# 6 Transmitter characteristics

## 6.1 General

Unless otherwise stated, the transmitter characteristics are specified at the antenna connector of the UE with a single or multiple transmit antenna(s). For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

Transmitter requirements for UL MIMO operation apply when the UE transmits on 2 ports on the same CDM group. The UE may use higher MPR values outside this limitation.

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

## 6.1A General

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

## 6.1F General

For wideband operations, the minimum requirements for the transmitter characteristics are specified for transmissions on one scheduled RB set or ≥ 1 scheduled contiguous RB set(s) within the UE channel. The requirements apply with configured UL intra-cell guard bands of non-zero size according to Table 5.3.3-2, with the union of the scheduled RB sets and the intra-cell guard bands.

Unless stated otherwise, when a clause is not present for shared spectrum channel access, the general requirements and the additional clause requirements (suffices A,B,D) in clause 6 apply.

## 6.2 Transmitter power

### 6.2.1 UE maximum output power

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

Table 6.2.1-1: UE Power Class

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 1.5 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) |
| n1 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n2 |  |  |  |  |  |  | 23 | ±23 |
| n3 |  |  |  |  | 26 | +2/-33 | 23 | ±23 |
| n5 |  |  |  |  |  |  | 23 | ±2 |
| n7 |  |  |  |  |  |  | 23 | ±23 |
| n8 |  |  |  |  |  |  | 23 | ±23 |
| n12 |  |  |  |  |  |  | 23 | ±23 |
| n13 |  |  |  |  |  |  | 23 | ±2 |
| n14 | 316 | +2/-3 |  |  |  |  | 23 | ±2 |
| n18 |  |  |  |  |  |  | 23 | ±2 |
| n20 |  |  |  |  |  |  | 23 | ±23 |
| n24 |  |  |  |  |  |  | 23 | +2/-33 |
| n25 |  |  |  |  |  |  | 23 | ±23 |
| n26 |  |  |  |  |  |  | 23 | ±23 |
| n28 |  |  |  |  |  |  | 23 | +2/-2.5 |
| n30 |  |  |  |  |  |  | 23 | ±2 |
| n34 |  |  | 295 | +2/-3 | 26 | +2/-3 | 23 | ±2 |
| n38 |  |  |  |  |  |  | 23 | ±2 |
| n39 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n40 |  |  | 295 | +2/-3 | 26 | +2/-3 | 23 | ±2 |
| n41 |  |  | 295 | +2/-33 | 26 | +2/-33 | 23 | ±23 |
| n47 |  |  |  |  |  |  | 23 | ±2 |
| n48 |  |  |  |  |  |  | 23 | +2/-3 |
| n50 |  |  |  |  |  |  | 23 | ±2 |
| n51 |  |  |  |  |  |  | 23 | ±2 |
| n53 |  |  |  |  |  |  | 23 | ±2 |
| n54 |  |  |  |  |  |  | 23 | ±2 |
| n65 |  |  |  |  |  |  | 23 | ±2 |
| n66 |  |  |  |  |  |  | 23 | ±2 |
| n70 |  |  |  |  |  |  | 23 | ±2 |
| n71 | 316 | +2/-3 |  |  |  |  | 23 | +2/-2.5 |
| n74 |  |  |  |  |  |  | 23 | ±2 |
| n77 | 316 | +2/-3 | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |
| n78 |  |  | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |
| n79 |  |  | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |
| n80 |  |  |  |  | 26 | +2/-33 | 23 | ±23 |
| n81 |  |  |  |  |  |  | 23 | ±2 |
| n82 |  |  |  |  |  |  | 23 | ±2 |
| n83 |  |  |  |  |  |  | 23 | +2/-2.5 |
| n84 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n85 | 316 | +2/-3 |  |  |  |  | 23 | ±23 |
| n86 |  |  |  |  |  |  | 23 | ±2 |
| n89 |  |  |  |  |  |  | 23 | ±2 |
| n91 |  |  |  |  |  |  | 23 | ±23, 4 |
| n92 |  |  |  |  |  |  | 23 | ±23, 4 |
| n93 |  |  |  |  |  |  | 23 | ±23, 4 |
| n94 |  |  |  |  |  |  | 23 | ±23, 4 |
| n95 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n97 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n98 |  |  |  |  | 26 | +2/-3 | 23 | ±2 |
| n99 |  |  |  |  |  |  | 23 | +2/-33 |
| n100 | 316 |  |  |  |  |  | 23 | ±2 |
| n101 | 316 |  |  |  |  |  | 23 | ±2 |
| n104 |  |  |  |  | 26 | +2/-3 | 23 | +2/-3 |
| n105 |  |  |  |  |  |  | 23 | +2/-2.5 |
| NOTE 1: PPowerClass is the maximum UE power specified without taking into account the tolerance  NOTE 2: Powerclass 3 is default power class unless otherwise stated  NOTE 3: Refers to the transmission bandwidths confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high – 4 MHz and FUL\_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB.  NOTE 4: The maximum output power requirement is relaxed by reducing the lower tolerance limit by 0.3 dB  NOTE 5: Achieved via dual Tx  NOTE 6: Generally, PC1 UE is not targeted for smartphone form factor. The UE power class 1 requirements for Band n14 are applicable for public safety scenario only. | | | | | | | | |

If a UE supports a different power class than the default UE power class for the band and the supported power class enables the higher maximum output power than that of the default power class:

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than 50% (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and half the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if the IE P-Max as defined in TS 38.331 [7] is provided and set to the maximum output power of the default power class or lower;

- shall apply all requirements for the default power class to the supported power class and set the configured transmitted power as specified in clause 6.2.4;

- else if the UE does not support a power class with higher maximum output power than PC2; or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than 25% (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than 0.5\**maxUplinkDutyCycle-PC2-FR1* (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if the IE P-Max as defined in TS 38.331 [7] is provided and set to the maximum output power of the power class 2 or lower;

- shall apply all requirements for power class 2 to the supported power class and set the configured transmitted power as specified in clause 6.2.4;

- else shall apply all requirements for the supported power class and set the configured transmitted power as specified in clause 6.2.4.

### 6.2.1I Void

### 6.2.2 UE maximum output power reduction

UE is allowed to reduce the maximum output power due to higher order modulations and transmit bandwidth configurations. For UE power class 2 and 3 and UE power class 1, the allowed maximum power reduction (MPR) is defined in Table 6.2.2-2, Table 6.2.2-1, Table 6.2.2-4b and Table 6.2.2-5, respectively for channel bandwidths ≤ 100 MHz. For UE power class 1.5, the allowed maximum power reduction (MPR) is defined in Table 6.2D.2-2 and Table 6.2D.2-3 in accordance with the indicated *modifiedMPR-Behavior* specified in Table L.1-1 for channel bandwidths ≤ 100 MHz. . When A UE that indicates PC1.5 for a given band is limited to PC2 by the rules in clause 6.2.1, the MPR requirements in Table 6.2.2-2 apply.

If the relative channel bandwidth ≤ 4% for TDD bands or ≤ 3% for FDD band, the ∆MPR is set to zero.

If the relative channel bandwidth > 4% for TDD bands or > 3% for FDD bands, the ∆MPR is defined in Table 6.2.2-3.

Where relative channel bandwidth = 2\*BWChannel / (FUL\_low + FUL\_high)

The allowed MPR for SRS, PUCCH formats 0, 1, 3 and 4, and PRACH shall be as specified for QPSK modulated DFT-s-OFDM of equivalent RB allocation. The allowed MPR for PUCCH format 2 shall be as specified for QPSK modulated CP-OFDM of equivalent RB allocation.

Table 6.2.2-1 Maximum power reduction (MPR) for power class 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.51 | ≤ 1.21 | ≤ 0.21 |
|  |  | ≤ 0.52 | ≤ 0.52 | 02 |
|  | Pi/2 BPSK w Pi/2 BPSK DMRS | ≤ 0.52 | 02 | 02 |
|  | QPSK | ≤ 1 | | 0 |
|  | 16 QAM | ≤ 2 | | ≤ 1 |
|  | 64 QAM | ≤ 2.5 | | |
|  | 256 QAM | ≤ 4.5 | | |
| CP-OFDM | QPSK | ≤ 3 | | ≤ 1.5 |
|  | 16 QAM | ≤ 3 | | ≤ 2 |
|  | 64 QAM | ≤ 3.5 | | |
|  | 256 QAM | ≤ 6.5 | | |
| NOTE 1: Applicable for UE operating in TDD mode with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and if the IE *powerBoostPi2BPSK* is set to 1 and 40 % or less slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. The reference power of 0 dB MPR is 26 dBm.  NOTE 2: Applicable for UE operating in FDD mode, or in TDD mode in bands other than n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and if the IE *powerBoostPi2BPSK* is set to 0 and if more than 40 % of slots in radio frame are used for UL transmission for bands n40, n41, n77, n78 and n79. | | | | |

Table 6.2.2-2 Maximum power reduction (MPR) for power class 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | ≤ 0.5 | 0 |
|  | QPSK | ≤ 3.5 | ≤ 1 | 0 |
|  | 16 QAM | ≤ 3.5 | ≤ 2 | ≤ 1 |
|  | 64 QAM | ≤ 3.5 | ≤ 2.5 | |
|  | 256 QAM | ≤ 4.5 | | |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 3 | ≤ 1.5 |
|  | 16 QAM | ≤ 3.5 | ≤ 3 | ≤ 2 |
|  | 64 QAM | ≤ 3.5 | | |
|  | 256 QAM | ≤ 6.5 | | |

Table 6.2.2-3: ∆MPR

|  |  |  |  |
| --- | --- | --- | --- |
| NR Band | Power class | Channel bandwidth | ∆MPR (dB) |
| n28 and n83 | Power class 3 | 30 MHz | 0.5 |
| n40 and n97 | Power class 3 and power class 2 | 100 MHz | 1 |
| n71 | Power class 3 | 25 MHz  30 MHz | 0.5 |

Table 6.2.2-4 Void

Table 6.2.2-4a Void

**Table 6.2.2-4b: Maximum power reduction (MPR) for power class 1 for bands other than Band n14**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | (NOTE 1) | ≤ 0.5 | 0 |
|  | Pi/2 BPSK w Pi/2 BPSK DMRS | (NOTE 1) | 0 | 0 |
|  | QPSK | (NOTE 1) | ≤ 1 | 0 |
|  | 16 QAM | (NOTE 1) | ≤ 2 | ≤ 1 |
|  | 64 QAM | (NOTE 1) | ≤ 2.5 | |
|  | 256 QAM | (NOTE 1) | ≤ 4.5 | |
| CP-OFDM | QPSK | (NOTE 1) | ≤ 3 | ≤ 1.5 |
|  | 16 QAM | (NOTE 1) | ≤ 3 | ≤ 2 |
|  | 64 QAM | (NOTE 1) | ≤ 3.5 | |
|  | 256 QAM | (NOTE 1) | ≤ 6.5 | |
| NOTE 1: MPR for all modulations for Edge RB allocation is defined as following for two distinguished channel bandwidths groups as:  Within the <50MHz channel bandwidth group:  Within the ≥50MHz channel bandwidth group:  where CEIL(x,0.5 dB) means rounding x upwards to the closest multiple of 0.5 dB. | | | | |

Table 6.2.2-5 Maximum power reduction (MPR) for power class 1 for Band n14

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 0.5 | ≤ 0.5 | 0 |
|  | Pi/2 BPSK w Pi/2 BPSK DMRS | ≤ 0.5 | 0 | 0 |
|  | QPSK | ≤ 1 | | 0 |
|  | 16 QAM | ≤ 2 | | ≤ 1 |
|  | 64 QAM | ≤ 2.5 | | |
|  | 256 QAM | ≤ 4.5 | | |
| CP-OFDM | QPSK | ≤ 3 | | ≤ 1.5 |
|  | 16 QAM | ≤ 3 | | ≤ 2 |
|  | 64 QAM | ≤ 3.5 | | |
|  | 256 QAM | ≤ 6.5 | | |

Where the following parameters are defined to specify valid RB allocation ranges for Outer and Inner RB allocations:

NRB is the maximum number of RBs for a given Channel bandwidth and sub-carrier spacing defined in Table 5.3.2-1. RBStart,Low = max(1, floor(LCRB/2))

where max() indicates the largest value of all arguments and floor(x) is the greatest integer less than or equal to x.

RBStart,High = NRB – RBStart,Low – LCRB

The RB allocation is an Inner RB allocation if the following conditions are met

RBStart,Low ≤ RBStart ≤ RBStart,High,and

LCRB ≤ ceil(NRB/2)

where ceil(x) is the smallest integer greater than or equal to x.

An Edge RB allocation is the one for which the RB(s) is (are) allocated at the lowermost or uppermost edge of the channel LCRB ≤ 2 RBs, except for PC1 UE supporting other bands than n14.

And for PC1 UE supporting other bands than n14 RB allocation is an Edge RB allocation if

AND ( OR ),

where

For with DFT-S-OFDM waveform and pi/2-BPSK, QPSK, or 16-QAM modulation, Otherwise,

The RB allocation is an Outer RB allocation for all other allocations which are not an Inner RB allocation or Edge RB allocation.If CP-OFDM allocation satisfies following conditions, it is considered as almost contiguous allocation

NRB\_gap / (NRB\_alloc + NRB\_gap ) ≤ 0.25

where NRB\_gap is the total number of unallocated RBs between allocated RBs and NRB\_alloc is the total number of allocated RBs. The size and location of allocated and unallocated RBs are restricted by RBG parameters specified in clause 6.1.2.2 of TS 38.214 [10]. For UE that indicates support for *almostContiguousCP-OFDM-UL*, the almost contiguous signals in power class 2 and 3, the allowed maximum power reduction defined in Table 6.2.2-2 and Table 6.2.2-1 are increased by

CEIL{ 10 log10(1 + NRB\_gap / NRB\_alloc), 0.5 } dB,

where CEIL{x,0.5} means x rounding upwards to closest 0.5dB. The parameter of LCRB which is used to specify valid RB allocation ranges for Outer and Inner RB allocations is replaced by (NRB\_alloc + NRB\_gap) for almost contiguous allocation cases

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2.4 apply.

### 6.2.3 UE additional maximum output power reduction

#### 6.2.3.1 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 6.2.1-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2.2. Outer and inner allocation notation used in clause 6.2.3 is defined in clause 6.2.2. Unless stated otherwise, Edge RB allocations get the same AMPR as Outer RB allocations. In absence of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2.3.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable operating band(s) for each NS value. In case of a power class 3 UE, when IE *powerBoostPi2BPSK* is set to 1, power class 2 A-MPR values apply. The mapping of NR frequency band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2.3.1-1A.

For almost contiguous allocations in CP-OFDM waveforms in power class 3, the allowed A-MPR defined in clause 6.2.3 is increased by CEIL{ 10 log10(1 + NRB\_gap / NRB\_alloc), 0.5 } dB, where CEIL{x, 0.5} means x rounding upwards to closest 0.5dB, NRB\_gap is the total number of unallocated RBs between allocated RBs and NRB\_alloc is the total number of allocated RBs, and the parameter LCRB is replaced by NRB\_alloc + NRB\_gap in specifying the RB allocation regions.

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

Table 6.2.3.1-1: Additional maximum power reduction (A-MPR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network signalling label | Requirements (clause) | NR Band | Channel bandwidth (MHz) | Resources blocks (*N*RB) | A-MPR (dB) |
| NS\_01 |  | Table 5.2-1  (NOTE 8) | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | Table 5.3.2-1 | N/A |
| NS\_03 | 6.5.2.3.3 | n2, n25, n66,  n70, n86 |  |  | Clause 6.2.3.7 |
| NS\_03U | 6.5.2.3.3, 6.5.2.4.2 | n2, n25, n66, n86 (NOTE 1) |  |  | Clause 6.2.3.7 |
| NS\_04 | 6.5.2.3.2, 6.5.3.3.1 | n41, n90 | 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |  | Clause 6.2.3.2 |
| NS\_05 | 6.5.3.3.4 | n1, n65, n84 (NOTE 1) | 5, 10, 15, 20(NOTE 2) |  | Clause 6.2.3.4 (NOTE 7) |
| NS\_05U | 6.5.3.3.4, 6.5.2.4.2 | n1, n65, n84 | 5, 10, 15, 20 |  | Clause 6.2.3.4 (NOTE 7) |
| NS\_06 | 6.5.2.3.4 | n12, n85 | 5, 10, 15 |  | Clause  6.2.3.3212 |
|  |  | n14 | 5,10 |  |  |
| NS\_07 | 6.5.3.3.26 | n13 | 5,10 | Table 6.2.3.29-1 | Table  6.2.3.29-2 |
| NS\_10 |  | n20, n82 | 15, 20 | Table 6.2.3.3-1 | Table  6.2.3.3-1 |
| NS\_12 | 6.5.3.3.17 | n26 | 5,10 | Table 6.2.3.21-1 | Table 6.2.3.21-2 |
| NS\_13 | 6.5.3.3.18 | n26 | 5 | Table 6.2.3.22-1 | Table 6.2.3.22-2 |
| NS\_14 | 6.5.3.3.19 | n26 | 10,15,20 | Table 6.2.3.23-1 | Table 6.2.3.23-2 |
| NS\_15 | 6.5.3.3.20 | n26 | 5,10,15,20 | Table 6.2.3.24-1 | Table 6.2.3.24-2 |
| NS\_17 | 6.5.3.3.2 | n28, n83 | 5,10 | Table 5.3.2-1 | N/A |
| NS\_18 | 6.5.3.3.3 | n28, n83 | 5 |  | Table 6.2.3.13-1, A1 |
|  |  |  | 10, 15, 20 |  | Table 6.2.3.13-1, A2 |
|  |  |  | 25, 30 |  | Table 6.2.3.13-1, A3, A4, A5 |
| NS\_21 | 6.5.2.3.9  6.5.3.3.12 | n30 | 5, 10 |  | Clause 6.2.3.14 |
| NS\_24 | 6.5.3.3.13 | n65 (NOTE 4) | 5, 10, 15, 20 | Table 6.2.3.15-1 | Clause 6.2.3.15 |
| NS\_27 | 6.5.2.3.8  6.5.3.3.14 | n48 | 5, 10, 15, 20, 30, 40 | Table 6.2.3.16-1 | Table 6.2.3.16-2 |
| NS\_35 | 6.5.2.3.1 | n71 | 5, 10, 15, 20, 25, 30 | Table 5.3.2-1 | Clause  6.2.3.3111 |
| NS\_37 | 6.5.3.3.6 | n74  (NOTE 3) | 10, 15 | Table 6.2.3.8-1 | Table  6.2.3.8-1 |
| NS\_38 | 6.5.3.3.7 | n74 | 5, 10, 15, 20 | Table 6.2.3.9-1 | Table  6.2.3.9-1 |
| NS\_39 | 6.5.3.3.8 | n74 | 10, 15, 20 | Table 6.2.3.10-1 | Table 6.2.3.10-1 |
| NS\_40 | 6.5.3.3.9 | n51 | 5 |  | Table  6.2.3.5-1 |
| NS\_41 | 6.5.3.3.10 | n50 | 5, 10, 15, 20, 30, 40, 50, 60 |  | Table 6.2.3.11-1 |
| NS\_42 | 6.5.3.3.11 | n50 | 5, 10, 15, 20, 30, 40, 50, 60 |  | Table 6.2.3.12-1 |
| NS\_43 | 6.5.3.3.5 | n8, n81 | 5, 10, 15 |  | Clause 6.2.3.6 |
| NS\_43U | 6.5.3.3.5, 6.5.2.4.2 | n8, n81 (NOTE 1) | 5, 10, 15 |  | Clause 6.2.3.6 |
| NS\_44 | 6.5.3.3.24 | n38 | 25, 30, 40 | Table 6.2.3.20-1 | Table 6.2.3.20-1 |
| NS\_45 | 6.5.3.3.21 | n53 | 5, 10 |  | Clause 6.2.3.25 |
| NS\_46 | 6.5.3.3.25 | n7 | 25, 30, 35, 40, 50 | Table 6.2.3.17-1 | Table 6.2.3.17-2 |
| NS\_47 | 6.5.3.3.15 | n41 (Note 5) | 30 | Table 6.2.3.18-1 | Table 6.2.3.18-2 |
| NS\_48 | 6.5.3.3.22 | n1 and n84 | 10, 15, 20, 25, 30, 40, 45, 50 | Table 6.2.3.26-1,  Table 6.2.3.26-3 | Table 6.2.3.26-2,  Table 6.2.3.26-4 (NOTE 7) |
| NS\_49 | 6.5.3.3.23 | n1 and n84 | 10, 15, 20, 25, 30, 40, 45, 50 | Table 6.2.3.27-1,  Table 6.2.3.27-3 | Table 6.2.3.27-2,  Table 6.2.3.27-4 (NOTE 7) |
| NS\_50 | 6.5.3.3.16 | n39, n98 | 10, 15, 20, 25, 30, 40 |  | Clause 6.2.3.19 |
| NS\_51 | 6.5.3.3.22 | n65 | 50 | Table 6.2.3.28-1 | Table 6.2.3.28-2 |
| NS\_55 | NOTE 6 | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  | N/A |
| NS\_56 | 6.5.3.3.27 | n24, n99 | 5, 10 |  | Clause 6.2.3.30 |
| NS\_57 | NOTE 10 | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  | N/A |
| NS\_62 | 6.5.3.3.28 | n54 | 5 |  | N/A |
| NS\_100 | 6.5.2.4.2 | n1, n2, n3, n5, n8, n18, n25, n26, n65, n66, n80, n81, n84, n86, n89  (NOTE 1) |  |  | Table  6.2.3.1-2 |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed.  NOTE 2: No A-MPR is applied for 5 MHz BWChannel where the upper channel edge is ≥ 1930 MHz,10 MHz BWChannel where the upper channel edge is ≥ 1950 MHz and 15 MHz BWChannel where the upper channel edge is ≥ 1955 MHz and 20 MHz BWChannel where the upper channel edge is ≥ 1970 MHz.  NOTE 3: Applicable when the NR carrier is within 1447.9 – 1462.9 MHz.  NOTE 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980 MHz.  NOTE 5: Applicable when the NR carrier is within 2545 – 2575 MHz.  NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements.  NOTE 7: The 1Tx architecture is assumed. For power class 2 UE indicating *txDiversity-r16* [TS 38.306], the additional relaxation of [2] dB is applicable.  NOTE 8: The NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.  NOTE 9: Void  NOTE 10: This NS value is applicable for cells below 3980 MHz that are partly or fully within the range 3650-3980 MHz for operations in Canada. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements.  NOTE 11: Applicable only for power class 1 operation.  NOTE 12: Applicable only for power class 1 operation on band n85. | | | | | |

