer) for Range 3 shall be modified to -20 dBm, for FInterferer > 4200 MHz. | | | | | |

### 7.6F.4 Narrow band blocking

The requirements for narrowband blocking do not apply.

**<<< End of Changes >>>**