Table 6.2.3.1-1A: Mapping of network signalling label

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Value of *additionalSpectrumEmission* | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| n1 | NS\_01 | NS\_100 | NS\_05 | NS\_05U | NS\_48 | NS\_49 |  | Reserved |
| n2 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  | Reserved |
| n3 | NS\_01 | NS\_100 |  |  |  |  |  | Reserved |
| n5 | NS\_01 | NS\_100 |  |  |  |  |  | Reserved |
| n7 | NS\_01 | NS\_46 |  |  |  |  |  | Reserved |
| n8 | NS\_01 | NS\_100 | NS\_43 | NS\_43U |  |  |  | Reserved |
| n12 | NS\_01 | NS\_06 |  |  |  |  |  | Reserved |
| n13 | NS\_01 | NS\_06 | NS\_07 |  |  |  |  | Reserved |
| n14 | NS\_01 | NS\_06 |  |  |  |  |  | Reserved |
| n18 | NS\_01 | NS\_100 |  |  |  |  |  | Reserved |
| n20 | NS\_01 | Void | NS\_10 |  |  |  |  | Reserved |
| n24 | NS\_01 | NS\_56 |  |  |  |  |  | Reserved |
| n25 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  | Reserved |
| n26 | NS\_01 | NS\_100 | NS\_12 | NS\_13 | NS\_14 | NS\_15 |  | Reserved |
| n28 | NS\_01 | NS\_17 | NS\_18 |  |  |  |  | Reserved |
| n30 | NS\_01 | NS\_21 |  |  |  |  |  | Reserved |
| n34 | NS\_01 |  |  |  |  |  |  | Reserved |
| n38 | NS\_01 | NS\_44 |  |  |  |  |  | Reserved |
| n39 | NS\_01 | NS\_50 |  |  |  |  |  | Reserved |
| n40 | NS\_01 |  |  |  |  |  |  | Reserved |
| n41 | NS\_01 | NS\_04 | NS\_47 |  |  |  |  | Reserved |
| n48 | NS\_01 | NS\_27 |  |  |  |  |  | Reserved |
| n50 | NS\_01 | NS\_41 | NS\_42 |  |  |  |  | Reserved |
| n51 | NS\_01 | NS\_40 |  |  |  |  |  | Reserved |
| n53 | NS\_01 | NS\_45 |  |  |  |  |  | Reserved |
| n54 | NS\_01 | NS\_62 |  |  |  |  |  | Reserved |
| n65 | NS\_01 | NS\_24 | NS\_100 | NS\_05 | NS\_05U | NS\_51 |  | Reserved |
| n66 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  | Reserved |
| n70 | NS\_01 | NS\_03 |  |  |  |  |  | Reserved |
| n71 | NS\_01 | NS\_35 |  |  |  |  |  | Reserved |
| n74 | NS\_01 | NS\_37 | NS\_38 | NS\_39 |  |  |  | Reserved |
| n77 | NS\_01 | NS\_55 | NS\_57 |  |  |  |  | Reserved |
| n78 | NS\_01 |  |  |  |  |  |  | Reserved |
| n79 | NS\_01 |  |  |  |  |  |  | Reserved |
| n80 | NS\_01 | NS\_100 |  |  |  |  |  | Reserved |
| n81 | NS\_01 | NS\_100 | NS\_43 | NS\_43U |  |  |  | Reserved |
| n82 | NS\_01 | Void | NS\_10 |  |  |  |  | Reserved |
| n83 | NS\_01 | NS\_17 | NS\_18 |  |  |  |  | Reserved |
| n84 | NS\_01 | NS\_100 | NS\_05 | NS\_05U |  |  |  | Reserved |
| n85 | NS\_01 | NS\_06 |  |  |  |  |  | Reserved |
| n86 | NS\_01 | NS\_100 | NS\_03 | NS\_03U |  |  |  | Reserved |
| n89 | NS\_01 | NS\_100 |  |  |  |  |  | Reserved |
| n91 | NS\_01 |  |  |  |  |  |  | Reserved |
| n92 | NS\_01 |  |  |  |  |  |  | Reserved |
| n93 | NS\_01 |  |  |  |  |  |  | Reserved |
| n94 | NS\_01 |  |  |  |  |  |  | Reserved |
| n95 | NS\_01 |  |  |  |  |  |  | Reserved |
| n97 | NS\_01 |  |  |  |  |  |  | Reserved |
| n98 | NS\_01 | NS\_50 |  |  |  |  |  | Reserved |
| n99 | NS\_01 | NS\_56 |  |  |  |  |  | Reserved |
| n1042 | NS\_01 |  |  |  |  |  |  | Reserved |
| n105 | NS\_01 |  |  |  |  |  |  | Reserved |
| NOTE 1: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7].  NOTE 2: Additional emission requirements and associated network signalling for Band n104 are not defined in this version of the specification but may be forthcoming in the future. | | | | | | | | |

Table 6.2.3.1-2: A-MPR for NS\_100 (UTRA protection)

|  |  |  |
| --- | --- | --- |
| Modulation/Waveform | | Outer (dB) |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 2 |
|  | QPSK | ≤ 2 |
|  | 16 QAM | ≤ 2.5 |
|  | 64 QAM | ≤ 3 |
|  | 256 QAM | ≤ 4.5 |
| CP-OFDM | QPSK | ≤ 4 |
|  | 16 QAM | ≤ 4 |
|  | 64 QAM | ≤ 4 |
|  | 256 QAM | ≤ 6.5 |
| NOTE 1: Void  NOTE 2: Void | | |

#### 6.2.3.2 A-MPR for NS\_04

For NS\_04, A-MPR is not added to MPR. Also, when NS\_04 is signalled, MPR shall be set to zero in the PCMAX equations to avoid double counting MPR.

Allowed maximum power reduction is defined as A-MPR = max(MPR, A-MPR'),

Note that A-MPR' = 0 dB means only MPR is applied,

where A-MPR' is defined as

if RBstart ≤ fstart,max,IMD3 / (12⋅SCS) and LCRB ≤ AWmax,IMD3 / (12⋅SCS) and FC - BWChannel/2 < FUL\_low + offsetIMD3,  
then

the A-MPR' is defined according to Table 6.2.3.2-2 PC3\_A2 relative to 23 dBm for power class 3, PC2\_A4 relative to 26 dBm for power class 2, and PC1.5\_A6 relative to 29 dBm for power class 1.5,

else,

if RBstart ≤ LCRB/2 + start / (12⋅SCS) and LCRB ≤ AWmax,regrowth / (12⋅SCS) and FC - BWChannel/2 < FUL\_low + offsetregrowth,  
then

the A-MPR' is defined according to Table 6.2.3.2-2 PC3\_A1 relative to 23 dBm for power class 3, PC2\_A3 relative to 26 dBm for power class 2, , and PC1.5\_A5 relative to 29 dBm for power class 1.5,

else

A-MPR' = 0 dB and apply MPR.

With the parameters defined in Table 6.2.3.2-1.

Table 6.2.3.2-1: Parameters for region edges and frequency offsets

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Symbol | Value | | | Related condition |
|  |  | CP-OFDM | | DFT-s-OFDM |  |
| Max allocation start in IMD3 region | fstart,max,IMD3 | 0.33 BWChannel | | | RBstart ≤ fstart,max,IMD3 / (12SCS) |
| Max allocation BW in IMD3 region | AWmax,IMD3 | 4 MHz | | | LCRB ≤ AWmax,IMD3 / (12SCS) |
| Freq. offset required to avoid A-MPR in IMD3 region | offsetIMD3 | BWChannel – 6 MHz | | | FC - BWChannel/2 ≥ FUL\_low + offsetIMD3 |
| Right edge of regrowth region | start | 0.08 BWChannel | | | RBstart ≤ LCRB/2 + start / (12SCS) |
| Max allocation BW in regrowth region | AWmax,regrowth | 100 MHz | | | LCRB ≤ Min(LCRB,Max, AWmax,regrowth / (12SCS)) |
| Freq. offset required to avoid A-MPR in regrowth region | offsetregrowth | Max (10 MHz, 0.25\* BWChannel MHz) | Max (10 MHz, 0.45\* BWChannel MHz) | | FC - BWChannel/2 ≥ FUL\_low + offsetregrowth |

Table 6.2.3.2-2: A-MPR' values Access

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A-MPR' (dB) | | | | | |
|  | | PC3\_A1 | PC3\_A2 | PC2\_A3 | PC2\_A4 | PC1.5\_A51 | PC1.5\_A61 |
| DFT-s-OFDM | Pi/2-BPSK | ≤ 3.5 | ≤ 3.5 | ≤ 3.5 | ≤ 5.5 | ≤ 5 | ≤ 7 |
|  | QPSK | ≤ 4 | ≤ 4 | ≤ 4.5 | ≤ 6 | ≤ 6 | ≤ 7.5 |
|  | 16 QAM | ≤ 4 | ≤ 4 | ≤ 5 | ≤ 6 | ≤ 6.5 | ≤ 7.5 |
|  | 64 QAM | ≤ 4 | ≤ 4.5 | ≤ 5 | ≤ 6.5 | ≤ 6.5 | ≤ 8 |
|  | 256 QAM | ≤ 4.5 | ≤ 6 | ≤ 6.5 | ≤ 8 | ≤ 8 | ≤ 9.5 |
| CP-OFDM | QPSK | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 |
|  | 16 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 |
|  | 64 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 |
|  | 256 QAM | ≤ 6.5 | ≤ 8 | ≤ 7.5 | ≤ 10 | ≤ 9 | ≤ 11.5 |
| NOTE 1: PC1.5 assumes dual Tx. | | | | | | | |

#### 6.2.3.3 A-MPR for NS\_10

Table 6.2.3.3-1: A-MPR for NS\_10

|  |  |  |
| --- | --- | --- |
| Channel bandwidth (MHz) | Parameters | Region A |
| 15 | RBstart | 0 – 10 |
|  | LCRB (RBs) | 1 – 20 |
|  | A (dB) | ≤ 36 |
| 20 | RBstart | 0 – 15 |
|  | LCRB (RBs) | 1 – 20 |
|  | A (dB) | ≤ 66 |
| NOTE 1: RBstart indicates the lowest RB index of transmitted resource blocks  NOTE 2: LCRB is the length of a contiguous resource block allocation  NOTE 3: For intra-subframe frequency hopping which intersects Region A, notes 1 and 2 apply on a per slot basis. For intra-slot or intra-subslot frequency hopping which intersects Region A, notes 1 and 2 apply on a Tno\_hopping basis.  NOTE 4: For intra-subframe frequency hopping which intersect Region A, the larger A-MPR value may be applied for both slots in the subframe. For intra-slot frequency hopping which intersects Region A, the larger A-MPR value may be applied for the slot. For intra-subslot frequency hopping which intersects Region A, the larger A-MPR value may be applied for the subslot.  NOTE 5: The A-MPR for DFT-s-OFDM is the total backoff and is obtained by taking the maximum value of MPR + A-MPR specified in Table 6.2.3-1 and Table 6.2.4-1 in TS 36.101 and A value specified in Table 6.2.3.3-1.  NOTE 6: The A-MPR for CP-OFDM is the total backoff and is obtained by adding the A value in Table 6.2.3.3-1 to the corresponding MPR specified in Table 6.2.2-1. | | |

#### 6.2.3.4 A-MPR for NS\_05 and NS\_05U

Table 6.2.3.4-1: A-MPR regions for NS\_05 and NS\_05U (Power Class 3)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A | | | Region B | | | Region C | | |
|  |  | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR |
| 5 | 1922.5 ≤ FC < 1927.5 | < 1.62 MHz/12/SCS | > 2.52 MHz/12/SCS | A3 |  |  |  |  |  |  |
| 10 | 1925 ≤ FC < 1935 | ≤ 1.62 MHz/12/SCS | > 0 | A1 | > 1.62 MHz/12/SCS  ≤ 3.60 MHz/12/SCS | > 5.4 MHz/12/SCS | A7 | ≥ 7.2 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A2 |
| 10 | 1935 ≤ FC < 1945 |  | > 4.5 MHz/12/SCS | A4 |  |  |  |  |  |  |
| 15 | 1927.5 ≤ FC < 1932.5 | ≤ 3.24MHz/12/SCS | > 0 | A1 | > 3.24 MHz/12/SCS  ≤ 5.40 MHz/12/SCS | > 8.1 MHz/12/SCS | A7 | ≥ 10.08  MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A2 |
| 15 | 1932.5 ≤ FC < 1942.5 | < 1.62 MHz/12/SCS | > 0 | A1 |  |  |  | ≥ 12.24 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A2 |
| 15 | 1942.5 ≤ FC < 1947.5 |  | > 7.2 MHz/12/SCS | A5 |  |  |  |  |  |  |
| 20 | 1930 ≤ FC < 1950 | ≤ 4.86 MHz/12/SCS | > 0 | A1 | > 4.86 MHz/12/SCS  ≤ 7.20 MHz/12/SCS | > 9.0 MHz/12/SCS | A7 | ≥ 13.68 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A2 |
| 20 | 1950 ≤ FC < 1960 |  | > 9.0 MHz/12/SCS | A6 |  |  |  |  |  |  |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.4-2, 6.2.3.4-3 and 6.2.3.4-10.  NOTE 2: Void | | | | | | | | | | |

Table 6.2.3.4-2: A-MPR for NS\_05 and NS\_05U (Power Class 3)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | A2 (dB) | A3 (dB) | |
|  | | Outer/Inner | Outer/Inner | Outer |  |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 10 | ≤ 5 | ≤ 4 |  |
|  | QPSK | ≤ 10 | ≤ 5 | ≤ 4.5 |  |
|  | 16 QAM | ≤ 10 | ≤ 5 | ≤ 6 |  |
|  | 64 QAM | ≤ 11 | ≤ 5 | ≤ 6 |  |
|  | 256 QAM | ≤ 13 | ≤ 5 | ≤ 7 |  |
| CP-OFDM | QPSK | ≤ 10 | ≤ 5 | ≤ 7.5 |  |
|  | 16 QAM | ≤ 10 | ≤ 5 | ≤ 7.5 |  |
|  | 64 QAM | ≤ 11 | ≤ 5 | ≤ 8 |  |
|  | 256 QAM | ≤ 13 |  | ≤ 10 |  |
| NOTE 1: Void  NOTE 2: Void | | | | | |

Table 6.2.3.4-3: A-MPR for NS\_05 (Power Class 3)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A4 (dB) | | A5 (dB) | | A6 (dB) | | A7 (dB) |
|  | | Outer | Inner | Outer |  | Outer | Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 1 | N/A | ≤ 1 |  | ≤ 1 | N/A | ≤ 6 |
|  | QPSK |  |  | ≤ 1.5 |  | ≤ 1.5 |  | ≤ 6 |
|  | 16 QAM |  |  |  |  |  |  | ≤ 6 |
|  | 64 QAM |  |  |  |  |  |  | ≤ 6 |
|  | 256 QAM |  |  |  |  |  |  | ≤ 6 |
| CP-OFDM | QPSK | ≤ 3.5 |  | ≤ 3.5 |  | ≤ 3.5 |  | ≤ 6 |
|  | 16 QAM | ≤ 3.5 |  | ≤ 3.5 |  | ≤ 3.5 |  | ≤ 6 |
|  | 64 QAM |  |  |  |  |  |  | ≤ 6 |
|  | 256 QAM |  |  |  |  |  |  | ≤ 6 |
| NOTE 1: Void  NOTE 2: Void | | | | | | | | |

Table 6.2.3.4-4 - Table 6.2.3.4-9: Void

Table 6.2.3.4-10: A-MPR for modulation and waveform type for NS\_05U (Power Class 3)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A4 (dB) | | A5 (dB) | | A6 (dB) | | A7 (dB) |
|  | | Outer | Inner | Outer |  | Outer | Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 2 | **N/A** | ≤ 2 |  | ≤ 2 | N/A | ≤ 6 |
|  | QPSK | ≤ 2 |  | ≤ 2 |  | ≤ 2 |  | ≤ 6 |
|  | 16 QAM | ≤ 2.5 |  | ≤ 2.5 |  | ≤ 2.5 |  | ≤ 6 |
|  | 64 QAM | ≤ 3 |  | ≤ 3 |  | ≤ 3 |  | ≤ 6 |
|  | 256 QAM | ≤ 4.5 |  | ≤ 4.5 |  | ≤ 4.5 |  | ≤ 6 |
| CP-OFDM | QPSK | ≤ 4 |  | ≤ 4 |  | ≤ 4 |  | ≤ 6 |
|  | 16 QAM | ≤ 4 |  | ≤ 4 |  | ≤ 4 |  | ≤ 6 |
|  | 64 QAM | ≤ 4 |  | ≤ 4 |  | ≤ 4 |  | ≤ 6 |
|  | 256 QAM | ≤ 6.5 |  | ≤ 6.5 |  | ≤ 6.5 |  | ≤ 6.5 |
| NOTE 1: Void  NOTE 2: Void | | | | | | | | |

Table 6.2.3.4-11: A-MPR regions for NS\_05 and NS\_05U (Power Class 2)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A | | | Region B | | | Region C | | |
|  |  | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR |
| 5 | 1922.5 ≤ FC < 1927.5 | < 1.98 MHz/12/SCS | > 1.44 MHz/12/SCS | A3 | < 0.72 MHz/12/SCS | ≤ 1.44 MHz/12/SCS | A4 |  |  |  |
| 10 | 1925 ≤ FC < 1935 | < 1.98 MHz/12/SCS | > 0 | A1 | ≥ 1.98 MHz/12/SCS | > max(0, RBstart-1.08 MHz/12/SCS) | A7 | ≥ 7.2 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A1 |
|  |  |  | ≥ 1.98, ≤2.7  MHz/12/SCS | < 1.08 MHz/12/SCS | A8 |  |  |  |
| 10 | 1935 ≤ FC < 1945 |  | > 3.96 MHz/12/SCS | A4 |  |  |  |  |  |  |
| 15 | 1927.5 ≤ FC < 1932.5 | < 3.6 MHz/12/SCS | > 0 | A1 | ≥ 3.6 MHz/12/SCS | > max(0, RBstart-1.8 MHz/12/SCS) | A7 | ≥ 10.08  MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A1 |
|  |  |  | ≥ 3.6, ≤4.68  MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A8 |  |  |  |
| 15 | 1932.5 ≤ FC < 1942.5 | < 1.98 MHz/12/SCS | > 0 | A1 | ≥ 1.98 MHz/12/SCS | > max(0, RBstart+1.08 MHz/12/SCS) | A7 | ≥ 12.24 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A1 |
| 15 | 1942.5 ≤ FC < 1947.5 |  | > 5.04 MHz/12/SCS | A5 |  |  |  |  |  |  |
| 20 | 1930 ≤ FC < 1950 | < 5.04 MHz/12/SCS | > 0 | A1 | ≥ 5.04 MHz/12/SCS | > max(0, RBstart-3.6 MHz/12/SCS) | A7 | ≥ 13.68 MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A1 |
|  |  |  | ≥ 5.04, ≤6.66  MHz/12/SCS | ≤ 1.08 MHz/12/SCS | A8 |  |  |  |
| 20 | 1950 ≤ FC < 1960 |  | > 9.0 MHz/12/SCS | A6 |  |  |  |  |  |  |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.4-12 and 6.2.3.4-13.  NOTE 2: Void | | | | | | | | | | |

Table 6.2.3.4-12: A-MPR for NS\_05 and NS\_05U (Power Class 2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | A2 (dB) | A3 (dB) | |
|  | | Outer/Inner | Outer/Inner | Outer | Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ [13] | ≤ 6 | ≤ 6.5 | ≤ 2 |
|  | QPSK | ≤ [13] | ≤ 6 | ≤ 7 | ≤ 2 |
|  | 16 QAM | ≤ [13] | ≤ 6 | ≤ 8.5 | ≤ 2 |
|  | 64 QAM | ≤ [14] | ≤ 6 | ≤ 9 | ≤ 2 |
|  | 256 QAM | ≤ [15] | ≤ 6 | ≤ 9.5 |  |
| CP-OFDM | QPSK | ≤ [13] | ≤ 6 | ≤ 10 | ≤ 4 |
|  | 16 QAM | ≤ [13] | ≤ 6 | ≤ 10 | ≤ 4 |
|  | 64 QAM | ≤ [14] | ≤ 6 | ≤ 10 | ≤ 4 |
|  | 256 QAM | ≤ [16] |  | ≤ 10 |  |
| NOTE 1: Void  NOTE 2: Void | | | | | |

Table 6.2.3.4-13: A-MPR for NS\_05 and NS\_05U (Power Class 2)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A4 (dB) | | A5 (dB) | | A6 (dB) | | A7 (dB) | A8 (dB) |
|  | | Outer | Inner | Outer | Inner | Outer | Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3 | N/A | ≤ 2 |  | ≤ 2 | N/A | ≤ 8 | ≤ 3.5 |
|  | QPSK | ≤ 3 |  | ≤ 2 |  | ≤ 2 |  | ≤ 8 | ≤ 3.5 |
|  | 16 QAM | ≤ 3.5 |  | ≤ 2.5 |  | ≤ 2 |  | ≤ 8 | ≤ 3.5 |
|  | 64 QAM | ≤ 3.5 |  | ≤ 2.5 |  |  |  | ≤ 8 | ≤ 3.5 |
|  | 256 QAM |  |  |  |  |  |  | ≤ 8 |  |
| CP-OFDM | QPSK | ≤ 4.5 |  | ≤ 4.5 |  | ≤ 4 |  | ≤ 8.5 | ≤ 3.5 |
|  | 16 QAM | ≤ 4.5 |  | ≤ 4.5 |  | ≤ 4 |  | ≤ 8.5 | ≤ 3.5 |
|  | 64 QAM | ≤ 5 |  | ≤ 5 | ≤ 5 | ≤ 4 |  | ≤ 8.5 |  |
|  | 256 QAM |  |  |  |  |  |  | ≤ 8.5 |  |
| NOTE 1: Void  NOTE 2: Void | | | | | | | | | |

#### 6.2.3.5 A-MPR for NS\_40

Table 6.2.3.5-1: A-MPR for NS\_40

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/ Waveform | | A (dB) | |
|  | | Channel bandwidth: 5 MHz | |
|  | | Outer | Inner |
| DFT-s-OFDM | QPSK | ≤ 15.5 | ≤ 12 |
|  | 16 QAM | ≤ 14.5 | ≤ 11 |
|  | 64 QAM | ≤ 14.5 | ≤ 10 |
|  | 256 QAM | ≤ 12.5 | ≤ 7.5 |
| CP-OFDM | QPSK | ≤ 14.5 | ≤ 10 |
|  | 16 QAM | ≤ 14.5 | ≤ 10 |
|  | 64 QAM | ≤ 14 | ≤ 8 |
|  | 256 QAM | ≤ 11 | ≤ 5.5 |
| NOTE 1: The A-MPR for NS\_40 is the total backoff and is obtained by taking the maximum value of MPR + A-MPR specified in Table 6.2.3-1 and Table 6.2.4-30a in TS 36.101 and MPR + A specified in Table 6.2.2-1 and Table 6.2.3.5-1. | | | |

#### 6.2.3.6 A-MPR for NS\_43 and NS\_43U

Table 6.2.3.6-1: A-MPR regions for NS\_43

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A | | | Region B | | |
|  |  | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR |
| 5 MHz | 902.5 ≤ FC < 912.5 |  | > 15 | A1 |  |  |  |
| 10 MHz | FC = 910 |  | > 40 | A2 |  | > 5.4 MHz/12/SCS | A4 |
|  |  |  | > 45 | A3 |  | > 7.2 MHz/12/SCS | A5 |
| 15 MHz | FC = 907.5 | < 1.8 MHz /12/SCS  > 12.24 MHz/12/SCS | > 0 | A6 | > 1.8 MHz/12/SCS  < 6.12 MHz/12/SCS | ≥ 7.2 MHz/12/SCS | A6 |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.6-2.  NOTE 2: 15 kHz SCS unless otherwise stated  NOTE 3: Void | | | | | | | |

Table 6.2.3.6-2: A-MPR for NS\_43

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | | A2 (dB) | | A3 (dB) | | A4 (dB) | | A5 (dB) | | A6 (dB) |
|  | | Outer | Inner | Outer | Inner | Outer | Inner | Outer | Inner | Outer | Inner | Outer /  Inner |
| DFT-s-OFDM | Pi/2 BPSK |  | N/A | ≤ 1.5 | N/A |  |  |  | N/A |  | N/A | ≤ 9 |
|  | QPSK | ≤ 2 |  |  |  |  |  | ≤ 2.5 |  |  |  | ≤ 9 |
|  | 16 QAM |  |  |  |  |  |  |  |  | ≤ 2.5 |  | ≤ 9 |
|  | 64 QAM |  |  |  |  | ≤ 2.5 |  |  |  |  |  | ≤ 9 |
|  | 256 QAM |  |  |  |  |  |  |  |  |  |  | ≤ 9 |
| CP-OFDM | QPSK | ≤ 3.5 |  |  |  |  |  |  |  | ≤ 4 |  | ≤ 9 |
|  | 16 QAM | ≤ 3.5 |  |  |  |  |  |  |  | ≤ 4 |  | ≤ 9 |
|  | 64 QAM |  |  |  |  | ≤ 4 |  |  |  |  |  | ≤ 9 |
|  | 256 QAM |  |  |  |  |  |  |  |  |  |  | ≤ 9 |

Table 6.2.3.6-3: Void

When NS\_43U is signalled for 5 and 10 MHz channel bandwidths A-MPR is defined in Table 6.2.3.1-2 except for DFT-s-OFDM QPSK when LCRB > 5.4 MHz/12/SCS the A-MPR is 2.5 dB. For 15 MHz channel bandwidth Table 6.2.3.6-4 applies.

Table 6.2.3.6-4: A-MPR for NS\_43U

|  |  |  |
| --- | --- | --- |
| Modulation/Waveform | | 15 MHz |
|  | | Outer /  Inner (dB) |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 9 |
|  | QPSK | ≤ 9 |
|  | 16 QAM | ≤ 9 |
|  | 64 QAM | ≤ 9 |
|  | 256 QAM | ≤ 9 |
| CP-OFDM | QPSK | ≤ 9 |
|  | 16 QAM | ≤ 9 |
|  | 64 QAM | ≤ 9 |
|  | 256 QAM | ≤ 9 |

#### 6.2.3.7 A-MPR for NS\_03 and NS\_03U

Table 6.2.3.7-1 A-MPR for NS\_03

Table 6.2.3.7-1 A-MPR for NS\_03

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | | Outer (dB) | Inner (dB) |
| DFT-s-OFDM | PI/2 BPSK | ≤ 1.5 | N/A |
|  | QPSK | ≤ 2 |  |
|  | 16 QAM | ≤ 3 |  |
|  | 64 QAM | ≤ 3.5 |  |
|  | 256 QAM | ≤ 5.5 |  |
| CP-OFDM | QPSK | ≤ 4 |  |
|  | 16 QAM | ≤ 4 |  |
|  | 64 QAM | ≤ 4.5 |  |
|  | 256 QAM | ≤ 7.5 |  |
| NOTE 1: Void  NOTE 2: Void | | | |

In case UE operates in a band where NS\_03U applies and it receives *additionalSpectrumEmission* value of 3 then A-MPR values specified in Table 6.2.3.7-1 apply with an exception that DFT-s-OFDM Pi/2 BPSK A-MPR is 2 dB.

#### 6.2.3.8 A-MPR for NS\_37

Table 6.2.3.8-1: A-MPR regions for B11/B21 protection (NS\_37) (1447.9 - 1462.9 MHz)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A  (Outer/Inner) | | | Region B  (Outer/Inner) | | | Region C  (Outer/Inner) | | |
|  |  | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR | RBstart | LCRB | A-MPR |
| 10 | 1452.9 < FC ≤ 1457.9 | ≥ 0 | > 7.2 MHz/12/SCS | ≤ A1 | N/A | N/A | N/A | N/A | N/A | N/A |
| 15 | FC = 1455.4 | ≥ 0 | > 9.9 MHz/12/SCS | ≤ A1 | < 0.54 MHz/12/SCS | < 1.08 MHz/12/SCS | ≤ A2 | > 13.86 MHz/12/SCS | < 1.08 MHz/12/SCS | ≤ A2 |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.8-2  NOTE 2: Void  NOTE 3: Void  NOTE 4: No A-MPR for SCS = 60 kHz for region B and C only. | | | | | | | | | | |

Table 6.2.3.8-2: A-MPR for NS\_37

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | | A2 (dB) |
|  | | Outer | Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 1 | N/A | ≤ 3 |
|  | QPSK | ≤ 1.5 |  | ≤ 3 |
|  | 16 QAM | ≤ 2.5 |  | ≤ 3 |
|  | 64 QAM | ≤ 3 |  | ≤ 3 |
|  | 256 QAM |  |  |  |
| CP-OFDM | QPSK | ≤ 3.5 |  | ≤ 3 |
|  | 16 QAM | ≤ 3.5 |  | ≤ 3 |
|  | 64 QAM |  |  |  |
|  | 256 QAM |  |  |  |
| NOTE 1: Void  NOTE 2: Void | | | | |

#### 6.2.3.9 A-MPR for NS\_38

Table 6.2.3.9-1: A-MPR for EESS (NS\_38) Protection (1430 – 1470 MHz)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A  Outer/Inner | | | Region B  Outer/Inner | | |
|  |  | RBstart | LCRB | A-MPR (dB) | RBstart | RBstart+LCRB | A-MPR (dB) |
| 5 | 1432.5 ≤ FC < 1437.5 | ≤ -3.6 MHz/12/SCS + LCRB | ≥ 3.6 MHz/12/SCS | ≤ 7 | **>** -3.6 MHz/12/SCS + LCRB) | ≤ 2.16 MHz/12/SCS | ≤ 5.5 |
| 10 | 1435 ≤ FC < 1442 | ≤ -3.6 MHz/12/SCS + LCRB | ≥ 3.6 MHz/12/SCS | ≤ 12 | **>** -3.6 MHz/12/SCS + LCRB) | ≤ 2.16 MHz/12/SCS | ≤ 9 |
| 15 | 1437.5 ≤ FC < 1447.5 | ≤ -3.6 MHz/12/SCS + LCRB | ≥ 3.6 MHz/12/SCS | ≤ 13 | **>** -3.6 MHz/12/SCS + LCRB) | ≤ 3.6 MHz/12/SCS | ≤ 10 |
| 20 | 1440 ≤ FC < 1450 | ≤ -3.6 MHz/12/SCS + LCRB | ≥ 3.6 MHz/12/SCS | ≤ 13 | **>** -3.6 MHz/12/SCS + LCRB) | ≤ 5.4 MHz/12/SCS | ≤ 10 |
| NOTE 1 - 4: Void | | | | | | | |

#### 6.2.3.10 A-MPR for NS\_39

Table 6.2.3.10-1: A-MPR for own RX (NS\_39) Protection (1440 – 1470 MHz)

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Centre Frequency, Fc, MHz | Region A  (Outer/Inner) | |
|  |  | RBstart+LCRB | A-MPR (dB) |
| 10 | 1462 < FC ≤ 1465 | > 7.9 MHz/12/SCS | ≤ 6 |
| 15 | 1456.3 < FC ≤ 1462.5 | > 11.2 MHz/12/SCS | ≤ 6 |
| 20 | 1450.8 < FC ≤ 1460 | > 12.6 MHz/12/SCS | ≤ 6 |
| NOTE 1 - 4: Void | | | |

#### 6.2.3.11 A-MPR for NS\_41

Table 6.2.3.11-1: A-MPR for NS\_41

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A  Outer/Inner | | | Region B  Outer/Inner | |
|  |  | RBstart | LCRB | A-MPR  (dB) | RBstart+LCRB | A-MPR  (dB) |
| 5 | - | - | - | - | - | - |
| 10 | 1437 ≤ FC < 1442 | ≤ -4.5 MHz/12/SCS + LCRB | > 4.5 MHz/12/SCS | ≤ 9 | < 1.8 MHz/12/SCS | ≤ 9 |
| 15 | 1439.5 ≤ FC < 1447.5 | ≤ -5.4 MHz/12/SCS + LCRB | > 5.4 MHz/12/SCS | ≤ 11 | < 3.42 MHz/12/SCS | ≤ 9 |
| 20 | 1442 ≤ FC < 1450 | ≤ -5.4 MHz/12/SCS + LCRB | > 5.4 MHz/12/SCS | ≤ 12 | < 5.04 MHz/12/SCS | ≤ 9 |
| 30 | 1452 ≤ FC < 1502 | ≤ -7.2MHz/12/SCS + LCRB | > 7.2 MHz/12/SCS | ≤ 13.5 | < 11.7 MHz/12/SCS | ≤ 13.5 |
| 40 | 1452 ≤ FC < 1497 | ≤ -7.2 MHz/12/SCS + LCRB | > 7.2 MHz/12/SCS | ≤ 13.5 | < 11.7 MHz/12/SCS | ≤ 13.5 |
| 50 | 1457 ≤ FC < 1492 | ≤ -7.2 MHz/12/SCS + LCRB | > 7.2 MHz/12/SCS | ≤ 13.5 | < 15.12 MHz/12/SCS | ≤ 13.5 |
| 60 | 1462 ≤ FC < 1487 | ≤ -7.2 MHz/12/SCS + LCRB | > 7.2 MHz/12/SCS | ≤ 13.5 | < 18.72 MHz/12/SCS | ≤ 13.5 |
| NOTE 1 - 4: Void | | | | | | |

#### 6.2.3.12 A-MPR for NS\_42

Table 6.2.3.12-1: A-MPR for NS\_42

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth (MHz) | Carrier Centre Frequency, Fc (MHz) | Region A | | Region B | | | |
|  |  | RBstart+LCRB | A-MPR  Outer/Inner (dB) | RBstart | RBstart+LCRB | A-MPR  Inner (dB) | A-MPR  Outer (dB) |
| 5 | 1512 ≤ FC ≤ 1514.5 | > 3.1 MHz / 12 / SCS | ≤ 7 | < 0.90 MHz / 12 / SCS | ≤ 3.1 MHz / 12 / SCS | ≤ 1.5 | ≤ 4 |
| 10 | 1497 ≤ FC ≤ 1512 | > 6.2 MHz / 12 / SCS | ≤ 8 | < 0.90 MHz / 12 / SCS | ≤ 6.2 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 15 | 1502 ≤ FC ≤ 1509.5 | > 9.3 MHz / 12 / SCS | ≤ 8 | < 3.06 MHz / 12 / SCS | ≤ 9.3 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 20 | 1497 ≤ FC ≤ 1507 | > 12.4 MHz / 12 / SCS | ≤ 8 | < 4.50 MHz / 12 / SCS | ≤ 12.4 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 30 | 1477 ≤ FC ≤ 1502 | > 24.8 MHz / 12 / SCS | ≤ 8 | < 5.40 MHz / 12 / SCS | ≤ 24.8 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 40 | 1477 ≤ FC ≤ 1497 | > 24.8 MHz / 12 / SCS | ≤ 8 | < 5.40 MHz / 12 / SCS | ≤ 24.8 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 50 | 1467 ≤ FC ≤ 1492 | > 31 MHz / 12 / SCS | ≤ 8 | < 7.20 MHz / 12 / SCS | ≤ 31 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| 60 | 1462 ≤ FC ≤ 1487 | > 37.2 MHz / 12 / SCS | ≤ 8 | < 7.20 MHz / 12 / SCS | ≤ 37.2 MHz / 12 / SCS | ≤ 1.5 | ≤ 5 |
| NOTE 1 - 5: Void | | | | | | | |

#### 6.2.3.13 A-MPR for NS\_18

Table 6.2.3.13-0: Band n28 and n83 30MHz A-MPR regions for NS\_18

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of UL transmission bandwidth configuration, MHz | Regions | | A-MPR |
|  |  | RBstart\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 | 703~733 | >(LCRB\*12\*SCS)/2+3.6 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+3.6 | ≥5.4 | A4 |
|  |  | ≤6.3 | <5.4 | A5 |
| 30 | 703~733 | >(LCRB\*12\*SCS)/2+5.22 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+5.22 | ≥5.4 | A4 |
|  |  | ≤7.92 | <5.4 | A5 |

Table 6.2.3.13-1: A-MPR for NS\_18

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | | A2 (dB) | A3 (dB) | A4 (dB) | A5 (dB) |
|  | | Outer | Inner | Inner/Outer | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 2 | N/A | ≤ 5 | 3 | 8 | 3 |
|  | QPSK | ≤ 2 |  | ≤ 5 | 3 | 8 | 3 |
|  | 16 QAM | ≤ 3 |  | ≤ 6 | 3 | 8 | 3 |
|  | 64 QAM | ≤ 4 |  | ≤ 7 | 3 | 8 | 4.5 |
|  | 256 QAM | ≤ 6 |  | ≤ 9 | 3 | 8 | 5.5 |
| CP-OFDM | QPSK | ≤ 5 |  | ≤ 6.5 | 4.5 | 9.5 | 5 |
|  | 16 QAM | ≤ 5 |  | ≤ 7 | 4.5 | 9.5 | 5 |
|  | 64 QAM | ≤ 5.5 |  | ≤ 8.5 | 4.5 | 9.5 | 5.5 |
|  | 256 QAM | ≤ 8.5 |  | ≤ 11.5 | 4.5 | 9.5 | 7.5 |
| NOTE 1: Void  NOTE 2: Void | | | | | | | |

#### 6.2.3.14 A-MPR for NS\_21

Table 6.2.3.14-1: A-MPR for "NS\_21"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth  (MHz) | Modulation/Waveform | | Region A1a  RBstart ≤ 1.44MHz/12/SCS  LCRB ≤ 0.54 MHz/12/SCS | Region A1b  RBstart ≤ 1.44MHz/12/SCS  LCRB > 0.54 MHz/12/SCS  LCRB ≤ 2.16MHz/12/SCS | Region A2  LCRB > 5.4MHz/12/SCS | Region A3b  RBend ≥ 7.74MHz/12/SCS  LCRB > 0.54 MHz/12/SCS  LCRB ≤ 2.16MHz/12/SCS | Region A3a  RBend ≥ 7.74MHz/12/SCS  LCRB ≤ 0.54 MHz/12/SCS |
|  |  | | Outer/Inner | | Outer | Outer/Inner | |
| 10 | DFT-s-OFDM | PI/2 BPSK | 6 | 3 | 4 | 3 | 6 |
|  |  | QPSK | 6 | 3 | 4 | 3 | 6 |
|  |  | 16 QAM | 6 | 3 | 4 | 3 | 6 |
|  |  | 64 QAM | 6 | 3 | 4 | 3 | 6 |
|  |  | 256 QAM | 6 | 3 | 4 | 3 | 6 |
|  | CP-OFDM | QPSK | 6 | 4 | 5.5 | 4 | 6 |
|  |  | 16 QAM | 6 | 4 | 5.5 | 4 | 6 |
|  |  | 64 QAM | 6 | 4 | 5.5 | 4 | 6 |
|  |  | 256 QAM | 6 | 4 | 5.5 | 4 | 6 |

Table 6.2.3.14-2: A-MPR for "NS\_21"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth  (MHz) | Modulation/Waveform | | Region A1a  RBstart ≤ 0.36MHz/12/SCS  LCRB ≤ 0.54 MHz/12/SCS | Region A1b  RBstart ≤ 0.36MHz/12/SCS  LCRB > 0.54 MHz/12/SCS  LCRB ≤ 2.52MHz/12/SCS | Region A2  LCRB > 2.52MHz/12/SCS | Region A3b  RBend ≥ 3.96MHz/12/SCS  LCRB > 0.54 MHz/12/SCS  LCRB ≤ 2.52MHz/12/SCS | Region A3a  RBend ≥ 3.96MHz/12/SCS  LCRB ≤ 0.54 MHz/12/SCS |
|  |  | | Outer/Inner | | Outer | Outer/Inner | |
| 5 | DFT-s-OFDM | PI/2 BPSK | ≤ 4.0 | ≤ 2.0 | ≤ 1.5 | 2.0 | 4.0 |
|  |  | QPSK | ≤ 4.5 | ≤ 2.5 | ≤ 2.0 | ≤ 2.5 | ≤ 4.5 |
|  |  | 16 QAM | ≤ 4.5 | ≤ 2.5 | ≤ 2.5 | ≤ 2.5 | ≤ 4.5 |
|  |  | 64 QAM | ≤ 4.5 | ≤ 2.5 | ≤ 2.5 | ≤ 2.5 | ≤ 4.5 |
|  |  | 256 QAM | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 |
|  | CP-OFDM | QPSK | ≤ 4.5 | ≤ 4.0 | ≤ 4.0 | ≤ 4.0 | ≤ 4.5 |
|  |  | 16 QAM | ≤ 4.5 | ≤ 4.0 | ≤ 4.0 | ≤ 4.0 | ≤ 4.5 |
|  |  | 64 QAM | ≤ 4.5 | ≤ 4.0 | ≤ 4.0 | ≤ 4.0 | ≤ 4.5 |
|  |  | 256 QAM | ≤ 6.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.5 |

#### 6.2.3.15 A-MPR for NS\_24

Table 6.2.3.15-1: A-MPR for NS\_24

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Centre Frequency, Fc, MHz | Region A | | | Region B | | | Region C | | |
|  |  | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz | A-MPR | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz | A-MPR | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz | A-MPR |
| 5MHz | Fc=1992.5 |  | >3.24 | A7 |  |  |  |  |  |  |
| 5MHz | Fc=1997.5 |  | >3.24 | A4 |  |  |  |  |  |  |
| 5MHz | Fc=2002.5 |  | >1.98 | A1 | >3.6 | >1.08 ≤1.98 | A2 | ≤3.6 | ≤1.98 | A3 |
|  |  |  |  |  |  | ≤1.08 | A6 |  |  |  |
| 10MHz | Fc=1985 | >5.4 |  | A4 |  |  |  |  |  |  |
| 10MHz | Fc=1995 |  | >4.32 | A1 | ≥7.2 | >1.08 ≤4.32 | A2 | <7.2 | ≤4.32 | A3 |
|  |  |  |  |  |  | ≤1.08 | A6 |  |  |  |
| 10MHz | Fc=2000 | ≥5.76 |  | A5 | <3.06 |  | A5 | ≥3.06  <5.76 | >1.44 | A6 |
| 15MHz | Fc=1987.5 |  | >6.84 | A1 | ≥10.8 | >1.08 ≤6.84 | A2 | <10.8 | ≤6.84 | A3 |
|  |  |  |  |  |  | ≤1.08 | A6 |  |  |  |
| 15MHz | Fc=1997.5 | ≥8.64 |  | A5 | <3.78 |  | A5 | ≥3.78  <8.64 | >1.44 | A6 |
| 20MHz | Fc=1990 | ≥12.96 |  | A5 | <4.68 |  | A5 | ≥4.68  <12.96 | >2.16 | A6 |
| 20MHz | Fc=1995 | ≥11.52 |  | A5 | <5.58 |  | A5 | ≥5.58  <11.52 | >1.44 | A6 |
| NOTE 1: The A-MPR values are listed in Table 6.2.3.15-2.  NOTE 2: For any undefined region, MPR applies | | | | | | | | | | |

Table 6.2.3.15-2: A-MPR for modulation and waveform type

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 | A4 | A5 | A6 | A7 |
|  | Outer/Inner | Outer/Inner | Outer/Inner | Outer | Outer/Inner | Outer/Inner | Outer |
| DFT-s-OFDM PI/2 BPSK | ≤ 11 | ≤ 5 | ≤ 4 | ≤ 8.5 | ≤ 18 | ≤ 10 | ≤ 3.5 |
| DFT-s-OFDM QPSK | ≤ 11 | ≤ 5 | ≤ 4 | ≤ 8.5 | ≤ 18 | ≤ 10 | ≤ 3.5 |
| DFT-s-OFDM 16 QAM | ≤ 11 | ≤ 5 | ≤ 4 | ≤ 8.5 | ≤ 18 | ≤ 10 | ≤ 3.5 |
| DFT-s-OFDM 64 QAM | ≤ 11 | ≤ 5 | ≤ 4 | ≤ 8.5 | ≤ 19 | ≤ 10 | ≤ 3.5 |
| DFT-s-OFDM 256 QAM | ≤ 11 | ≤ 5 |  | ≤ 8.5 | ≤ 20 | ≤ 10 |  |
| CP-OFDM QPSK | ≤ 13 | ≤ 6.5 | ≤ 4 | ≤ 8.5 | ≤ 19 | ≤ 12 | ≤ 5.5 |
| CP-OFDM 16 QAM | ≤ 13 | ≤ 6.5 | ≤ 4 | ≤ 8.5 | ≤ 19 | ≤ 12 | ≤ 5.5 |
| CP-OFDM 64 QAM | ≤ 13 | ≤ 6.5 | ≤ 4 | ≤ 8.5 | ≤ 19 | ≤ 12 | ≤ 5.5 |
| CP-OFDM 256 QAM | ≤ 13 | ≤ 6.5 |  | ≤ 8.5 | ≤ 20 | ≤ 12 |  |
| NOTE 1: The backoff applied is max(MPR, A-MPR) where MPR is defined in Table 6.2.2-1  NOTE 2: Outer and inner allocations are defined in clause 6.2.2 | | | | | | | |

#### 6.2.3.16 A-MPR for NS\_27

Table 6.2.3.16-1: A-MPR for NS\_27

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Centre Frequency, Fc, MHz | Region A | | | | Region B | |
|  |  | RBstart\*12\*SCS | RBend\*12\*SCS | LCRB\*12\*SCS | A-MPR | LCRB\*12\*SCS | A-MPR |
| 15 MHz | 3557.5 ≤ FC < 3562.5 | <1.8 MHz |  |  | A3 | ≥10.8 MHz | A3 |
|  | 3687.5 < FC ≤ 3692.5 | >11.52 MHz |  |  |  |  |  |
| 15 MHz | 3562.5 ≤ FC < 3567.5 | ≤1.08 MHz |  | <1.44 MHz | A4 | ≥11.52 MHz | 2 |
|  | 3682.5 < FC ≤ 3687.5 |  | ≥13.22 MHz |  |  |  |  |
| 20 MHz | 3560 ≤ FC < 3570 | <3.6 MHz |  |  | A5 | ≥10.8 MHz | A5 |
|  | 3680 < FC ≤ 3690 | >12.96 MHz |  |  |  |  |  |
| 20 MHz | 3570 ≤ FC < 3580 | ≤2.16 MHz |  | <1.44 MHz | A6 | ≥14.4 MHz | 2 |
|  | 3670 < FC ≤ 3680 |  | ≥16.92 |  |  |  |  |
| 30 MHz | 3565 ≤ FC < 3585 | < 7.38MHz |  |  | A7 |  |  |
|  |  | ≥ 7.38MHz  ≤24.48MHz |  | ≥ 15.3MHz | A2 |  |  |
|  |  |  |  | < 15.3 MHz | A1 |  |  |
|  |  | ≥24.48MHz |  | < 2.7 MHz | A7 |  |  |
|  |  |  | > 19.44 MHz |  | A7 |  |  |
|  | 3665 < FC ≤ 3685 |  | ≤19.44MHz  ≥3.24 MHz | ≥ 15.3 MHz | A2 |  |  |
|  |  |  |  | < 15.3 MHz | A1 |  |  |
|  |  |  | <3.24 MHz | < 2.7MHz | A7 |  |  |
|  | 3585 ≤ FC ≤ 3665 | ≤[3.96] MHz |  | < 1.44MHz | A8 | ≥19.44 MHz | 4 |
|  |  |  | ≥24.48MHz |  | A8 |  |  |
| 40 MHz | 3570 ≤ FC < 3600 | <11.34 MHz |  |  | A7 |  |  |
|  |  | ≥11.34 MH,  ≤31.0 MHz |  | ≥18 MHz | A2 |  |  |
|  |  |  |  | <18 MHz | A1 |  |  |
|  |  | >31.0 MHz |  | <3.6 MHz | A7 |  |  |
|  | 3650 < FC ≤ 3680 |  | >24.48 MHz |  | A7 |  |  |
|  |  |  | ≤24.48 MHz, ≥6.48 MHz | ≥18 MHz | A2 |  |  |
|  |  |  |  | <18 MHz | A1 |  |  |
|  |  |  | <6.48 MHz | <3.6 MHz | A7 |  |  |
| 40 MHz | 3600 ≤ FC ≤ 3650 | ≤6.12 MHz |  | <1.44 MHz | A8 | >20 MHz | 4.5 |
|  |  |  | ≥ 32.76 |  |  |  |  |
| NOTE 1: Void  NOTE 2: Void | | | | | | | |

Table 6.2.3.16-2: A-MPR for modulation and waveform type

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 |
|  | | Outer | Outer | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | 4.5 | 6 | 4 | 4 | 4 | 4 | 10.5 | 4 |
|  | QPSK | 4.5 | 6 | 4 | 4 | 4 | 4 | 10.5 | 4 |
|  | 16 QAM | 4.5 | 6 | 5 | 4 | 5 | 4 | 11 | 4 |
|  | 64 QAM | 4.5 | 6 | 5 | 4 | 5 | 4 | 11 | 4 |
|  | 256 QAM |  | 6 |  |  |  |  | 11 |  |
| CP-OFDM | QPSK | 5.5 | 7 | 6 | 4 | 6 | 4 | 11.5 | 4 |
|  | 16 QAM | 5.5 | 7 | 6 | 4 | 6 | 4 | 11.5 | 4 |
|  | 64 QAM | 5.5 | 7 | 6 | 4 | 6 | 4 | 11.5 | 4 |
|  | 256 QAM |  | 7 |  |  |  |  | 11.5 |  |
| NOTE 1: The backoff applied is max (MPR, A-MPR) where MPR is defined in Table 6.2.2-1  NOTE 2: Outer and inner allocations are defined in clause 6.2.2 | | | | | | | | | |

#### 6.2.3.17 A-MPR for NS\_46

Table 6.2.3.17-1: A-MPR regions for NS\_46

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
|  |  | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 MHz | 2534.5 ≤ FC ≤ 2557.5 |  | Note 1 | A3 |
| 30 MHz | 2515 ≤ FC ≤ 2555 | ≥0, <1.44 | >0 | A4 |
|  |  | ≥1.44, <13.5 | >max (0, 12\*SCS\*RBend -1.8) | A5 |
|  |  | ≥13.5, <19.8 | >11.52 | A6 |
|  |  | ≥19.8, <25.92 | >6.3 | A7 |
|  |  | ≥25.92 | >0 | A8 |
| 35 MHz | 2517.5 ≤ FC ≤ 2552.5 | ≥0, <3.42 | >0 | A4 |
|  |  | ≥3.42, <15.84 | >max (0, 12\*SCS\*RBend - 3.06) | A5 |
|  |  | ≥15.84, <22.68 | >12.6 | A6 |
|  |  | ≥22.68, <28.8 | >9.0 | A7 |
|  |  | ≥28.8 | >0 | A8 |
| 40 MHz | 2520 ≤ FC ≤ 2550 | ≥0, <4.14 | >0 | A4 |
|  |  | ≥4.14, <18 | >max (0, 12\*SCS\*RBend - 4.5) | A5 |
|  |  | ≥18, <25.74 | >13.5 | A6 |
|  |  | ≥25.74, <32.4 | >12.6 | A7 |
|  |  | ≥32.4 | >0 | A8 |
| 50 MHz | 2525 ≤ FC ≤ 2545 | ≥0, <9 | >0 | A4 |
|  |  | ≥9, <21.6 | >max (0, 12\*SCS\*RBend - 7.2) | A5 |
|  |  | ≥21.6, <31.5 | >18 | A6 |
|  |  | ≥31.5, <39.6 | >16.2 | A7 |
|  |  | ≥39.6 | >0 | A8 |
| NOTE 1: > 9.72 MHz for DFT-s-OFDM, > 16.02 MHz for CP-OFDM. | | | | |

Table 6.2.3.17-2: A-MPR for NS\_46

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A3 | A4 | A5 | A6 | A7 | A8 |
|  | | Outer | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | 4.5 | 5 | 2 | 3.5 | 6 | 10 |
|  | QPSK | 4.5 | 5 | 2 | 3.5 | 6 | 10 |
|  | 16 QAM | 4.5 | 5 | 2 | 3.5 | 6 | 10 |
|  | 64 QAM | 4.5 | 5 |  | 3.5 | 6 | 10 |
|  | 256 QAM |  |  |  |  | 6 | 10 |
| CP-OFDM | QPSK | 6 | 5 | 3.5 | 5.5 | 7 | 11 |
|  | 16 QAM | 6 | 5 | 3.5 | 5.5 | 7 | 11 |
|  | 64 QAM | 6 | 5 | 3.5 | 5.5 | 7 | 11 |
|  | 256 QAM | 6 |  |  |  | 7 | 11 |

#### 6.2.3.18 A-MPR for NS\_47

Table 6.2.3.18-1: A-MPR regions and types for NS\_47

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, (MHz) | Carrier Centre Frequency, Fc, (MHz) | RBstart\*12\*SCS  (MHz) | LCRB\*12\*SCS  (MHz) | A-MPR |
| 30MHz | Fc=2560-2560.020 | ≤5.04 | ≤1.44 | A1 |
|  |  | >5.04, ≤9.6 | ≤1.44 | A2 |
|  |  | >24.48 | ≤1.44 | A3 |
|  |  | ≤9.6 | >21 | A2 |
|  |  |  | >14.4, <21 | A4 |
|  |  | ≤6.12 | >10, ≤14.4 | A4 |
|  |  |  | >1.44, <10 | A2 |
| NOTE: The A-MPR values are listed in Table 6.2.3.18-2. | | | | |

Table 6.2.3.18-2: A-MPR for modulation and waveform type

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | A1(dB) | | A2(dB) | | A3(dB) | | A4(dB) | |
|  | PC3 | PC2 | PC3 | PC2 | PC3 | PC2 | PC3 | PC2 |
|  | Outer/ Inner | Outer/ Inner | Outer/ Inner | Outer/ Inner | Outer/ Inner | Outer/ Inner | Outer/ Inner | Outer/ Inner |
| DFT-s-OFDM PI/2 BPSK | ≤ 7 | ≤ 10 | ≤ 5.5 | ≤ 8.5 | ≤ 2 | ≤ 5 | ≤ 3 | ≤ 6 |
| DFT-s-OFDM QPSK | ≤ 7 | ≤ 10 | ≤ 5.5 | ≤ 8.5 | ≤ 2 | ≤ 5 | ≤ 3 | ≤ 6 |
| DFT-s-OFDM 16 QAM | ≤ 7 | ≤ 10 | ≤ 5.5 | ≤ 8.5 |  | ≤ 5 | ≤ 3 | ≤ 6 |
| DFT-s-OFDM 64 QAM | ≤ 7 | ≤ 10 | ≤ 6 | ≤ 8.5 |  | ≤ 5 | ≤ 3 | ≤ 6 |
| DFT-s-OFDM 256 QAM | ≤ 7 | ≤ 10 | ≤ 6 | ≤ 8.5 |  | ≤ 5 |  | ≤ 6 |
| CP-OFDM QPSK | ≤ 7 | ≤ 10 | ≤ 7 | ≤ 10 |  | ≤ 5 | ≤ 4 | ≤ 7 |
| CP-OFDM 16 QAM | ≤ 7 | ≤ 10 | ≤ 7 | ≤ 10 |  | ≤ 5 | ≤ 4 | ≤ 7 |
| CP-OFDM 64 QAM | ≤ 7 | ≤ 10 | ≤ 7 | ≤ 10 |  | ≤ 5 |  | ≤ 7 |
| CP-OFDM 256 QAM | ≤ 7 | ≤ 10 | ≤ 7 | ≤ 10 |  |  |  | ≤ 7 |

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

Table 6.2.3.19-1: A-MPR regions for NS\_50 (Power Class 3)

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

Table 6.2.3.19-2: A-MPR for NS\_50 (Power Class 3)

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

Table 6.2.3.19-3: A-MPR regions for NS\_50 (Power Class 2)

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth (MHz) | RBstart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 10 MHz | ≤ 1.44 | < 1.44 | A5 |
| ≤ 1.8 | ≥ 2.7+2\* RBstart\*12\*SCS | A4 |
| >1.8 | ≥ 8.1- RBstart\*12\*SCS | A4 |
| 15 MHz | ≤ 2.88 | < 2.7 | A5 |
| ≤ 3.24 | ≥ 2.7+2\* RBstart\*12\*SCS | A3 |
| >3.24 | ≥ 12.42- RBstart\*12\*SCS | A4 |
| 20 MHz | ≤ 4.32 | < 3.6 | A5 |
| ≤ 4.5 | ≥ 3.6+2\* RBstart\*12\*SCS | A3 |
| >4.5 | ≥ 17.1- RBstart\*12\*SCS | A4 |
| 25 MHz | ≤ LCRB\*12\*SCS – 5 | > 5 | A2 |
| ≤ 6.48 | ≤ 1.44 | A5 |
| > 8.28 | > max (21.6 – RBstart\*12\*SCS, 0), <RBstart\*12\*SCS+5 | A4 |
| >1.8, ≤6.48 | > 1.44, ≤ 3.6 | A6 |
| > LCRB \*12\*SCS – 5, ≤ 1.8 | > 1.44 | A4 |
| 30 MHz | ≤ LCRB\*12\*SCS – 5 | >5 | A2 |
| ≤ 7.56 | ≤ 1.44 | A5 |
| >1.8, ≤7.56 | > 1.44, ≤ 3.6 | A6 |
| ≤ 1.8 | >1.44, <RBstart\*12\*SCS+5 | A4 |
| > 10.8 | > max (26.64 – RBstart\*12\*SCS, 0), <RBstart\*12\*SCS+5 | A4 |
| 40 MHz | ≤ 4.32 | > 0 | A1 |
| > 4.32 | > RBstart\*12\*SCS + 11.88 | A8 |
| > 4.32, ≤ 12.96 | ≤ 10.8 | A3 |
| > 4.32, ≤ 18 | > 10.8, <= RBstart\*12\*SCS + 11.88 | A7 |
| > 18, ≤ 31.68 | > max (31.68 – RBstart\*12\*SCS, 0) | A4 |
| > 31.68 | > 0 | A9 |
| NOTE 1: The A-MPR values are specified in Table 6.2.3.19-4. | | | |

Table 6.2.3.19-4: A-MPR for NS\_50 (Power Class 2)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 (dB) | A2 (dB) | A3 (dB) | A4 (dB) | A5 (dB) | A6 (dB) | A7 (dB) | A8 (dB) | A9 (dB) |
| Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 11.5 | ≤4.5 | ≤ 4 | ≤ 2.5 | ≤ 4 | ≤ 1 | ≤ 3.5 | ≤ 10 | ≤ 8 |
| QPSK | ≤ 11.5 | ≤ 5.5 | ≤ 4 | ≤ 2.5 | ≤ 4 | ≤ 1 | ≤ 3.5 | ≤ 10 | ≤ 8 |
| 16 QAM | ≤ 11.5 | ≤ 5.5 | ≤ 4 | ≤ 2.5 | ≤ 4 | ≤ 1.5 | ≤ 3.5 | ≤ 10 | ≤ 8 |
| 64 QAM | ≤ 11.5 | ≤ 5.5 | ≤ 4 |  | ≤ 4 |  |  | ≤ 10 | ≤ 8 |
| 256 QAM | ≤ 11.5 | ≤ 5.5 |  |  |  |  |  | ≤ 10 | ≤ 8 |
| CP-OFDM | QPSK | ≤ 12.5 | ≤ 7 | ≤ 5.5 | ≤ 4 | ≤ 4 | ≤ 2 | ≤ 5 | ≤ 11 | ≤ 8 |
| 16 QAM | ≤ 12.5 | ≤ 7 | ≤ 5.5 | ≤ 4 | ≤ 4 |  | ≤ 5 | ≤ 11 | ≤ 8 |
| 64 QAM | ≤ 12.5 | ≤ 7 | ≤ 5.5 | ≤ 4 | ≤ 4 |  | ≤ 5 | ≤ 11 | ≤ 8 |
| 256 QAM | ≤ 12.5 | ≤ 7 |  |  |  |  |  | ≤ 11 | ≤ 8 |

#### 6.2.3.20 A-MPR for NS\_44

Table 6.2.3.20-1: A-MPR regions for NS\_44

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
|  |  | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 MHz | 2582.5≤ FC ≤ 2602.5 | <18.0 | >max(0, 12\*SCS\* RBend - 3.6) | A3 |
|  |  | ≥18.0 | <7.2 | A3 |
|  |  | ≥18.0 | ≥7.2 | A6 |
| 30 MHz | 2585 ≤ FC ≤ 2600 | <21.6 | >max(0, 12\*SCS\* RBend - 3.6) | A3 |
|  |  | ≥21.6 | <12.6 | A3 |
|  |  | ≥21.6 | ≥12.6 | A6 |
| 40 MHz | 2590 ≤ FC ≤ 2595 | ≥0, <2.88 | >0 | A1 |
|  |  | ≥2.88, <14.4 | >max (0, 12\*SCS\*RBend - 3.6) | A2 |
|  |  | ≥14.4, <23.4 | >10.8 | A3 |
|  |  | ≥23.4, <32.4 | >16.2 | A4 |
|  |  | ≥32.4 | >0 | A5 |

Table 6.2.3.20-2: A-MPR for NS\_44

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 | A6 |
|  | | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | 5 | 2 | 3 | 7 | 12 | 4 |
|  | QPSK | 5 | 2 | 3 | 7 | 12 | 4 |
|  | 16 QAM | 5 | 2 | 3 | 7 | 12 | 4 |
|  | 64 QAM | 5 |  | 3 | 7 | 12 | 4 |
|  | 256 QAM | 5 |  |  | 7 | 12 |  |
| CP-OFDM | QPSK | 5 | 4 | 5 | 8 | 12 | 6 |
|  | 16 QAM | 5 | 4 | 5 | 8 | 12 | 6 |
|  | 64 QAM | 5 | 4 | 5 | 8 | 12 | 6 |
|  | 256 QAM |  |  |  | 8 | 12 |  |

#### 6.2.3.21 A-MPR for NS\_12

Table 6.2.3.21-1: A-MPR regions for NS\_12

|  |  |  |  |
| --- | --- | --- | --- |
| Channel BW | RBStart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 5MHz | ≤1.8 | >0 | A1 |
| 10MHz | ≤3.6 | >0 | A1 |

Table 6.2.3.21-2: A-MPR for NS\_12

|  |  |
| --- | --- |
| Modulation/Waveform | A1 |
|  | Outer/Inner |
| DFT-s-OFDM PI/2 BPSK | ≤ 5 |
| DFT-s-OFDM QPSK | ≤ 5 |
| DFT-s-OFDM 16 QAM | ≤ 5.5 |
| DFT-s-OFDM 64 QAM | ≤ 5.5 |
| DFT-s-OFDM 256 QAM | ≤ 9.5 |
| CP-OFDM QPSK | ≤ 7 |
| CP-OFDM 16 QAM | ≤ 7 |
| CP-OFDM 64 QAM | ≤ 7 |
| CP-OFDM 256 QAM | ≤ 9.5 |

#### 6.2.3.22 A-MPR for NS\_13

Table 6.2.3.22-1: A-MPR regions for NS\_13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel BW | Carrier Frequency, Fc, MHz | RBStart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 5MHz | 819.5 ≤ Fc < 821.5 | ≤1.44 | <1.08 | A1 |
|  |  | ≤1.44 | ≥1.08 | A2 |
| 5MHz | Fc ≥ 821.5 | ≤0.54 | <1.08 | A1 |
|  |  |  | ≥3.24 | A3 |

Table 6.2.3.22-2: A-MPR for NS\_13

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 |
|  | Outer/Inner | Outer/Inner | Outer |
| DFT-s-OFDM PI/2 BPSK | ≤ 3.5 | ≤ 4.5 | ≤ 3 |
| DFT-s-OFDM QPSK | ≤ 3.5 | ≤ 4.5 | ≤ 3 |
| DFT-s-OFDM 16 QAM | ≤ 3.5 | ≤ 5 | ≤ 3 |
| DFT-s-OFDM 64 QAM | ≤ 4.5 | ≤ 5 | ≤ 3 |
| DFT-s-OFDM 256 QAM | ≤ 8 | ≤ 6 |  |
| CP-OFDM QPSK | ≤ 5 | ≤ 6.5 | ≤ 4.5 |
| CP-OFDM 16 QAM | ≤ 5 | ≤ 6.5 | ≤ 4.5 |
| CP-OFDM 64 QAM | ≤ 6 | ≤ 6.5 | ≤ 4.5 |
| CP-OFDM 256 QAM | ≤ 8 | ≤ 8 |  |

#### 6.2.3.23 A-MPR for NS\_14

Table 6.2.3.23-1: A-MPR regions for NS\_14

|  |  |  |  |
| --- | --- | --- | --- |
| Channel BW | RBStart\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 10MHz | ≤0.18 | <1.08 | A1 |
|  | ≥0 | ≥9 | A2 |
| 15MHz | ≤1.8 | <1.8 | A1 |
|  | ≥0 | ≥9 | A2 |
| 20MHz | ≤3.42 | <1.8 | A3 |
|  | ≥0 | ≥9 | A2 |

Table 6.2.3.23-2: A-MPR for NS\_14

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 |
|  | Outer/Inner | Outer | Outer/Inner |
| DFT-s-OFDM PI/2 BPSK | ≤ 3 | ≤ 2 | ≤ 3 |
| DFT-s-OFDM QPSK | ≤ 3 | ≤ 2 | ≤ 3 |
| DFT-s-OFDM 16 QAM | ≤ 3 | ≤ 2 | ≤ 3 |
| DFT-s-OFDM 64 QAM | ≤ 3 |  | ≤ 3 |
| DFT-s-OFDM 256 QAM |  |  | ≤ 8 |
| CP-OFDM QPSK | ≤ 5 | ≤ 4 | ≤ 5 |
| CP-OFDM 16 QAM | ≤ 5 | ≤ 4 | ≤ 5 |
| CP-OFDM 64 QAM | ≤ 6 |  | ≤ 6 |
| CP-OFDM 256 QAM | ≤ 8 |  | ≤ 8 |

#### 6.2.3.24 A-MPR for NS\_15

Table 6.2.3.24-1: A-MPR regions for NS\_15

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel BW | Carrier Frequency, Fc, MHz | RBend\*12\*SCS (MHz) | LCRB\*12\*SCS (MHz) | A-MPR |
| 5MHz | 840.5 < Fc ≤ 846.5 | ≥3.24 | >0 | A1 |
|  |  | <3.24, ≥2.52 | ≥1.44 | A2 |
|  |  | <0.9 | ≤0.36 | A3 |
| 10MHz | 840 < Fc ≤ 844 | ≥5.76 | >1.08 | A1 |
|  |  | ≥5.76 | ≤1.08 | A4 |
|  |  | <5.76, ≥4.14 | ≥2.7 | A2 |
|  |  | <2.52 | ≤0.36 | A3 |
|  | 835 < Fc ≤ 840 | ≥7.2 | >0 | A1 |
|  |  | <7.2, ≥5.22 | ≥4.32 | A2 |
|  |  | <1.08 | ≤0.36 | A3 |
| 15MHz | 837.5 < Fc ≤ 841.5 | ≥9.36 | >1.08 | A1 |
|  |  | ≥9.36 | ≤1.08 | A4 |
|  |  | <9.36, ≥4.68 | ≥3.6 | A2 |
|  |  | <3.96 | ≤0.36 | A3 |
|  | 831.5 < Fc ≤ 837.5 | ≥10.8 | >1.08 | A1 |
|  |  | ≥10.8 | ≤1.08 | A4 |
|  |  | <10.8, ≥6.48 | ≥3.6 | A2 |
|  |  | <2.7 | ≤0.36 | A3 |
|  | Fc ≤ 831.5 | ≥13.14 | >0 | A1 |
|  |  | <13.14, ≥7.92 | ≥3.6 | A2 |
|  |  | <0.72 | ≤0.36 | A3 |
| 20MHz | 835 < Fc ≤ 839 | ≥12.24 | >1.08 | A1 |
|  |  | ≥12.24 | ≤1.08 | A4 |
|  |  | <12.24, ≥8.46 | ≥5.4 | A2 |
|  |  | <5.58 | ≤0.36 | A3 |
|  | Fc ≤ 835 | ≥13.68 | >1.08 | A1 |
|  |  | ≥13.68 | ≤1.08 | A4 |
|  |  | <13.68, ≥8.46 | ≥5.4 | A2 |
|  |  | <4.32 | ≤0.36 | A3 |

Table 6.2.3.24-2: A-MPR for NS\_15

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 | A4 |
|  | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM PI/2 BPSK | ≤ 9 | ≤ 5 | ≤ 4 | ≤ 9 |
| DFT-s-OFDM QPSK | ≤ 9 | ≤ 5 | ≤ 4 | ≤ 9 |
| DFT-s-OFDM 16 QAM | ≤ 9 | ≤ 5 | ≤ 4 | ≤ 9 |
| DFT-s-OFDM 64 QAM | ≤ 9 | ≤ 5 | ≤ 4 | ≤ 9 |
| DFT-s-OFDM 256 QAM | ≤ 9 | ≤ 5 | ≤ 9 | ≤ 13.5 |
| CP-OFDM QPSK | ≤ 10.5 | ≤ 6.5 | ≤ 4 | ≤ 10.5 |
| CP-OFDM 16 QAM | ≤ 10.5 | ≤ 6.5 | ≤ 4 | ≤ 10.5 |
| CP-OFDM 64 QAM | ≤ 10.5 | ≤ 6.5 | ≤ 4 | ≤ 10.5 |
| CP-OFDM 256 QAM | ≤ 10.5 | ≤ 6.5 | ≤ 9 | ≤ 13.5 |

#### 6.2.3.25 A-MPR for NS\_45

Table 6.2.3.25-1: A-MPR for NS\_45

|  |  |  |
| --- | --- | --- |
| Modulation/Waveform | | Outer |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 1.5 |
|  | QPSK | ≤ 2 |
|  | 16 QAM | ≤ 2.5 |
|  | 64 QAM | ≤ 3 |

#### 6.2.3.26 A-MPR for NS\_48

Table 6.2.3.26-1: A-MPR regions for NS\_48 (Power Class 3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
|  |  | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 MHz | 1932.5≤ FC ≤ 1967.5 | ≥0 | ≥9.72 | A3 |
|  |  | ≥18.72 | <1.08 | A3 |
| 30 MHz | 1935 ≤ FC ≤ 1965 | ≥0 | ≥13.5 | A3 |
|  |  | ≥21.6 | <1.08 | A5 |
| 40 MHz | 1940 ≤ FC ≤ 1960 | ≥0, <2.88 | ≥0 | A2 |
|  |  | ≥2.88, <17.1 | ≥max (0, 12\*SCS\*RBend - 3.6) | A3 |
|  |  | ≥17.1, <27.36 | ≥13.5 | A4 |
|  |  | ≥27.36, <34.56 | ≥13.5 | A2 |
|  |  | ≥27.36, <34.56 | <1.08 | A3 |
|  |  | ≥34.56 | ≥0 | A1 |
| 45 MHz | 1942.5 ≤ FC ≤ 1957.5 | ≥0, <4.86 | >0 | A2 |
|  |  | ≥4.86, <19 | ≥max (0, 12\*SCS\*RBend - 3.6) | A4 |
|  |  | ≥19, <37.44 | ≥15.4 | A2 |
|  |  | ≥30.96, <37.44 | <1.08 | A5 |
|  |  | ≥37.44 | >0 | A1 |
| 50 MHz | 1945 ≤ FC ≤ 1955 | ≥0, <6.12 | >0 | A2 |
|  |  | ≥6.12, <20.7 | ≥max (0, 12\*SCS\*RBend - 3.6) | A4 |
|  |  | ≥20.7, <41.04 | ≥17.1 | A2 |
|  |  | ≥33.84, <41.04 | <1.08 | A5 |
|  |  | ≥41.04 | >0 | A1 |

Table 6.2.3.26-2: A-MPR for NS\_48 (Power Class 3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 |
|  | | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
|  | QPSK | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
|  | 16 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
|  | 64 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
|  | 256 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| CP-OFDM | QPSK | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
|  | 16 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
|  | 64 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
|  | 256 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |

Table 6.2.3.26-3: A-MPR regions for NS\_48 (Power Class 2)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | | A-MPR |
|  |  | RBend\*12\*SCS  MHz | | LCRB\*12\*SCS  MHz |  |
| 10 MHz | 1925≤ FC ≤ 1975 | | ≥0 | ≥8.1 | A6 |
| <1.8 | ≥0 | A6 |
| 15 MHz | 1927.5≤ FC ≤ 1972.5 | | ≥0 | ≥9 | A6 |
| ≥0 | ≥max (0,12\*SCS\* RBend - 2.88)  <9 | A6 |
| 20 MHz | 1930≤ FC ≤ 1970 | | ≥0 | ≥9.72 | A4 |
| ≥0 | ≥max (0,12\*SCS\* RBend - 3.6)  <9.72 | A6 |
| 25 MHz | 1932.5≤ FC ≤ 1967.5 | ≥0 | | ≥9.72 | A4 |
|  |  | ≥18.72 | | <1.08 | A3 |
| ≥0 | | ≥max (0, 12\*SCS\*RBend - 1.08)  < 9.72 | A4 |
| 30 MHz | 1935 ≤ FC ≤ 1965 | ≥0 | | ≥12.96 | A4 |
|  | ≥21.6 | | <1.08 | A5 |
| ≥0 | | ≥max (0, 12\*SCS\*RBend - 3.6)  < 12.96 | A4 |
| 40 MHz | 1940 ≤ FC ≤ 1960 | ≥0, <2.88 | | ≥0 | A1 |
|  |  | ≥2.88, <17.1 | | ≥max (0, 12\*SCS\*RBend - 4.68) | A3 |
|  |  | ≥17.1, <27.36 | | ≥12.96 | A4 |
|  |  | ≥27.36, <34.56 | | ≥12.96 | A2 |
|  |  | ≥27.36, <34.56 | | <1.08 | A3 |
|  |  | ≥34.56 | | ≥0 | A1 |
| 45 MHz | 1942.5 ≤ FC ≤ 1957.5 | ≥0, <5.22 | | >0 | A1 |
|  |  | ≥5.22, <19 | | ≥max (0, 12\*SCS\*RBend - 5.4) | A4 |
|  |  | ≥19, <37.44 | | ≥14.04 | A2 |
|  |  | ≥30.96, <37.44 | | <1.08 | A5 |
|  |  | ≥37.44 | | >0 | A1 |
| 50 MHz | 1945 ≤ FC ≤ 1955 | ≥0, <7.2 | | >0 | A1 |
|  |  | ≥7.2, <20.7 | | ≥max (0, 12\*SCS\*RBend – 5.4) | A4 |
|  |  | ≥20.7, <41.04 | | ≥15.12 | A2 |
|  |  | ≥33.84, <41.04 | | <1.08 | A5 |
|  |  | ≥41.04 | | >0 | A1 |

Table 6.2.3.26-4: A-MPR for NS\_48 (Power Class 2)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 | A6 |
|  | | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | ≤[12] | ≤8.0 | ≤4.0 | ≤4.5 | ≤6.0 | ≤3.0 |
|  | QPSK | ≤[12] | ≤8.0 | ≤4.0 | ≤4.5 | ≤6.0 | ≤3.0 |
|  | 16 QAM | ≤[12] | ≤8.0 | ≤4.0 | ≤4.5 | ≤6.0 | ≤3.0 |
|  | 64 QAM | ≤[12] | ≤8.0 | ≤4.0 | ≤4.5 | ≤6.0 | ≤3.0 |
|  | 256 QAM | ≤[12] | ≤8.0 | ≤4.0 | ≤4.5 | ≤6.0 | ≤3.0 |
| CP-OFDM | QPSK | ≤[12.5] | ≤9.0 | ≤5.5 | ≤6.0 | ≤6.0 | ≤4.5 |
|  | 16 QAM | ≤[12.5] | ≤9.0 | ≤5.5 | ≤6.0 | ≤6.0 | ≤4.5 |
|  | 64 QAM | ≤[12.5] | ≤9.0 | ≤5.5 | ≤6.0 | ≤6.0 | ≤4.5 |
|  | 256 QAM | ≤[12.5] | ≤9.0 | ≤5.5 | ≤6.0 | ≤6.0 | ≤4.5 |

#### 6.2.3.27 A-MPR for NS\_49

Table 6.2.3.27-1: A-MPR regions for NS\_49 (Power Class 3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
| RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |
| 25 MHz | 1932.5≤ FC ≤ 1967.5 | ≥0 | ≥9.72 | A3 |
| ≥18.72 | <1.08 | A3 |
| ≤3.96 | <1.08 | A3 |
| 30 MHz | 1935 ≤ FC ≤ 1965 | ≥0, <3.6 | ≥0 | A1 |
| ≥3.6, <6.48 | ≥0 | A5 |
| ≥6.48, <14.4 | ≥max (0,12\*SCS\* RBend - 3.6) | A3 |
| ≥14.4, <21.6 | ≥10.8 | A4 |
| ≥21.6 | ≥10.8 | A2 |
| ≥21.6 | <1.08 | A5 |
| 40 MHz | 1940 ≤ FC ≤ 1960 | ≥0, <7.2 | ≥0 | A1 |
| ≥7.2, <10.44 | <1.08 | A5 |
| ≥7.2, <18 | ≥max (0, 12\*SCS\*RBend - 3.6) | A4 |
| ≥18, <34.56 | ≥14.4, <28.8 | A2 |
| ≥27.36, <34.56 | <1.08 | A5 |
| <34.56 | ≥28.8 | A1 |
| ≥34.56 | ≥0 | A1 |
|  |  | ≥6.12, <12.42 | < min [1.08, max(0,12\*SCS\* RBend-6.12)] | A5 |
|  |  | ≥30.76, <36.72 | <1.08 | A5 |
| 45 MHz | 1942.5 ≤ FC ≤ 1957.5 | <36.72 | ≥16.2, <max (0, 12\*SCS\*RBend – 6.12) | A2 |
|  |  | <36.72 | ≥max (0, 12\*SCS\*RBend – 6.12) | A1 |
|  |  | ≥36.72 | >0 | A1 |
| 50 MHz | 1945 ≤ FC ≤ 1955 | ≥7.74, <14.4 | < min [1.08, max(0,12\*SCS\* RBend-7.74)] | A5 |
| ≥36, <39.6 | <1.08 | A5 |
| <39.6 | ≥18, <max (0, 12\*SCS\*RBend – 7.74) | A2 |
| <39.6 | ≥max (0, 12\*SCS\*RBend – 7.74) | A1 |
| ≥39.6 | >0 | A1 |

Table 6.2.3.27-2: A-MPR for NS\_49 (Power Class 3)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 |
| Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| QPSK | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| 16 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| 64 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| 256 QAM | ≤10 | ≤6 | ≤3 | ≤4 | ≤5 |
| CP-OFDM | QPSK | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
| 16 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
| 64 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |
| 256 QAM | ≤11 | ≤7 | ≤4.5 | ≤5.5 | ≤5 |

Table 6.2.3.27-3: A-MPR regions for NS\_49 (Power Class 2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
| RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |
| 10 MHz | 1925≤ FC ≤ 1975 | ≥0 | ≥8.1 | A3 |
| <1.8 | ≥0 | A3 |
| 15 MHz | 1927.5≤ FC ≤ 1972.5 | ≥0 | ≥9 | A3 |
| ≥0 | ≥max (0,12\*SCS\* RBend - 2.88)  <9 | A3 |
| 20 MHz | 1930≤ FC ≤ 1970 | ≥0 | ≥9.72 | A4 |
| ≥0 | ≥max (0,12\*SCS\* RBend - 3.6)  <9.72 | A3 |
| 25 MHz | 1932.5≤ FC ≤ 1967.5 | ≥0 | ≥7.92 | A4 |
| ≥18.72 | <1.08 | A3 |
| ≤6.48 | <3.6 | A3 |
| 30 MHz | 1935 ≤ FC ≤ 1965 | ≥0, <3.6 | ≥0 | A1 |
| ≥3.6, <7.92 | ≥0 | A5 |
| ≥7.92, <14.4 | ≥max (0,12\*SCS\* RBend - 4.32) | A3 |
| ≥14.4, <21.6 | ≥10.44 | A4 |
| ≥21.6 | ≥10.44 | A2 |
| ≥21.6 | <1.8 | A1 |
| 40 MHz | 1940 ≤ FC ≤ 1960 | ≥0, <9 | ≥0 | A1 |
| ≥9, <11.52 | <3.06 | A5 |
| ≥9, <18 | ≥max (3.06, 12\*SCS\*RBend – 6.48) | A4 |
| ≥18, <34.56 | ≥11.16, <27 | A2 |
| ≥27.36, <34.56 | <1.08 | A5 |
| <34.56 | ≥27 | A1 |
| ≥34.56 | ≥0 | A1 |
|  |  | ≥7.92, <12.42 | < min [1.08, max(0,12\*SCS\* RBend-7.92)] | A5 |
|  |  | ≥30.76, <36.72 | <1.08 | A5 |
| 45 MHz | 1942.5 ≤ FC ≤ 1957.5 | <36.72 | ≥12.24, <max (0, 12\*SCS\*RBend – 7.92) | A2 |
|  |  | <36.72 | ≥max (0, 12\*SCS\*RBend – 7.92) | A1 |
|  |  | ≥36.72 | >0 | A1 |
| 50 MHz | 1945 ≤ FC ≤ 1955 | ≥10.08, <14.4 | < min [1.08, max(0,12\*SCS\* RBend-10.08)] | A5 |
| ≥36, <39.6 | <1.08 | A5 |
| <39.6 | ≥13.68, <max (0, 12\*SCS\*RBend – 10.08) | A2 |
| <39.6 | ≥max (0, 12\*SCS\*RBend – 10.08) | A1 |
| ≥39.6 | >0 | A1 |

Table 6.2.3.27-4: A-MPR for NS\_49 (Power Class 2)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 |
| Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | ≤[12.5] | ≤7 | ≤4 | ≤5.5 | ≤6 |
| QPSK | ≤[12.5] | ≤7 | ≤4 | ≤5.5 | ≤6 |
| 16 QAM | ≤[12.5] | ≤7 | ≤4 | ≤5.5 | ≤6 |
| 64 QAM | ≤[12.5] | ≤7 | ≤4 | ≤5.5 | ≤6 |
| 256 QAM | ≤[12.5] | ≤7 | ≤4 | ≤5.5 | ≤6 |
| CP-OFDM | QPSK | ≤[13.5] | ≤8 | ≤5.5 | ≤7.5 | ≤6 |
| 16 QAM | ≤[13.5] | ≤8 | ≤5.5 | ≤7.5 | ≤6 |
| 64 QAM | ≤[13.5] | ≤8 | ≤5.5 | ≤7.5 | ≤6 |
| 256 QAM | ≤[13.5] | ≤8 | ≤5.5 | ≤7.5 | ≤6 |

#### 6.2.3.28 A-MPR for NS\_51

Table 6.2.3.28-1: A-MPR regions for NS\_51

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR |
| RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |
| 50 MHz | Fc ≤ 1945 | ≤ 4.5 | > 0 | A7 |
| >4.5, < 32.4 | ≥ max(0, 12\*SCS\*RBend - 14.4) | A4 |
| < 32.4 | < max(0, 12\*SCS\*RBend - 14.4) | A5 |
| ≥ 32.4 | > 0 | A6 |
| 50 MHz | 1945 < Fc ≤ 1980 | < 27 | ≥ max(0, 12\*SCS\*RBend - 14.4) | A1 |
| < 27 | < max(0, 12\*SCS\*RBend - 14.4) | A2 |
| ≥ 27 | > 0 | A3 |

Table 6.2.3.28-2: A-MPR for NS\_51

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | | A1 | A2 | A3 | A4 | A5 | A6 | A7 |
| Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM | PI/2 BPSK | 17 | 12.5 | 22 | 7 | 4.5 | 16 | 14 |
| QPSK | 17 | 12.5 | 22 | 7 | 4.5 | 16 | 14 |
| 16 QAM | 17 | 12.5 | 22 | 7 | 4.5 | 16 | 14 |
| 64 QAM | 17 | 12.5 | 22 | 7 | 4.5 | 16 | 14 |
| 256 QAM | 17 | 12.5 | 22 | 7 | 4.5 | 16 | 14 |
| CP-OFDM | QPSK | 17 | 12.5 | 22 | 8.5 | 4.5 | 17 | 14 |
| 16 QAM | 17 | 12.5 | 22 | 8.5 | 4.5 | 17 | 14 |
| 64 QAM | 17 | 12.5 | 22 | 8.5 | 4.5 | 17 | 14 |
| 256 QAM | 17 | 12.5 | 22 | 8.5 | 4.5 | 17 | 14 |

#### 6.2.3.29 A-MPR for NS\_07

Table 6.2.3.29-1: A-MPR regions for NS\_07

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Frequency, MHz | Regions | | A-MPR |
|  |  | RBstart\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 5 MHz | 782 ≤ Fc ≤ 784.5 | >0 | ≥ 1.8 | A3 |
| 5 MHz | 779.5 ≤ Fc < 782 | ≤ 0.9 | ≥ 0 | A1 |
|  |  | > 0.9, ≤ 1.26 | ≥1.26 | A2 |
|  |  | > 1.26, ≤ 3.42 | ≥ 1.8 | A3 |
|  |  | >3.42 | ≤ 0.36 | A4 |
| 10 MHz | Fc = 782 | ≤ 2.34 | ≥ 0 | A1 |
|  |  | >2.34, ≤ 3.24 | ≥ 1.44 | A2 |
|  |  | > 3.24, ≤ 6.48 | ≥ 3.24 | A3 |
|  |  | > 6.48 | ≤ 0.36 | A4 |

Table 6.2.3.29-2: A-MPR for NS\_07

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 | A4 |
|  | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM PI/2 BPSK | 12 | 9 | 6 | 3 |
| DFT-s-OFDM QPSK | 12 | 9 | 6 | 3 |
| DFT-s-OFDM 16 QAM | 12 | 9 | 6 | 3 |
| DFT-s-OFDM 64 QAM | 12 | 9 | 6 | 3 |
| DFT-s-OFDM 256 QAM | 12 | 9 | 6 | 3 |
| CP-OFDM QPSK | 14 | 10 | 7 | 3 |
| CP-OFDM 16 QAM | 14 | 10 | 7 | 3 |
| CP-OFDM 64 QAM | 14 | 10 | 7 | 3 |
| CP-OFDM 256 QAM | 14 | 10 | 7 | 3 |

#### 6.2.3.30 A-MPR for NS\_56

For 5 MHz channel centered on frequencies (FC) = 1630.0, 1630.3 MHz, A-MPR is defined as

if RBstart <= ceil{3/SCS/15 kHz)}and LCRB <= ceil{17/SCS/15 kHz)},

then

the A-MPR = 14 dB for SCS = 15 kHz and AMPR = 8 dB for SCS >= 30 kHz,

else,

if RBstart <= ceil{3/(SCS/15 kHz)} and LCRB > ceil{17/(SCS/15 kHz)},

then

the A-MPR = 6 dB,

else,

if RBstart <= ceil{8/(SCS/15 kHz)},

then

the A-MPR = 4 dB.

For 5 MHz channel centered on frequencies (Fc) = 1635.0, 1649.0, 1654.0 MHz, no A-MPR is needed.

For Channel 10 MHz with center frequency of 1632.5 MHz, A-MPR is defined as

if RBstart < ceil{3/(SCS/15 kHz)} and LCRB <= ceil{8/(SCS/15 kHz)},

then

the A-MPR = 12 dB for SCS = 15 kHz and AMPR = 8 dB for SCS >= 30 kHz,

else,

if RBstart < ceil{9/(SCS/15 kHz)}, and LCRB > ceil{8/(SCS/15 kHz)},

then

the A-MPR = 8 dB,

else,

if RBstart <= ceil{18/(SCS/15 kHz)},

then

the A-MPR = 6 dB,

else,

if RBstart >= floor{40/(SCS/15 kHz)}], and LCRB <= ceil{7/(SCS/15 kHz)},

then

the A-MPR = 5 dB,

else,

if RBstart >= floor{40/(SCS/15 kHz)} and LCRB > ceil{7/(SCS/15 kHz)},

then

the A-MPR = 3 dB,

else,

if RBstart >= floor{35/(SCS/15 kHz)} and LCRB <= ceil{7/(SCS/15 kHz)},

then

the A-MPR = 4 dB,

else,

if RBstart >= floor{35/(SCS/15 kHz)} and LCRB > ceil{7/(SCS/15 kHz)},

then

the A-MPR = 2 dB.

For 10 MHz channel centered on frequency of 1651.5 MHz, no A-MPR is needed.

#### 6.2.3.31 A-MPR for NS\_35

For power class 1 operation A-MPR = 8.5 dB if

( LCRB ≤ 0.20 ∙ NRB and ( RBstart = 0 or RBstart + LCRB = NRB ) )

or

( LCRB = 1 and 5 ∙ | RBstart + 0.5 – NRB / 2 | ∙ 12 ∙ SCS ≥ 1.5 ∙ CBW + 5 MHz ).

#### 6.2.3.32 A-MPR for NS\_06

For power class 1 operation on band n85 A-MPR = 8.5 dB if

( LCRB ≤ 0.20 ∙ NRB and ( RBstart = 0 or RBstart + LCRB = NRB ) )

or

( LCRB = 1 and 5 ∙ | RBstart + 0.5 – NRB / 2 | ∙ 12 ∙ SCS ≥ 1.5 ∙ CBW + 5 MHz ).

### 6.2.4 Configured transmitted power

The UE is allowed to set its configured maximum output power PCMAX,f,c for carrier f of serving cell c in each slot. The configured maximum output power PCMAX,f,c is set within the following bounds:

PCMAX\_L,f,c ≤ PCMAX,f,c ≤ PCMAX\_H,f,c with

PCMAX\_L,f,c = MIN {PEMAX,c– ∆TC,c, (PPowerClass – ΔPPowerClass) – MAX(MAX(MPRc+∆MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c +∆TRxSRS, P-MPRc) }

PCMAX\_H,f,c = MIN {PEMAX,c, PPowerClass – ΔPPowerClass }

where

PEMAX,c is the value given by either the *p-Max* IE or the field *additionalPmax* of the *NR-NS-PmaxList IE*, whichever is applicable according to TS 38.331[7];

PPowerClass is the maximum UE power specified in Table 6.2.1-1 and in Table 6.2F.1-1 for shared spectrum access operation, without taking into account the tolerance specified in the Table 6.2.1-1 and in Table 6.2F.1-1 for shared spectrum access operation;

When the IE *powerBoostPi2BPSK* is set to 1, PEMAX,c is increased by +3 dB for a power class 3 capable UE operating in TDD bands n40, n41, n77, n78, and n79 with PI/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and 40% or less symbols in certain evaluation period are used for UL transmission when PEMAX,c ≥ 20 dBm (The exact evaluation period is no less than one radio frame).

When the IE *powerBoostPi2BPSK* is set to 1, ΔPPowerClass = -3 dB for a power class 3 capable UE operating in TDD bands n40, n41, n77, n78, and n79 with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and 40% or less slots in radio frame are used for UL transmission.

ΔPPowerClass =

- 3 dB for a power class 2 capable UE or 6 dB for a power class 1.5 UE when P-max of 23 dBm or lower is indicated; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than 50%; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or when the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and half the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame).

- 3 dB for a power class 1.5 capable UE when P-max of between 23 dBm and 26 dB is indicated; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of uplink symbols transmitted in a certain evaluation period is between 25% and 50%; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is between *maxUplinkDutyCycle-PC2-FR1* and *maxUplinkDutyCycle-PC2-FR1/2* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or when the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and the percentage of uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame).

- 3dB when the UE is configured with SUL configurations and the requirements of default power class are applied as specified in sub-clause 6.2C.1 on the band where UE indicates power class 2;

- 3dB is applied during SRS transmission occasions with usage in SRS-ResourceSet set as ‘antennaSwitching’ with configured SRS resources in each SRS resource set(s) consisting of one SRS port when PC2 capable UE with txDiversity-r16 capability or PC1.5 capable UE further indicates SRS-TxSwitch capability ‘t1r2’ or ‘t1r4’ or ‘t1r1-t1r2’ or ‘t1r1-t1r2-t1r4’;

- 0 dB otherwise;

∆TIB,c is the additional tolerance for serving cell c as specified in clause 6.2A.4.2 for NR CA, clause 6.2C.2 for SUL, or TS 38.101-3 clause 6.2B.4.2 for EN-DC; ∆TIB,c = 0 dB otherwise; In case the UE supports more than one of band combinations for V2X operating bands for concurrent operation, CA, SUL or DC, and an operating band belongs to more than one band combinations then

a) When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ∆TIB,c among the different supported band combinations involving such band shall be applied

b) When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3] for the applicable operating bands.

∆TC,c = 1.5dB when NOTE 3 in Table 6.2.1-1 in 38.101-1 applies for a serving cell c, otherwise ∆TC,c = 0 dB ;

MPRc and A-MPRc for serving cell c are specified in clause 6.2.2 and clause 6.2.3, respectively and in clause 6.2F.2 and clause 6.2F.3 respectively for shared spectrum access operation;

∆MPRc for serving cell c is specified in clause 6.2.2 and in clause 6.2F.2 for shared spectrum access operation.

∆TRxSRS is applied during SRS transmission occasions with *usage* in *SRS-ResourceSet* set as ‘antennaSwitching’ when

a) UE transmits SRS on the second SRS resource in every configured SRS resource set when the *SRS-TxSwitch* capability is indicated as 't1r2' or 't1r1-t1r2'

b) UE transmits SRS on the second, third and fourth SRS resources of the total 4 SRS resources from all configured SRS resource set(s) consisting of one SRS port when the *SRS-TxSwitch* capability is indicated as 't1r4' or, 't1r4-t2r4' or 't1r1-t1r2-t1r4' or, 't1r1-t1r2-t2r2-t1r4-t2r4'

c) UE transmits SRS from the second SRS port pair on the second SRS resource in every configured SRS resource set consisting of two SRS ports when the *SRS-TxSwitch* capabilityis indicated as' t2r4' or ' t1r4-t2r4', or 't1r1-t1r2-t2r2-t2r4' or 't1r1-t1r2-t2r2-t1r4-t2r4', or

d) UE transmits SRS to a DL-only carrier

The value of ∆TRxSRS is 4.5dB for bands whose FUL\_high is higher than the FUL\_low of n79 and 3 dB for bands whose FUL\_high is lower than the FUL\_low of n79 when the device is capable of power class 3 or power class 5 or power class 1.5 in the band, or when the device is capable of power class 2 in the band and ΔPPowerClass = 3 dB, or when UE indicating *txDiversity-r16*~~.~~.

The value of ∆TRxSRS is 7.5dB for bands whose FUL\_high is higher than the FUL\_low of n79 and 6 dB for bands whose FUL\_high is lower than the FUL\_low of n79 during SRS transmission occasions with configured SRS resources consisting of one SRS port when the device is capable of power class 2 in the band and ΔPPowerClass = 0 dB and not indicating *txDiversity-r16*.

For other SRS transmissions ∆TRxSRS is zero;

P-MPRc is the power management maximum power reduction for

a) ensuring compliance with applicable electromagnetic energy absorption requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications;

b) ensuring compliance with applicable electromagnetic energy absorption requirements in case of proximity detection is used to address such requirements that require a lower maximum output power.

The UE shall apply P-MPRc for serving cell c only for the above cases. For UE conducted conformance testing P-MPRc shall be 0 dB

NOTE 1: P-MPRc was introduced in the PCMAX,f,c equation such that the UE can report to the gNB the available maximum output transmit power. This information can be used by the gNB for scheduling decisions.

NOTE 2: P-MPRc may impact the maximum uplink performance for the selected UL transmission path.

TREF and Teval are specified in Table 6.2.4-1. For each TREF, the PCMAX,L,c for serving cell c are evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L,f,c over one or more Teval is then applied for the entire TREF

Table 6.2.4-1: Evaluation and reference periods for Pcmax

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| Physical channel length | Physical channel length | Min(*Tno\_hopping*, Physical Channel Length) |

The measured configured maximum output power PUMAX,f,c shall be within the following bounds:

PCMAX\_L,f,c – MAX{TL,c, T(PCMAX\_L,f,c)} ≤ PUMAX,f,c ≤ PCMAX\_H,f,c + T(PCMAX\_H,f,c).

where the tolerance T(PCMAX,f,c) for applicable values of PCMAX,f,c is specified in Table 6.2.4-1. The tolerance TL,c is the absolute value of the lower tolerance for the applicable operating band as specified in Table 6.2.1-1 and in Table 6.2F.1-1 for shared spectrum access operation.

Table 6.2.4-1: PCMAX tolerance

|  |  |
| --- | --- |
| PCMAX,f,c (dBm) | Tolerance T(PCMAX,f,c) (dB) |
| 23 < PCMAX,c ≤ 33 | 2.0 |
| 21 ≤ PCMAX,c ≤ 23 | 2.0 |
| 20 ≤ PCMAX,c < 21 | 2.5 |
| 19 ≤ PCMAX,c < 20 | 3.5 |
| 18 ≤ PCMAX,c < 19 | 4.0 |
| 13 ≤ PCMAX,c < 18 | 5.0 |
| 8 ≤ PCMAX,c < 13 | 6.0 |
| -40 ≤ PCMAX,c < 8 | 7.0 |

## 6.2A Transmitter power for CA

### 6.2A.1 UE maximum output power for CA

#### 6.2A.1.1 UE maximum output power for Intra-band contiguous CA

For uplink intra-band contiguous carrier aggregation, the maximum output power is specified in Table 6.2A.1.1-1. For downlink intra-band contiguous carrier aggregation with a single uplink component carrier configured in the NR band, the maximum output power is specified in Table 6.2.1-1 for power class 3 and other power classes if indicated in clause 5.5A.1.

Table 6.2A.1.1-1: UE Power Class for intra-band contiguous CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| CA\_n5B |  |  |  |  | 23 | +2/-2 |  |  |
| CA\_n7B |  |  |  |  | 23 | +2/-2 |  |  |
| CA\_n40B |  |  |  |  | 23 | +2/-2 |  |  |
| CA\_n41B |  |  |  |  | 23 | +2/-21 |  |  |
| CA\_n41C |  |  | 26 | +2/-3 | 23 | +2/-21 |  |  |
| CA\_n48B |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n77C |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n78C |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n79C |  |  |  |  | 23 | +2/-3 |  |  |
| NOTE 1: An uplink CA configuration in which the band has NOTE 3 in Table 6.2.1-1 is allowed to reduce the lower tolerance limit by 1.5 dB when the transmission bandwidths of the band are confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high - 4 MHz and FUL\_high.  NOTE 2: PPowerClass is the maximum UE power specified without taking into account the tolerance.  NOTE 3: For intra-band contiguous carrier aggregation the maximum power requirement shall apply to the total transmitted power over all component carriers (per UE). | | | | | | | | |

#### 6.2A.1.2 UE maximum output power for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in clause 6.2.1 apply for power class 3 and other power classes if indicated in clause 5.5A.2. For intra-band non-contiguous carrier aggregation with two uplink carriers the maximum output power is specified in Table 6.2A.1.2-1.

Table 6.2A.1.2-1: UE Power Class for intraband non-contiguous CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| CA\_n41(2A) |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n77(2A) |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n78(2A) |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| NOTE 1: An uplink CA configuration in which the band has NOTE 3 in Table 6.2.1-1 is allowed to reduce the lower tolerance limit by 1.5 dB when the transmission bandwidths of the band are confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high - 4 MHz and FUL\_high.  NOTE 2: PPowerClass is the maximum UE power specified without taking into account the tolerance.  NOTE 3: For intra-band non-contiguous carrier aggregation the maximum power requirement shall apply to the total transmitted power over all component carriers (per UE). | | | | | | | | |

#### 6.2A.1.3 UE maximum output power for Inter-band CA

For inter-band downlink carrier aggregation with one uplink carrier assigned to one NR band, the transmitter power requirements in Table 6.2.1-1 apply for power class 3 and other power classes if indicated in clause 5.5A.3.

For inter-band carrier aggregation with two uplink contiguous carrier assigned to one NR band, the transmitter power requirements specified in subclause 6.2A.1.1 apply.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the transmitter power requirements specified in subclause 6.2A.1.2 apply. For inter-band uplink carrier aggregation with uplink assigned to two NR bands, UE maximum output power shall be measured over all component carriers from different bands. If each band has separate antenna connectors, maximum output power is defined as the sum of maximum output power from each UE antenna connector. The period of measurement shall be at least one sub frame (1 ms). The maximum output power is specified in Table 6.2A.1.3-1.

Table 6.2A.1.3-1 UE Power Class for uplink inter-band CA (two bands)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Uplink CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance  (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| CA\_n1A-n3A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n5A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n8A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n18A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n20A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n26A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n41A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n1A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n74A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n1A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n1A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n1A-n105A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n5A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n12A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n14A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n30A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n71A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n2A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n2A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n5A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n8A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n18A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n20A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n26A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n34A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n38A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n41A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n3A-n41C |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n74A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n75A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n3A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n3A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n3A-n105A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n12A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n14A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n25A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n30A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n5A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n5A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n5A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n8A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n25A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n26A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n7A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n7A-n105A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n34A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n39A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n8A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n8A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n12A-n25A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n12A-n30A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n12A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n12A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n12A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n13A-n25A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n13A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n13A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n14A-n30A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n14A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n14A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n18A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n18A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n18A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n18A-n74A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n18A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n18A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n20A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n20A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n24A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n24A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n24A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n25A-n38A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n25A-n41A |  |  | 266 | +2/-32 | 23 | +2/-3 |  |  |
| CA\_25A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n25A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n25A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n25A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n25A-n85A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n26A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n26A-n70A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n26A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n26A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n34A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n39A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n41A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n28A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n50A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n74A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n28A-n78A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n28A-n79A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n28A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n34A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n30A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n30A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n34A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n34A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n34A-n41C |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n38A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n38A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n39A-n40A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n39A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n39A-n41C |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n39A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n40A-n41A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n40A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n40A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n40A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n40A-n105A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n50A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n66A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n41A-n70A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n71A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n41A-n74A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n41A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n41A-n79A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n41A-n85A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n46A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n46A-n48B |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n46A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n46A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48A-n70A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48A-n71A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48A-n96A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48B-n96A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n48A-n96B |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n50A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n66A-n71A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n66A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n66A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n66A-n85A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n70A-n71A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n70A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n70A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n71A-n77A |  |  | 266 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n71A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n74A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n74A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n77A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n77A-n85A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n77A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n78A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n78A-n92A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n78A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n78A-n105A |  |  |  |  | 23 | +2/-3 |  |  |
| NOTE 1: Void  NOTE 2: An uplink CA configuration in which at least one of the bands has NOTE 3 in Table 6.2.1-1 is allowed to reduce the lower tolerance limit by 1.5 dB when the transmission bandwidths of at least one of the bands is confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high - 4 MHz and FUL\_high.  NOTE 3: PPowerClass is the maximum UE power specified without taking into account the tolerance  NOTE 4: For inter-band carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).  NOTE 5: Power class 3 is the default power class unless otherwise stated.  NOTE 6: The UE supports PC3 within NR FDD band, and supports either PC3 or PC2 within NR TDD band.  NOTE 7: The UE that supports a PC2 uplink CA configuration with single carrier for each individual band and a composite of supporting PC3 within an NR TDD or FDD band and PC2 within a second NR TDD band may signal a *higherPowerLimit-r17* capability whereby the maximum output power indicated in the table may be exceeded in accordance with sub-clause 6.2A.4.1.3. The power classes referenced are according to the reported *ue-PowerClassPerBandPerBC-r17* if indicated or ue-PowerClass otherwise. | | | | | | | | |

If a UE supports a different power class than the default UE power class for the band combination listed in Table 6.2A.1.3-1 and the supported power class enables the higher maximum output power than that of the default power class:

– if the field of UE capability maxUplinkDutyCycle-interBandCA-PC2 is not absent and the average percentage of uplink symbols transmitted in a certain evaluation period is larger than maxUplinkDutyCycle-interBandCA-PC2 as defined in TS 38.331 (The exact evaluation period is no less than one radio frame); or

– if the IE P-Max as defined in TS 38.331 [7] is provided and set to the maximum output power of the default power class or lower;

– shall apply all requirements for the default power class to the supported power class and set the configured transmitted power as specified in clause 6.2A.4;

– else;

– shall apply all requirements for the supported power class and set the configured transmitted power as specified in clause 6.2A.4 (regardless of the average percentage of uplink symbols if the field of UE capability *maxUplinkDutyCycle-interBandCA-PC2* is absent).

The average percentage of uplink symbols is defined as 50% × ( DutyNR, x /maxDutyNR,x + DutyNR, y /maxDutyNR,y, ). DutyNR, x, DutyNR, y represent the actual percentage of uplink symbols transmitted in the same evaluation period (The exact evaluation period is no less than one radio frame) for NR Band x, NR Band y respectively; maxDutyNR,x,maxDutyNR,y represent the field of UE capability *maxUplinkDutyCycle-PC2-FR1* per band as defined in TS 38.331. For NR Band x or NR Band y,

– if power class of one or both of the bands within the band combination is power class 2 and the corresponding UE capability maxUplinkDutyCycle-PC2-FR1 is absent;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 50%;

– else if the band is configured with power class 3;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 100%.

Table 6.2A.1.3-2 Void

#### 6.2A.1.4 Void

#### 6.2A.1.5 Void

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

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

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in 6.2A.1.1-1 with contiguous RB allocation is specified in Table 6.2A.2.1-1 for UE power class 3 CA bandwidth classes B and C. The MPR with contiguous RB allocation is specified in Table 6.2A.2.1-1a for power class 2 CA bandwidth classes B and C when the signalling is absent for *dualPA-Architecture* IE, and for power class 2 CA bandwidth classe C when the signalling is indicated for *dualPA-Architecture* IE. The MPR with contiguous RB allocation is specified in Table 6.2A.2.1-1b for power class 2 CA bandwidth classes B and C with TxD supported.

In case the modulation format or waveform type is different on different component carriers then the requirement is set by rules applied to the waveform type (DFT-s-OFDM or CP-OFDM) and modulation order used in the configuration with the largest MPR..

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

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

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

Table 6.2A.2.1-1a: Contiguous RB allocation for Power Class 2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation | | MPR for bandwidth class B(dB) | | MPR for bandwidth class C(dB) | |
|  | | inner | Outer1 | inner | outer |
| DFT-s-OFDM | Pi/2 BPSK | 2.0 | 4.01 | 2.5 | 7 |
|  | QPSK | 2.0 | 4.01 | 2.5 | 7 |
|  | 16QAM | 2.5 | 4.01 | 2.5 | 7 |
|  | 64QAM | 3.0 | 4.51 | 5 | 7 |
|  | 256QAM | 5.5 | 6.0 | 7 | 7.5 |
| CP-OFDM | QPSK | 2.5 | 5.01 | 3.5 | 8 |
|  | 16QAM | 3.0 | 5.01 | 3.5 | 8 |
|  | 64QAM | 3.5 | 5.01 | 5 | 8 |
|  | 256QAM | 6.5 | 6.5 | 7 | 8 |
| NOTE 1: When 1 RB or 2 RB are allocated at the lower edge of lowest CC or upper edge of upper CC, MPR for outer is 5.5 dB. | | | | | |

Table 6.2A.2.1-1b: Contiguous RB allocation for Power Class 2 with dual Tx2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation | | MPR for bandwidth class B(dB) | | MPR for bandwidth class C(dB) | |
|  | | inner | Outer1 | inner | outer |
| DFT-s-OFDM | Pi/2 BPSK | 3.0 | 5.01 | 3.5 | 8 |
| QPSK | 3.0 | 5.01 | 3.5 | 8 |
| 16QAM | 3.5 | 5.01 | 3.5 | 8 |
| 64QAM | 4.0 | 5.51 | 6 | 8 |
| 256QAM | 6.5 | 7.0 | 8 | 8.5 |
| CP-OFDM | QPSK | 3.0 | 5.51 | 4.0 | 8.5 |
| 16QAM | 3.5 | 5.51 | 4.0 | 8.5 |
| 64QAM | 4.0 | 5.51 | 5.5 | 8.5 |
| 256QAM | 7.0 | 7.0 | 7.5 | 8.5 |
| NOTE 1: When 1 RB or 2 RB are allocated at the lower edge of lowest CC or upper edge of upper CC, MPR for outer is 5.5 dB.  NOTE 2: UE indicating TxDsupported | | | | | |

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

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

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

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

where

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

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

with

NRB\_alloc= LCRB1 ∙ 2^µ1 + LCRB2 ∙ 2^µ2,

NRB,agg=NRB1∙2^µ1+ NRB2∙2^µ2.

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

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

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

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table Table 6.2A.1.1-1 with non-contiguous RB allocation is specified in Table 6.2A.2.1-2 for UE power class 3 CA bandwidth classes B and C. The MPR with non-contiguous RB allocation is specified in Table 6.2A.2.1-3 for power class 2 CA bandwidth classes B and C when the signalling is absent for *dualPA-Architecture* IE, and for power class 2 CA bandwidth classe C when the signalling is indicated for *dualPA-Architecture* IE. The MPR with non-contiguous RB allocation is specified in Table 6.2A.2.1-4 for power class 2 CA bandwidth classes B and C with TxD supported.

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

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

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation | | MPR for bandwidth class B(dB) | | | MPR for bandwidth class C(dB) | | |
|  | | inner | Outer12 | Outer23 | Inner | Outer12 | Outer23 |
| DFT-s-OFDM | Pi/2 BPSK | 31 | 6.5 | 13 | 31 | 7.5 | 13.5 |
|  | QPSK | 31 | 6.5 |  | 31 | 7.5 |  |
|  | 16QAM | 31 | 6.5 |  | 31 | 7.5 |  |
|  | 64QAM | 5 | 6.5 |  | 5 | 7.5 |  |
|  | 256QAM | 6.5 | 7 |  | 6.5 | 7.5 |  |
| CP-OFDM | QPSK | 3.51 | 7 | 14 | 3.51 | 8 | 14.5 |
|  | 16QAM | 3.51 | 7 |  | 3.51 | 8 |  |
|  | 64QAM | 5 | 7 |  | 5 | 8 |  |
|  | 256QAM | 7.5 | 7.5 |  | 7.5 | 8 |  |
| NOTE 1: the allowed MPR is [4]dB for aggregated allocation bandwidth < [2MHz].  NOTE 2: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz  NOTE 3: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz | | | | | | | |

Table 6.2A.2.1-4: non-contiguous RB allocation for Power Class 2 with dual Tx4

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Modulation | | MPR for bandwidth class B(dB) | | | MPR for bandwidth class C(dB) | | |
|  | | inner | Outer12 | Outer23 | Inner | Outer12 | Outer23 |
| DFT-s-OFDM | Pi/2 BPSK | 41 | 7.5 | 14 | 41 | 8.5 | 14.5 |
|  | QPSK | 41 | 7.5 |  | 41 | 8.5 |  |
|  | 16QAM | 41 | 7.5 |  | 41 | 8.5 |  |
|  | 64QAM | 6 | 7.5 |  | 6 | 8.5 |  |
|  | 256QAM | 7.5 | 8 |  | 7.5 | 8.5 |  |
| CP-OFDM | QPSK | 4.51 | 8 | 15 | 4.51 | 9 | 15.5 |
|  | 16QAM | 4.51 | 8 |  | 4.51 | 9 |  |
|  | 64QAM | 6 | 8 |  | 6 | 9 |  |
|  | 256QAM | 8.5 | 8.5 |  | 8.5 | 9 |  |
| NOTE 1: the allowed MPR is [4]dB for aggregated allocation bandwidth < [2MHz].  NOTE 2: Outer 1 MPR for Pi/2 BPSK and QPSK is reduced by 2dB for aggregated allocation bandwidth > 10MHz  NOTE 3: Outer 2 MPR is reduced by 4.5dB for aggregated allocation bandwidth > 10MHz  NOTE 4: UE indicating TxDsupported | | | | | | | |

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

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

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

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

where

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

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

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

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

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

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

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

where

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

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

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

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

#### 6.2A.2.2 UE maximum output power reduction for Intra-band non-contiguous CA

##### 6.2A.2.2.0 General

For intra-band non-contiguous CA, the allowed Maximum Power Reduction (MPR) for the maximum output power is specified into 2 types: MPR to meet -30dBm/MHz and -13dBm/MHz. The UE determins the MPR type as follows:

For UE indicating *dualPA-Architecture* supported

If OR (LCRB1 = 0, LCRB2 = 0)

MPR defined in Table 6.2.2-1 and Table 6.2.2-2 for PC3 and PC2 UE respectively

Else If AND( FIM3,low\_block,low > SEM-13,low , FIM3,high\_block,high < SEM-13,high )

MPR defined in Clause 6.2A.2.2.2.1 and Clause 6.2A.2.2.2.2 for PC3 and PC2 UE respectively.

Else

MPR defined in Clause 6.2A.2.2.1.1 and Clause 6.2A.2.2.1.2 for PC3 and PC2 UE respectively.

For UE without indicating *dualPA-Architecture* supported

If OR( LCRB1 = 0, LCRB2 = 0 )

For PC3 UE, MPR defined in Table 6.2.2-1, except for B < 9 MHz where 5.5 dB MPR is used;

For PC2 UE without indicating *TxD*, MPR defined in Table 6.2.2-2 is used, except for B < 11.52 MHz where 6.5 dB MPR is used;

For PC2 UE indicating *TxD*, MPR defined in Table 6.2D.2-1 is used, except for B < 11.52 MHz where the maximum value between 6.5 dB and MPR defined in Table 6.2D.2-1 is used.

Else If AND( FIM3,low\_block,low > SEM-13,low , FIM3,high\_block,high < SEM-13,high )

MPR defined in Clause 6.2A.2.2.2.3 and Clause 6.2A.2.2.2.4 for PC3 and PC2 UE respectively.

Else

MPR defined in Clause 6.2A.2.2.1.3 and Clause 6.2A.2.2.1.4 for PC3 and PC2 UE respectively.

where

- LCRB1 is for CC1 which is the component carrier with lower frequency

- LCRB2 is for CC2 which is the component carrier with higher frequency

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

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

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

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

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

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

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

- SEM-13,low = Threshold frequency where lower spectral emission mask below the lower channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.2.2.

- SEM-13,high = Threshold frequency where upper spectral emission mask above the upper channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.2.2.

MPRs in section 6.2A.2.2.1.3, 6.2A.2.2.1.4, 6.2A.2.2.2.3 and 6.2A.2.2.2.4 are applicable only when the Gap between the component carriers is ≤ the overall channel bandwidth summed across all the component carriers and when UE declares *intraBandFreqSeparationUL-v1620* value ≤ 200 MHz.

The definition of the gap is between the component carriers in a spectrum that is not part of any configured component carrier that is located in between the lowest edge of the component carrier with higher center frequency and the highest edge of the component carrier with center frequency that is located lower in frequency.

#### 6.2A.2.2.1 MPR to meet -30dBm/MHz

##### 6.2A.2.2.1.1 PC3 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 3 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 15; 0 ≤ B < 1.08

14.5; 1.08 ≤ B < 2.16

13.5; 2.16 ≤ B < 3.24

12.5; 3.24 ≤ B < 5.04

11.5; 5.04≤ B < 10.08

10.5; 10.08 ≤ B < 16.38

10; 16.38 ≤ B < 21.78

9; 21.78 ≤ B

##### 6.2A.2.2.1.2 PC2 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 15.5; 0 ≤ B < 1.44

15.0; 1.44 ≤ B < 2.88

14.0; 2.88 ≤ B < 5.76

12.0; 5.76 ≤ B < 10.8

10.5; 10.8 ≤ B < 23.04

9.0; 23.04 ≤ B

##### 6.2A.2.2.1.3 PC3 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 3 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 17.5; 0 ≤ B < 1.08

17.0; 1.08 ≤ B < 2.16

16.5; 2.16 ≤ B < 3.24

16; 3.24 ≤ B < 5.04

15; 5.04≤ B < 10.08

14.5; 10.08 ≤ B < 36

10; 36 ≤ B < 56.88

9; 56.88 ≤ B

##### 6.2A.2.2.1.4 PC2 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 19.5; 0 ≤ B < 1.08

19; 1.08 ≤ B < 2.16

18; 2.16 ≤ B < 5.04

16.5; 5.04≤ B < 10.08

16; 10.08 ≤ B < 36

12; 36 ≤ B < 56.88

10.5; 56.88 ≤ B

#### 6.2A.2.2.2 MPR to meet -13dBm/MHz

##### 6.2A.2.2.2.1 PC3 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 3 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA

Where MA is defined as follows

MA = 9 ; 0 ≤ B < 0.54

8 ; 0.54 ≤ B < 1.08

7 ; 1.08 ≤ B < 2.16

6.5 ; 2.16 ≤ B < 3.24

5.5 ; 3.24 ≤ B < 5.4

4 ; 5.4 ≤ B

##### 6.2A.2.2.2.2 PC2 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA

Where MA is defined as follows

MA = 9 ; 0 ≤ B < 0.54

8 ; 0.54 ≤ B < 1.08

7 ; 1.08 ≤ B < 2.16

6.5 ; 2.16 ≤ B < 3.24

6 ; 3.24 ≤ B < 5.4

5.5 ; 5.4 ≤ B ≤ 10.8

4 ; 10.8 < B

##### 6.2A.2.2.2.3 PC3 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 3 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 11; 0 ≤ B < 1.08

10.5; 1.08 ≤ B < 2.16

10; 2.16 ≤ B < 3.24

9.5; 3.24≤ B < 5.04

8.5; 5.04 ≤ B < 10.08

7.5; 10.08 ≤ B < 36

7; 36 ≤ B

##### 6.2A.2.2.2.4 PC2 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MAWhere MA is defined as follows

MA = 14; 0 ≤ B < 1.08

12; 1.08 ≤ B < 2.16

11.5; 2.16 ≤ B < 3.24

11; 3.24≤ B < 5.04

9.5; 5.04 ≤ B < 10.08

8.5; 10.08 ≤ B < 36

6.5; 36 ≤ B

#### 6.2A.2.3 UE maximum output power reduction for Inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the requirements in subclause 6.2.2 apply.

For inter-band carrier aggregation with two uplink contiguous carrier assigned to one NR band, the maximum output power reduction requirements for intra-band contiguous carrier aggregation in subclause 6.2A.2.1 apply for that band.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the maximum output power reduction requirements for intra-band non-contiguous carrier aggregation in subclause 6.2A.2.2 apply for that band.

For inter-band carrier aggregation with uplink assigned to two NR bands, the requirements in clause 6.2.2 apply for each uplink component carrier.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the maximum output power reduction requirements specified in subclause 6.2.2 apply for the NR band supporting one component carrier, and for the NR band supporting two contiguous component carriers the requirements specified in subclause 6.2A.2.1 apply.

#### 6.2A.2.4 Void

### 6.2A.3 UE additional maximum output power reduction for CA

#### 6.2A.3.1 UE additional maximum output power reduction for Intra-band CA

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

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

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2A.1.1-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2A.2.1. In absense of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2A.3.1.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable CA band(s) for each CA\_NS value. The CA\_NS\_xy value indicates the additional unwanted emissions requirements that apply for intra-band contiguous CA bands with NS\_xy indicated or configured in multiple uplink serving cells, except CA\_NS\_01 that indicates the general emission requirements for intra-band contiguous CA bands. The mapping of NR CA band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2A.3.1.1-2. For any NR CA band not listed in Table 6.2A.3.1.1-2 the network signalling label CA\_NS\_01 applies.

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network signalling label | Requirements (clause) | NR CA Band | Aggregated channel bandwidth (MHz) | Resources blocks (*N*RB) | A-MPR (dB) |
| CA\_NS\_01 | 6.5A.2.2.1  6.5A.3.2.1 | Table 5.2A.1-1 | All applicaple NR CA bands | All applicaple NR CA configurations | N/A |
| CA\_NS\_04 | 6.5A.2.3.1.1  6.5A.3.3.1.1 | CA\_n41 | Table 5.5A.1-1 | 6.2A.3.1.1.1 | 6.2A.3.1.1.1 |
| CA\_NS\_27 | 6.5A.2.3.1.2  6.5A.3.3.1.2 | CA\_n48 | Table 5.5A.1-1 | 6.2A.3.1.1.2 | 6.2A.3.1.1.2 |
| CA\_NS\_46 | 6.5A.3.3.1.3 | CA\_n7 | Table 5.5A.1-1 | 6.2A.3.1.1.3 | 6.2A.3.1.1.3 |
| CA\_NS\_55, CA\_NS\_57 | See CA\_NS\_01 | CA\_n77 | Table 5.5A.1-1 | 6.2A.2.1 | See CA\_NS\_01 |

For UEs configured with intra-band contiguous CA in n77 and if NS\_01 is indicated for an uplink component carrier in the range 3450-3650 MHz and NS\_01 or NS\_57 for another uplink component carrier below 3980 MHz and partly or fully confined within the range 3650-3980 MHz, the allowed additional spurious emission and maximum output power reduction requirements are according to CA\_NS\_01.

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA band | Value of additionalSpectrumEmission | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| CA\_n41 | CA\_NS\_01 | CA\_NS\_04 |  |  |  |  |  |  |
| CA\_n48 | CA\_NS\_01 | CA\_NS\_27 |  |  |  |  |  |  |
| CA\_n7 | CA\_NS\_01 | CA\_NS\_46 |  |  |  |  |  |  |
| CA\_n77 | CA\_NS\_01 | CA\_NS\_55 | CA\_NS\_57 |  |  |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

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

6.2A.3.1.1.1.1 Contiguous allocations

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

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

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

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

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

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

Where

- MPR is the MPR as defined in Table 6.2A.2.1-1, Table 6.2A.2.1-1a and Table 6.2A.2.1-1b for PC3 and PC2 respectively and the respective CA bandwidth class

- AMPRcc is defined as the PC3\_A2 or PC2\_A4 AMPR in table 6.2.3.2-2 for PC3 and PC2 respectively.

6.2A.3.1.1.1.2 Non-contiguous allocations

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

The UE determines the AMPR type as follows:

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

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

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

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

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

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

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

Else

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

where

- MPR is the MPR as defined in Table 6.2A.2.1-2, Table 6.2A.2.1-3 and Table 6.2A.2.1-4 for PC3 and PC2 respectively and the respective CA bandwidth class

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

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

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

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

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

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

- Ffilter,low = 2480 MHz

- Ffilter,high = 2745 MHz

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

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

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

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

AMPRIM3=MA, Where MA is defined as follows

MA = 13; 0 ≤ B < 2.16

11.5; 2.16 ≤ B < 3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04 ≤ B < 10.08

8; 10.08 ≤ B < 16.56

7; 16.56 ≤ B < 21.96

6; 21.96 ≤ B

Where:

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

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

6.2A.3.1.1.2 A-MPR for CA\_NS\_27

6.2A.3.1.1.2.1 Contiguous allocations

For all modulations and scs when Fedge, low - BWChannel\_CA ≥ 3540 MHz AND Fedge, high + BWChannel\_CA ≤ 3710 MHz

if allocation is inner 1 then A-MPR = 0 dB where inner 1 is defined as

RBStart,Low = max(1, floor(LCRB/2))

where max() indicates the largest value of all arguments and floor(x) is the greatest integer less than or equal to x.

RBStart,High = NRB\_agg – RBStart,Low – LCRB

with following conditions

RBStart,Low ≤ RBStart ≤ RBStart,High,and

LCRB ≤ ceil(NRB\_agg /2)

Inner 1 region exceptions thresholds are for LCRB < 8 and

RBstart ≤ 30 and RBend ≥ 164 for BWChannel\_CA = 40MHz, and

when 3540 MHz + BWChannel\_CA ≤ Fedge, low < 3530 MHz + 2\*BWChannel\_CA,

RBstart ≤ 25 for BWChannel\_CA = 35MHz, and

RBstart ≤ 19 for BWChannel\_CA = 30MHz, and

RBstart ≤ 14 for BWChannel\_CA = 25MHz, and

RBstart ≤ 9 for BWChannel\_CA = 20MHz, and

RBstart ≤ 3 for BWChannel\_CA = 15MHz, and

when 3720 MHz – 2\*BWChannel\_CA < Fedge, high ≤ 3710 MHz - BWChannel\_CA,

RBend ≥ 144 for BWChannel\_CA = 35MHz, and

RBend ≥ 124 for BWChannel\_CA = 30MHz, and

RBend ≥ 104 for BWChannel\_CA = 25MHz, and

RBend ≥ 80 for BWChannel\_CA = 20MHz, and

RBend ≥ 68 for BWChannel\_CA = 15MHz,

For which AMPR = 5dB.

else A-MPR= 5 dB

For all modulations and scs when 3550 MHz ≤ Fedge, low < 3540 MHz + BWChannel\_CA

if allocation is inner 3 then A-MPR = 0 dB.

Inner 3 region exceptions thresholds are

RBstart ≤ 63 for BWChannel\_CA = 40MHz, and

RBstart ≤ 52 for BWChannel\_CA = 35MHz, and

RBstart ≤ 42 for BWChannel\_CA = 30MHz, and

For which AMPR = 7dB for BWChannel\_CA ≤ 20MHz and 11.5dB for BWChannel\_CA > 20MHz

where inner 3 is defined as

RBStart = NRB\_agg /4

LCRB = NRB\_agg/4

RBStart = NRB\_agg 3/4 − LCRB

with following conditions

NRB\_agg /4 < RBStart < NRB\_agg 3/4 − LCRB AND LCRB < NRB\_agg/4

else when BWagg ≤ 20 MHz, A-MPR = 7 dB or when BWagg > 20 MHz, A-MPR = 11.5dB.

For all modulations and scs when 3710 MHz - BWChannel\_CA < Fedge, high ≤ 3700

if allocation is inner 3 then A-MPR = 0 dB.

Inner 3 region exceptions thresholds are

RBend ≥ 132 for BWChannel\_CA = 40MHz, and

RBend ≥ 121 for BWChannel\_CA = 35MHz, and

RBend ≥ 110 for BWChannel\_CA = 30MHz, and

For which AMPR = 7dB for BWChannel\_CA ≤ 20MHz and 11.5dB for BWChannel\_CA > 20MHz

where inner 3 is defined as

RBStart = NRB\_agg /4

LCRB = NRB\_agg/4

RBStart = NRB\_agg 3/4 − LCRB

with following conditions

NRB\_agg /4 < RBStart < NRB\_agg 3/4 − LCRB AND LCRB < NRB\_agg/4

else when BWagg ≤ 20 MHz, A-MPR = 7 dB or when BWagg > 20 MHz, A-MPR = 11.5dB.

6.2A.3.1.1.2.2 Non-contiguous allocations

For all modulations and scs when Fedge, low - BWChannel\_CA ≥ 3540 MHz AND Fedge, high + BWChannel\_CA ≤ 3710 MHz

A-MPRCA\_IM5=

13; 0 ≤B<1.08

12; 1.08 ≤B<2.16

11; 2.16 ≤B<3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04≤B< 10.08

8; 10.08 ≤B< 16.56

7; 16.56 ≤ B < 21.96

6.5; 21.96 ≤B

For all modulations and scs when 3550 MHz ≤ Fedge, low < 3540 MHz + BWChannel\_CA or 3710 MHz - BWChannel\_CA < Fedge, high ≤ 3700

when BWagg ≤ 20 MHz

A-MPRCA\_IM5=

13; 0 ≤B<1.08

12; 1.08 ≤B<2.16

11; 2.16 ≤B<3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04 ≤B< 10.08

8; 10.08 ≤B< 16.56

7; 16.56 ≤ B < 21.96

6.5; 21.96 ≤B

or when BWagg > 20 MHz

A-MPRCA\_IM3 =

20; 0 ≤B<1.08

19.5; 1.08 ≤B<2.16

19; 2.16 ≤B<3.24

18.5; 3.24 ≤ B < 5.04

18; 5.04 ≤B< 10.08

17; 10.08 ≤B< 16.56

16; 16.56 ≤ B < 21.96

13; 21.96 ≤B.

Where:

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

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

6.2A.3.1.1.3 A-MPR for CA\_NS\_46

6.2A.3.1.1.3.1 Contiguous allocations

[For all modulations and scs when BWChannel\_CA > 25 MHz

IF RBend > NRB\_agg 5/6 with the exception of NRB\_agg 3/4 for BWChannel\_CA = 50MHz OR RBend > 4/3 NRB\_agg - LCRB

THEN A-MPR = 11dB

ELSE IF RBend < NRB\_agg /6 AND LCRB < 5

THEN A-MPR = 5dB

ELSE IF LCRB 3/2< RBend < NRB\_agg 3/4 AND LCRB < NRB\_agg /4

THEN A-MPR = 0 dB,

OTHERWISE A-MPR = [7] dB.

For all modulations and scs when BWChannel\_CA <= 25 MHz and 2595 MHz – 2\*BWChannel\_CA < Fedge,high ≤ 2570 MHz

IF RBend ≥ 4/3 NRB\_agg - LCRB

THEN A-MPR = 6 dB.

OTHERWISE A-MPR = 0 dB.

For all modulations and scs when BWChannel\_CA <= 25 MHz and Fedge\_high <= 2595 MHz – 2\*BWChannel\_CA,

A-MPR = 0 dB.]

6.2A.3.1.1.3.2 Non-contiguous allocations

[For all modulations and scs when BWChannel\_CA > 25 MHz and 2595 MHz - BWChannel\_CA ≤ Fedge\_high ≤ 2570 MHz

A-MPRCA\_IM3 =

20; 0 ≤B<1.08

19.5; 1.08 ≤B<2.16

19; 2.16 ≤B<3.24

18.5; 3.24 ≤ B < 5.04

18; 5.04 ≤B< 10.08

17; 10.08 ≤B< 16.56

16; 16.56 ≤ B < 21.96

13; 21.96 ≤B

For all modulations and scs when BWChannel\_CA > 25 MHz and Fedge\_high < 2595 MHz - BWChannel\_CA

A-MPRCA\_IM5 =

13; 0 ≤B<1.08

12; 1.08 ≤B<2.16

11; 2.16 ≤B<3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04 ≤B< 10.08

8; 10.08 ≤B< 16.56

7.5; 16.56 ≤ B < 21.96

7; 21.96 ≤B

For all modulations and scs when BWChannel\_CA <= 25 MHz and 2595 MHz – 2\*BWChannel\_CA ≤ Fedge\_high ≤ 2570 MHz

A-MPRCA\_IM5 =

13; 0 ≤B<1.08

12; 1.08 ≤B<2.16

11; 2.16 ≤B<3.24

10.5; 3.24 ≤ B < 5.04

9.5; 5.04 ≤B< 10.08

8; 10.08 ≤B< 16.56

7.5; 16.56 ≤ B < 21.96

7; 21.96 ≤B

Where:

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

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

##### 6.2A.3.1.2 UE additional maximum output power reduction for Intra-band non-contiguous CA

6.2A.3.1.2.0 General

Table 6.2A.3.1.2-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable CA band(s) for each CA\_NC\_NS value. The CA\_NC\_NS\_xy value indicates the additional unwanted emissions requirements that apply for intra-band non-contiguous CA bands with NS\_xy indicated or configured in multiple uplink serving cells, except CA\_NC\_NS\_01 that indicates the general emission requirements for intra-band non-contiguous CA bands. The mapping of NR CA band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2A.3.1.2-2. For any NR CA band not listed in Table 6.2A.3.1.2-2 the network signalling label CA\_NC\_NS\_01 applies.

Table 6.2A.3.1.2-1: Additional Maximum Power Reduction (A-MPR) for intra-band non-contiguous CA

|  |  |  |  |
| --- | --- | --- | --- |
| CA Network Signalling value | Requirements (clause) | Uplink CA Configuration | A-MPR for sub-blocks in order of increasing uplink carrier frequency |
| A-MPR [dB]  (clause) |
| CA\_NC\_NS\_01 | 6.5A.2.2.2  6.5A.3.2.2 | All applicaple NR CA configurations | N/A |
| CA\_NC\_NS\_04 | 6.5A.2.3.2.1  6.5A.3.3.2.1 | CA\_n41(2A) | 6.2A.3.1.2.1 |
| CA\_NC\_NS\_55,  CA\_NC\_NS\_57 | See  CA\_NC\_NS\_01 | CA\_n77(2A) | See  CA\_NC\_NS\_01 |

For UEs configured with intra-band non-contiguous CA in n77 and if NS\_01 is indicated for an uplink component carrier in the range 3700-3980 MHz and NS\_01 or NS\_55 for another uplink component carrier in the range 3450-3550 MHz, or if NS\_01 is indicated for an uplink component carrier in the range 3450-3650 MHz and NS\_01 or NS\_57 for another uplink component carrier below 3980 MHz and partly or fully confined within the range 3650-3980 MHz, the allowed additional spurious emission and maximum output power reduction requirements are according to CA\_NC\_NS\_01.

Table 6.2A.3.1.2-2: Mapping of network signaling label

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA band | Value of additionalSpectrumEmission | | | | | | | |
| **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| CA\_n41 | CA\_NC\_NS\_01 | CA\_NC\_NS\_04 |  |  |  |  |  |  |
| CA\_n77 | CA\_NC\_NS\_01 | CA\_NC\_NS\_55 | CA\_NC\_NS\_57 |  |  |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

6.2A.3.1.2.1 AMPR for CA\_NC\_NS\_04 (CA\_n41(2A))

For intra-band non-contiguous CA\_n41(2A) and it receives IE CA\_NC\_NS\_04 for UE indicating *dualPA-Architecture* supported for PC3 and PC2 operation, the UE determines the allowed Additional Maximum Power Reduction (AMPR) for the maximum output power as specified in this clause. The AMPR is specified into 2 types: AMPR to meet -25dBm/MHz and -13dBm/MHz. The A-MPR defined in this clause is used instead of MPR defined in 6.2A.2.2, not additively, so CA MPR=0 when CA\_NC\_NS\_04 is signaled.

The UE determins the AMPR type as follows:

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

- A-MPRIM3 defined in Clause 6.2A.3.1.2.1.2 for PC3 and 6.2A.3.1.2.1.4 for PC2

Else

- A-MPRIM3 defined in Clause 6.2A.3.1.2.1.1 for PC3 and 6.2A.3.1.2.1.3 for PC2

where

- LCRB1 is for CC1 which is the component carrier with lower frequency

- LCRB2 is for CC2 which is the component carrier with higher frequency

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

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

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

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

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

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

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

- Ffilter,low = 2480 MHz

- Ffilter,high = 2745 MHz

- SEM-13,high = Threshold frequency where upper spectral emission mask for upper channel drops from -13 dBm / 1MHz to -25 dBm / 1MHz, as specified in Clause 6.5A.2.3.2.

- SEM-13,low = Threshold frequency where lower spectral emission mask below the lower channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.3.2.

6.2A.3.1.2.1.1 AMPRIM3 to meet -25dBm/MHz for PC3

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 3 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MAWhere MA is defined as follows

MA = 12; 0 ≤ B < 1.08

12; 1.08 ≤ B < 2.16

11; 2.16 ≤ B < 3.24

10; 3.24 ≤ B < 5.04

9; 5.04 ≤ B < 10.08

8; 10.08 ≤ B < 16.38

7; 16.38 ≤ B < 21.78

6; 21.78 ≤ B

6.2A.3.1.2.1.2 AMPRIM3 to meet -13dBm/MHz for PC3

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 3 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MA

Where MA is defined as follows

MA = 9 ; 0 ≤ B < 0.54

8 ; 0.54 ≤ B < 1.08

7 ; 1.08 ≤ B < 2.16

6.5 ; 2.16 ≤ B < 3.24

5.5 ; 3.24 ≤ B < 5.4

4 ; 5.4 ≤ B

6.2A.3.1.2.1.3 AMPRIM3 to meet -25dBm/MHz for PC2

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 2 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MAWhere MA is defined as follows

MA = 14.5; 0 ≤ B < 1.44

14.0; 1.44 ≤ B < 2.88

13.0; 2.88 ≤ B < 5.76

11.0; 5.76 ≤ B < 10.8

9.5; 10.8 ≤ B < 23.04

9.0; 23.04 ≤ B

Where:

B=(LCRB\_alloc, 1\* 12\* SCS1 + LCRB\_alloc,2 \* 12 \* SCS2)/1,000

6.2A.3.1.2.1.4 AMPRIM3 to meet -13dBm/MHz for PC2

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 2 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MA

Where MA is defined as follows

MA = 9 ; 0 ≤ B < 0.54

8 ; 0.54 ≤ B < 1.08

7 ; 1.08 ≤ B < 2.16

6.5 ; 2.16 ≤ B < 3.24

6 ; 3.24 ≤ B < 5.4

5.5 ; 5.4 ≤ B ≤ 10.8

4 ; 10.8 < B

Where:

B=(LCRB\_alloc, 1\* 12\* SCS1 + LCRB\_alloc,2 \* 12 \* SCS2)/1,000

##### 6.2A.3.1.3 UE additional maximum output power reduction for Inter-band CA

Unless otherwise stated, for inter-band carrier aggregation with one uplink carrier assigned to one NR band, the requirements in subclause 6.2.3 apply.

Unless otherwise stated, for inter-band carrier aggregation with two uplink contiguous carrier assigned to one NR band, the additional maximum output power reduction requirements for intra-band contiguous carrier aggregation in subclause 6.2A.3.1.1 apply for that band, for inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the additional maximum output power reduction requirements for intra-band contiguous carrier aggregation in subclause 6.2A.3.1.2 apply for that band.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the additional maximum output power reduction requirements specified in subclause 6.2.3 apply for the NR band supporting one component carrier, and for the NR band supporting two contiguous component carriers the requirements specified in subclause 6.2A.3.1.1apply.

Unless specified in Table 6.2A.3.1.3-1, for inter-band carrier aggregation with uplink assigned to two NR bands, the requirements in clause 6.2.3 apply only to the indicated carrier. The requirements in Table 6.2A.3.1.3-1 are specified in terms of an additional spectrum emission requirement with their associated network signalling values and the allowed A-MPR. Unless otherwise stated, the combined requirements and allowed A-MPR are applicable on both bands when both component carriers are active. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet the additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2.1-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2.2. In case of a power class 3 UE, when IE powerBoostPi2BPSK is set to 1, power class 2 A-MPR values apply.

For almost contiguous allocations in CP-OFDM waveforms in power class 3, the allowed A-MPR defined in clause 6.2.3 is increased by CEIL{ 10 log10(1 + NRB\_gap / NRB\_alloc), 0.5 } dB, where NRB\_gap is the total number of unallocated RBs between allocated RBs and NRB\_alloc is the total number of allocated RBs, and the parameter LCRB is replaced by NRB\_alloc + NRB\_gap in specifying the RB allocation regions.

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

The emission requirements specified in Table 6.2A.3.1.3-1 also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.2A.3.1.3-1: Additional Requirements for uplink inter-band carrier aggregation (two-bands)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| NR CA combination | Band | Applied  NS | Requirements  (clause) | A-MPR  (table/clause) | Note |
| CA\_n1-n3 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 |
| CA\_n1-n8 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| CA\_n1-n18 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 |
| CA\_n1-n28 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1,2 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n28 | 17 | 6.5.3.3.2 | N/A |
| CA\_n1-n40 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| CA\_n1-n41 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |
| CA\_n1-n74 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |
| CA\_n1-n77 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| CA\_n1-n78 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| CA\_n1-n79 | n1 | 05 | 6.5.3.3.4 | Clause 6.2.3.4 | 1 |
| 05U | 6.5.3.3.4, 6.5.2.4.2 | Clause 6.2.3.4 |
| CA\_n3-n8 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| CA\_n3-n18 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 |
| CA\_n3-n28 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1,2 |
| n28 | 17 | 6.5.3.3.2 | N/A |
| CA\_n3-n40 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n3-n41 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |
| CA\_n3-n74 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
|  | n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |  |
| CA\_n3-n77 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n3-n78 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n3-n79 | n3 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n5-n77 | n5 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n5-n78 | n5 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n5-n79 | n5 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n8-n40 | n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 | 1 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| CA\_n8-n41 | n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 | 1 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |
| CA\_n8-n78 | n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 | 1 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| CA\_n8-n79 | n8 | 43 | 6.5.3.3.5 | Clause 6.2.3.6 | 1 |
| 43U | 6.5.3.3.5, 6.5.2.4.2 | Clause 6.2.3.6 |
| CA\_n18-n28 | n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1, 2 |
| n28 | 17 | 6.5.3.3.2 | N/A |
| CA\_n18-n41 | n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n18-n74 | n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |
| CA\_n18-n77 | n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n18-n78 | n18 | 100 | 6.5.2.4.2 | Table 6.2.3.1-2 | 1 |
| CA\_n28-n40 | n28 | 17 | 6.5.3.3.2 | N/A | 2 |
| CA\_n28-n41 | n28 | 17 | 6.5.3.3.2 | N/A | 2 |
| n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |
| CA\_n28-n74 | n28 | 17 | 6.5.3.3.2 | N/A | 2  2 |
| n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |
| CA\_n28-n77 | n28 | 17 | 6.5.3.3.2 | N/A | 2 |
| CA\_n28-n78 | n28 | 17 | 6.5.3.3.2 | N/A | 2 |
| CA\_n28-n79 | n28 | 17 | 6.5.3.3.2 | N/A | 2 |
| CA\_n40-n41 | n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |  |
| CA\_n41-n74 | n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |  |
| n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |
| CA\_n41-n77 | n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |  |
| CA\_n41-n78 | n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |  |
| CA\_n41-n79 | n41 | 47 | 6.5.3.3.15 | Table 6.2.3.18-2 |  |
| CA\_n74-n77 | n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |  |
| CA\_n74-n78 | n74 | 37 | 6.5.3.3.6 | Table 6.2.3.8-1 |  |
| NOTE 1: NS\_05U, NS\_43U and NS\_100 can be signalled for NR bands that have UTRA services deployed and the requirements in clause 6.5.2.4.2 are only applicable to the signalling carrier.  NOTE 2: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | | | |

### 6.2A.4 Configured output power for CA

#### 6.2A.4.1 Configured transmitted power level

##### 6.2A.4.1.1 Configured transmitted power for Intra-band contiguous CA

For uplink carrier aggregation the UE is allowed to set its configured maximum output power PCMAX,*c* for serving cell *c* and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,*c* on serving cell *c* shall be set as specified in clause 6.2.4, but with MPR*c* = MPR and A-MPR*c* = A-MPR with MPR and A-MPR as determined by subclause 6.2A.2 and 6.2A.3, respectively. For PH reporting the following exception applies: if the UE is configured with multiple uplink serving cells, the power PCMAX,*c* used for the purpose of PH reporting on first serving cell *c* = *c*1 does not consider for computation of the PH report transmissions on a second serving cell *c*2 as exempted in subclause 7.7.1 in [8]. There is one power management term for the UE, denoted P-MPR, and P-MPR*c* = P-MPR.

The total configured maximum output power PCMAX shall be set within the following bounds:

PCMAX\_L ≤ PCMAX ≤ PCMAX\_H

For uplink intra-band contiguous carrier aggregation when same slot pattern is used in all aggregated serving cells,

PCMAX\_L  = MIN{10 log10 ∑ pEMAX,c  - TC , PEMAX,CA,(PPowerClass,CA– ΔPPowerClass,CA) – MAX(MAX(MPR, A-MPR) + ΔTIB,c + TC + TRxSRS, P-MPRc ) }

PCMAX\_H  = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA ,PPowerClass,CA– ΔPPowerClass,CA }

where

- pEMAX,c is the linear value of PEMAX,*c* which is given by IE *P-Max* for serving cell *c* in [7];

PPowerClass,CA is the maximum UE power specified in Table 6.2A.1.1-1 without taking into account the tolerance;

- MPR and A-MPR are specified in clause 6.2A.2 and 6.2A.3, respectively;

- ΔPPowerClass,CA = 3 dB for a power class 2 capable UE when 10 log10 ∑ pEMAX,c of 23 dBm or lower is indicated; or when PEMAX,CA of 23dBm or lower is indicated; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 50%; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of total uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.331 (The exact evaluation period is no less than one radio frame); otherwise ΔPPowerClass,CA = 0 dB;

- TIB,c is the additional tolerance for serving cell *c* as specified in clause 6.2A.4.2 for NR CA, clause 6.2C.2 for SUL, or TS 38.101-3 clause 6.2B.4.2 for EN-DC; In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

a) When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ∆TIB,c among the different supported band combinations involving such band shall be applied

b) When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3] for the applicable operating bands.

- P-MPR is the power management term for the UE;

- TC is the highest value TC,c among all serving cells *c*;

- ∆TRxSRS is the highest value among all serving cells *c;*

- PEMAX,CA is the value indicated by *p-NR-FR1* or by *p-UE-FR1* whichever is the smallest if both are present*.*

For uplink intra-band contiguous carrier aggregation, when at least one different numerology/slot pattern is used in aggregated cells, the UE is allowed to set its configured maximum output power PCMAX,c(i),i for serving cell c(i) of slot numerology type *i*, and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,c(i),i (p) in slot p of serving cell c(i) on slot numerology type *i* shall be set within the following bounds:

PCMAX\_L,f,c(i),i (p) ≤ PCMAX,f,c(i), i (p) ≤ PCMAX\_H,f,c(i),i (p)

where PCMAX\_L,f,c (i),i (p) and PCMAX\_H,f,c(i),i (p) are the limits for a serving cell c(i) of slot numerology type i as specified in clause 6.2.4.

The total UE configured maximum output power PCMAX (p,q) in a slot p of slot numerology or symbol pattern *i*, and a slot q of slot numerology or symbol pattern *j* that overlap in time shall be set within the following bounds unless stated otherwise:

PCMAX\_L(p,q) ≤ PCMAX (p,q) ≤ PCMAX\_H (p,q)

When slots p and q have different transmissions lengths and belong to different cells on different or same bands:

PCMAX\_L (p,q) = MIN {10 log10 [pCMAX\_L,f,c(i),i (p) + pCMAX\_L,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

PCMAX\_H (p,q) = MIN {10 log10 [pCMAX\_ H,f,c(i),i (p) + pCMAX\_ H,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

where pCMAX\_L,f,c (i),i and pCMAX\_ H,f,c(i),i are the respective limits PCMAX\_L,f,c (i),i and PCMAX\_H,f,c(i),i expressed in linear scale.

TREF and Teval are specified in Table 6.2A.4.1.1-0 when same and different slot patterns are used in aggregated carriers. For each TREF, the PCMAX\_L is evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L over the one or more Teval is then applied for the entire TREF. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

Table 6.2A.4.1.1-0: PCMAX evaluation window for different slot and channel durations

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| TREF of largest slot duration over both UL CCs | Physical channel length | Min(Tno\_hopping, Physical Channel Length) |

If the UE is configured with multiple TAGs and transmissions of the UE on slot *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on slot *i* +1 for a different serving cell in another TAG, the UE minimum of PCMAX\_L for slots *i* and *i* + 1 applies for any overlapping portion of slots *i* and *i* + 1. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

The measured maximum output power PUMAX over all serving cells with same slot pattern shall be within the following range:

PCMAX\_L – MAX{TL, TLOW(PCMAX\_L) } ≤ PUMAX  ≤ PCMAX\_H + THIGH(PCMAX\_H)

PUMAX = 10 log10 ∑ pUMAX,c

where pUMAX,c denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX are specified in Table 6.2A.4.1.1-1. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.1-1 for intra-band carrier aggregation.

The measured maximum output power PUMAX over all serving cells, when at least one slot has a different transmission numerology or slot pattern, shall be within the following range:

P'CMAX\_L– MAX{TL, TLOW (P'CMAX\_L)} ≤ P'UMAX  ≤ P'CMAX\_H + THIGH (P'CMAX\_H)

P'UMAX = 10 log10 ∑ p'UMAX,c

where p'UMAX,c denotes the average measured maximum output power for serving cell *c* expressed in linear scale over TREF. The tolerances TLOW(P'CMAX) and THIGH(P'CMAX) for applicable values of P'CMAX are specified in Table 6.2A.4.1.1-1 for intra-band carrier aggregation. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.1-1 for inter-band carrier aggregation.

where:

P'CMAX\_L  = MIN{ MIN {10log10∑( pCMAX\_L,f,c(i),i), PPowerClass,CA} over all overlapping slots in TREF}

P'CMAX\_H = MAX{ MIN{10 log10 ∑ pEMAX,c , PPowerClass,CA} over all overlapping slots in TREF}

Table 6.2A.4.1.1-1: PCMAX tolerance for uplink intra-band contiguous CA

|  |  |  |
| --- | --- | --- |
| PCMAX (dBm) | Tolerance TLOW(PCMAX) (dB) | Tolerance THIGH(PCMAX) (dB) |
| 23 < PCMAX ≤ 26 | 3 | 2 |
| 21 ≤ PCMAX ≤ 23 | 2.0 | |
| 20 ≤ PCMAX < 21 | 2.5 | |
| 19 ≤ PCMAX < 20 | 3.5 | |
| 18 ≤ PCMAX < 19 | 4.0 | |
| 13 ≤ PCMAX < 18 | 5.0 | |
| 8 ≤ PCMAX < 13 | 6.0 | |
| -40 ≤ PCMAX < 8 | 7.0 | |

##### 6.2A.4.1.2 Configured transmitted power for Intra-band non-contiguous CA

For uplink carrier aggregation the UE is allowed to set its configured maximum output power PCMAX,*c* for serving cell *c* and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,*c* on serving cell *c* shall be set as specified in subclause 6.2.4.

The configured maximum output power PCMAX,c on serving cell c shall be set as specified in subclause 6.2.4, but with MPRc = MPR and A-MPRc = A-MPR with MPR and A-MPR as determined by subclause 6.2A.2 and 6.2A.3, respectively. For PH reporting the following exception applies: if the UE is configured with multiple uplink serving cells, the power PCMAX,c used for the purpose of PH reporting on first serving cell c = c1 does not consider for computation of the PH report transmissions on a second serving cell c2 as exempted in subclause 7.7.1 in [8]. There is one power management term for the UE, denoted P-MPR, and P-MPR c = P-MPR.

The total configured maximum output power PCMAX shall be set within the following bounds:

PCMAX\_L ≤ PCMAX ≤ PCMAX\_H

For uplink intra-band non-contiguous carrier aggregation when same slot pattern is used in all aggregated serving cells,

PCMAX\_L  = MIN{10 log10 ∑ pEMAX,c  - TC , PEMAX,CA,(PPowerClass,CA– ΔPPowerClass,CA) – MAX(MAX(MPRc, A-MPRc) + ΔTIB,c + TC + DTRxSRS, P-MPR) }

PCMAX\_H  = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA ,PPowerClass,CA– ΔPPowerClass,CA)}

where

- pEMAX,c is the linear value of PEMAX,*c* which is given by IE *P-Max* for serving cell *c* in [7];

- PPowerClass,CA is the maximum UE power specified in Table 6.2A.1.2-1 without taking into account the tolerance;

- MPR and A-MPR are specified in subclause 6.2A.2 and subclause 6.2A.3 respectively;

- ΔPPowerClass,CA = 3 dB for a power class 2 capable UE when 10 log10 ∑ pEMAX,c of 23 dBm or lower is indicated; or when PEMAX,CA of 23dBm or lower is indicated; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 50%; or when the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of total uplink symbols transmitted in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.331 (The exact evaluation period is no less than one radio frame); otherwise ΔPPowerClass,CA = 0 dB;

- TIB,c is the additional tolerance for serving cell *c* as specified in clause 6.2A.4.2 for NR CA, clause 6.2C.2 for SUL, or TS 38.101-3 clause 6.2B.4.2 for EN-DC; In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

a) When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ∆TIB,c among the different supported band combinations involving such band shall be applied

b) When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3] for the applicable operating bands.

- P-MPR is the power management term for the UE;

- TC is the highest value TC,c among all serving cells *c*;

- ∆TRxSRS is the highest value among all serving cells *c;*

- PEMAX,CA is the value indicated by *p-NR-FR1* or by *p-UE-FR1* whichever is the smallest if both are present*.*

[For uplink intra-band non-contiguous carrier aggregation, when at least one different numerology/slot pattern is used in aggregated cells, the UE is allowed to set its configured maximum output power PCMAX,c(i),i for serving cell c(i) of slot numerology type *i*, and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,c(i),i (p) in slot p of serving cell c(i) on slot numerology type *i* shall be set within the following bounds:

PCMAX\_L,f,c(i),i (p) ≤ PCMAX,f,c(i), i (p) ≤ PCMAX\_H,f,c(i),i (p)

where PCMAX\_L,f,c (i),i (p) and PCMAX\_H,f,c(i),i (p) are the limits for a serving cell c(i) of slot numerology type i as specified in subclause 6.2.4.

The total UE configured maximum output power PCMAX (p,q) in a slot p of slot numerology or symbol pattern *i*, and a slot q of slot numerology or symbol pattern *j* that overlap in time shall be set within the following bounds unless stated otherwise:

PCMAX\_L(p,q) ≤ PCMAX (p,q) ≤ PCMAX\_H (p,q)

When slots p and q have different transmissions lengths and belong to different cells on different or same bands:

PCMAX\_L (p,q) = MIN {10 log10 [pCMAX\_L,f,c(i),i (p) + pCMAX\_L,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

PCMAX\_H (p,q) = MIN {10 log10 [pCMAX\_ H,f,c(i),i (p) + pCMAX\_ H,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

where pCMAX\_L,f,c (i),i and pCMAX\_ H,f,c(i),i are the respective limits PCMAX\_L,f,c (i),i and PCMAX\_H,f,c(i),i expressed in linear scale.]

TREF and Teval are specified in Table 6.2A.4.1.2-1 when same and different slot patterns are used in aggregated carriers. For each TREF, the PCMAX\_L is evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L over the one or more Teval is then applied for the entire TREF. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

Table 6.2A.4.1.2-1: PCMAX evaluation window for different slot and channel durations

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| TREF of largest slot duration over both UL CCs | Physical channel length | Min(Tno\_hopping, Physical Channel Length) |

If the UE is configured with multiple TAGs and transmissions of the UE on slot *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on slot *i* +1 for a different serving cell in another TAG, the UE minimum of PCMAX\_L for slots *i* and *i* + 1 applies for any overlapping portion of slots *i* and *i* + 1. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

The measured maximum output power PUMAX over all serving cells with same slot pattern shall be within the following range:

PCMAX\_L – MAX{TL, TLOW(PCMAX\_L) } ≤ PUMAX  ≤ PCMAX\_H + THIGH(PCMAX\_H)

PUMAX = 10 log10 ∑ pUMAX,c

where pUMAX,c denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX are specified in Table 6.2A.4.1.2-2. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.2-1 for intra-band carrier aggregation.

The measured maximum output power PUMAX over all serving cells, when at least one slot has a different transmission numerology or slot pattern, shall be within the following range:

P'CMAX\_L– MAX{TL, TLOW (P'CMAX\_L)} ≤ P'UMAX  ≤ P'CMAX\_H + THIGH (P'CMAX\_H)

P'UMAX = 10 log10 ∑ p'UMAX,c

where p'UMAX,c denotes the average measured maximum output power for serving cell *c* expressed in linear scale over TREF. The tolerances TLOW(P'CMAX) and THIGH(P'CMAX) for applicable values of P'CMAX are specified in Table 6.2A.4.1.2-2 for intra-band carrier aggregation. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.2-2 for intra-band carrier aggregation.

where:

P'CMAX\_L  = MIN{ MIN {10log10∑( pCMAX\_L,f,c(i),i), PPowerClass,CA} over all overlapping slots in TREF}

P'CMAX\_H = MAX{ MIN{10 log10 ∑ pEMAX,c , PPowerClass,CA} over all overlapping slots in TREF}

Table 6.2A.4.1.2-2: PCMAX tolerance for uplink intra-band non-contiguous CA

|  |  |  |
| --- | --- | --- |
| PCMAX (dBm) | Tolerance TLOW(PCMAX) (dB) | Tolerance THIGH(PCMAX) (dB) |
| 21 ≤ PCMAX ≤ 26 | 3.0 | 2.0 |
| 20 ≤ PCMAX < 21 | 2.5 | |
| 19 ≤ PCMAX < 20 | 3.5 | |
| 18 ≤ PCMAX < 19 | 4.0 | |
| 13 ≤ PCMAX < 18 | 5.0 | |
| 8 ≤ PCMAX < 13 | 6.0 | |
| -40 ≤ PCMAX < 8 | 7.0 | |

##### 6.2A.4.1.3 Configured transmitted power for Inter-band CA

For uplink carrier aggregation the UE is allowed to set its configured maximum output power PCMAX,*c* for serving cell *c* and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,*c* on serving cell *c* shall be set as specified in clause 6.2.4, except that the UE power class for serving cell *c* on the specific operating band shall be determined by the *ue-PowerClassPerBandPerBC-r17* IE [7] as indicated for the band combination if signalled.

For uplink inter-band carrier aggregation, MPR*c* and A-MPR*c* apply per serving cell *c* and are specified in clause 6.2.2 and clause 6.2.3, respectively. P-MPR*c* accounts for power management for serving cell *c*. PCMAX,*c* is calculated under the assumption that the transmit power is increased independently on all component carriers.

The total configured maximum output power PCMAX shall be set within the following bounds:

PCMAX\_L ≤ PCMAX ≤ PCMAX\_H

For uplink inter-band carrier aggregation with one serving cell c per operating band when same slot symbol pattern is used in all aggregated serving cells,

PCMAX\_L = MIN {10log10∑ MIN [ pEMAX,c/(tC,c), pPowerClass.c/(MAX(mprc·∆mprc, a-mprc)·tC,c ·tIB,c·tRxSRS,c), pPowerClass,c/pmprc], PEMAX,CA, PPowerClass,CA-ΔPPowerClass, CA}

PCMAX\_H = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA, PPowerClass,CA-ΔPPowerClass, CA}

where

- pEMAX,c is the linear value of PEMAX, *c* which is given by IE *P-Max* for serving cell *c* in [7];

- PPowerClass,CA is the maximum UE power specified in Table 6.2A.1.3-1 without taking into account the tolerance specified in the Table 6.2A.1.3-1; If the UE indicates *higherPowerLimit-r17* for an eligible CA configuration as specified in Table 6.2A.1.3-1 and ΔPPowerClass, CA = 0, PPowerClass,CA is replaced by 10 log10 ∑ pPowerClass,c.

- pPowerClass,c is the linear value of the maximum UE power for serving cell *c* specified in Table 6.2.1-1 according to *ue-PowerClassPerBandPerBC-r17* if indicated or ue-PowerClass otherwise without taking into account the tolerance;

- ΔPPowerClass,CA = 3 dB for a power class 2 capable UE when the requirements of default power class are applied as specified in sub-clause 6.2.A.1.3; otherwise ΔPPowerClass, CA = 0 dB;

- mpr *c* and a-mpr *c* are the linear values of MPR *c* and A-MPR *c* as specified in clause 6.2.2 and clause 6.2.3, respectively;

- ∆mpr *c* is the linear value of ∆MPR *c* as specified in clause 6.2.2;

- pmprc is the linear value of P-MPR*c*;

- ∆tRxSRS,c is the linear value of ∆TRxSRS,c;

- tC,c is the linear value of TC,ctC,c = 1.41 when NOTE 2 in Table 6.2A.1.3-1 applies for a serving cell *c*, otherwise tC,c = 1;

- tIB,c is the linear value of the inter-band relaxation term TIB,c of the serving cell *c* as specified in clause 6.2A.4.2 for NR CA, clause 6.2C.2 for SUL, or TS 38.101-3 clause 6.2B.4.2 for EN-DC; otherwise tIB,c In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

a) When the operating band frequency range is ≤ 1 GHz, the applicable additional TIB,c shall be the average value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ∆TIB,c among the different supported band combinations involving such band shall be applied

b) When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3] for the applicable operating bands.

- PEMAX,CA is the value indicated by *p-NR-FR1* or by *p-UE-FR1* whichever is the smallest if both are present.For uplink inter-band carrier aggregation with one serving cell *c* per operating band when at least one different numerology/slot pattern is used in aggregated cells, the UE is allowed to set its configured maximum output power PCMAX,c(i),i for serving cell c(i) of slot numerology type *i*, and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,c(i),i (p) in slot p of serving cell c(i) on slot numerology type *i* shall be set within the following bounds:

PCMAX\_L,f,c(i),i (p) ≤ PCMAX,f,c(i), i (p) ≤ PCMAX\_H,f,c(i),i (p)

where PCMAX\_L,f,c (i),i (p) and PCMAX\_H,f,c(i),i (p) are the limits for a serving cell c(i) of slot numerology type i as specified in clause 6.2.4, except that the UE power class for the serving cell c(i)on the specific operating band shall be determined by the *ue-PowerClassPerBandPerBC-r17* IE [7] as indicated for the band combination if signalled.

The total UE configured maximum output power PCMAX (p,q) in a slot p of slot numerology or symbol pattern *i*, and a slot q of slot numerology or symbol pattern *j* that overlap in time shall be set within the following bounds unless stated otherwise:

PCMAX\_L(p,q) ≤ PCMAX (p,q) ≤ PCMAX\_H (p,q)

When slots p and q have different transmissions lengths and belong to different cells on different bands:

PCMAX\_L (p,q) = MIN {10 log10 [pCMAX\_L,f,c(i),i (p) + pCMAX\_L,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

PCMAX\_H (p,q) = MIN {10 log10 [pCMAX\_ H,f,c(i),i (p) + pCMAX\_ H,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

where pCMAX\_L,f,c (i),i and pCMAX\_ H,f,c(i),i are the respective limits PCMAX\_L,f,c (i),i and PCMAX\_H,f,c(i),i expressed in linear scale and pPowerClass,c is the linear value of the maximum UE power for serving cell c specified in Table 6.2.1-1 according to *ue-PowerClassPerBandPerBC-r17* if indicated or ue-PowerClass otherwise without taking into account the tolerance; If the UE indicates *higherPowerLimit-r17*, PPowerClass,CA is replaced by 10 log10 ∑ pPowerClass,c.

For combinations of intra-band and inter-band carrier aggregation with UE configured for transmission on three serving cells (up to two contiguously aggregated carriers per operating band), the following apply:

The UE power class for the serving cell(s) on the operating band *Bi* including intra-band carrier aggregation shall be determined by the *ue-PowerClassPerBandPerBC-r17* IE [7] as indicated for the band combination if signalled.

For the case when p and q belong to the same band and k belongs to a different band, but p, q and k are of the same numerology and slot patterns.

PCMAX\_L = MIN {10log10∑( pCMAX\_L, Bi), PEMAX,CA, PPowerClass.CA }

PCMAX\_H = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA, PPowerClass.CA }

Where

- pCMAX\_L, Bi is the linear values of PCMAX\_L specified for the specific operating band *Bi*.

- The linear value of PCMAX\_L specified for uplink intra-band contiguous carrier aggregation in subclause 6.2A.4.1.1 applies for operating band supporting two contiguous serving cells, designated by its band index *Bi*. The linear value of PCMAX\_L specified for single carrier in subclause 6.2.4 applies for operating band *Bj* supporting one serving cell.

For the case when p and q belong to the same band and are of the same numerology *i* and slot patterns (p,q),while k belong to a different band and is of different numerology *j* and/or slot pattern on the 3rd cell then:

PCMAX\_L (p,q,k) = MIN {10 log10 [pCMAX\_L,Bi,i(p,q) + pCMAX\_L,c(3),Bj,j(k)], PEMAX,CA, PPowerClass.CA }

PCMAX\_H (p,q,k) = MIN {10 log10 [pCMAX\_ H,Bi,i (p,q) + pCMAX\_ H,c(3), Bj,j(k)], PEMAX,CA, PPowerClass.CA }

Where

- pEMAX,c is the linear value of PEMAX, *c* which is given by IE *P-Max* for serving cell *c* in [7];

- PEMAX,CA is p-UE-FR1 value signalled by RRC and defined in [38.331];

- PPowerClass.CA is the maximum UE power specified in Table 6.2A.1.3-1 without taking into account the tolerance specified in the Table 6.2A.1.3-1 or Table 6.2F.1A.1-1 for shared spectrum bands;

- pCMAX\_L,c(3),Bj,j(k) and pCMAX\_ H,c(3), Bj,j(k)are the linear values of PCMAX\_L and PCMAX\_H respectively, specified for single carrier in subclause 6.2.4 and applies for operating band supporting one serving cell in the *Bj* band on numerology *j*, using slot pattern k;

- pCMAX\_L,Bi,i(p,q) and pCMAX\_ H,Bi,i (p,q) are the linear values of PCMAX\_L respectively PCMAX\_H for uplink intra-band contiguous carrier aggregation specified in subclause 6.2A.4.1.1 which applies for operating band *Bi* on numerology *i*, supporting two contiguous serving cells, using the same slot pattern (p,q).

TREF and Teval are specified in Table 6.2A.4.1.3-0 when same and different slot patterns are used in aggregated carriers. For each TREF, the PCMAX\_L is evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L over the one or more Teval is then applied for the entire TREF. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

Table 6.2A.4.1.3-0: PCMAX evaluation window for different slot and channel durations

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| TREF of largest slot duration over both UL CCs | Physical channel length | Min(Tno\_hopping, Physical Channel Length) |

If the UE is configured with multiple TAGs and transmissions of the UE on slot *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on slot *i* +1 for a different serving cell in another TAG, the UE minimum of PCMAX\_L for slots *i* and *i* + 1 applies for any overlapping portion of slots *i* and *i* + 1. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

The measured maximum output power PUMAX over all serving cells with same slot pattern shall be within the following range:

PCMAX\_L – MAX{TL, TLOW(PCMAX\_L) } ≤ PUMAX  ≤ PCMAX\_H + THIGH(PCMAX\_H)

PUMAX = 10 log10 ∑ pUMAX,c

where pUMAX,c denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX are specified in Table 6.2A.4.1.3-1. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.3-1-2 for inter-band carrier aggregation.

The measured maximum output power PUMAX over all serving cells, when at least one slot has a different transmission numerology or symbol pattern, shall be within the following range:

P'CMAX\_L– MAX{TL, TLOW (P'CMAX\_L)} ≤ P'UMAX  ≤ P'CMAX\_H + THIGH (P'CMAX\_H)

P'UMAX = 10 log10 ∑ p'UMAX,c

where p'UMAX,c denotes the average measured maximum output power for serving cell *c* expressed in linear scale over TREF. The tolerances TLOW(P'CMAX) and THIGH(P'CMAX) for applicable values of P'CMAX are specified in Table 6.2A.4.1.3-1 for inter-band carrier aggregation. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.3-1 for inter-band carrier aggregation.

where:

P'CMAX\_L  = MIN{ MIN {10log10∑( pCMAX\_L,f,c(i),i), PPowerClass,CA} over all overlapping slots in TREF}

P'CMAX\_H = MAX{ MIN{10 log10 ∑ pEMAX,c , PPowerClass,CA} over all overlapping slots in TREF}

If the UE indicates *higherPowerLimit-r17*, PPowerClass,CA is replaced by 10 log10 ∑ pPowerClass,c

Table 6.2A.4.1.3-1: PCMAX tolerance for uplink inter-band CA (two bands)

|  |  |  |
| --- | --- | --- |
| PCMAX (dBm) | Tolerance TLOW(PCMAX) (dB) | Tolerance THIGH(PCMAX) (dB) |
| 23 ≤ PCMAX ≤ 28 | 3.0 | 2.0 |
| 22 ≤ PCMAX < 23 | 5.0 | 2.0 |
| 21 ≤ PCMAX < 22 | 5.0 | 3.0 |
| 20 ≤ PCMAX < 21 | 6.0 | 4.0 |
| 16 ≤ PCMAX < 20 | 5.0 | |
| 11 ≤ PCMAX < 16 | 6.0 | |
| -40 ≤ PCMAX < 11 | 7.0 | |

##### 6.2A.4.1.4 Void

#### 6.2A.4.2 ΔTIB,c for CA

For the UE which supports inter-band NR CA configuration, ΔTIB,c in tables below applies. Unless otherwise stated, ΔTIB,c is set to zero.

##### 6.2A.4.2.1 Void

##### 6.2A.4.2.2 Void

##### 6.2A.4.2.3 ΔTIB,c for Inter-band CA (two bands)

Table 6.2A.4.2.3-1: ΔTIB,c due to NR CA (two bands)

|  |  |  |
| --- | --- | --- |
| Inter-band CA combination | ΔTIB,c for NR bands (dB)9 | |
| Component band in order of bands in configuration10 | |
| CA\_n1-n3 | 0.3 | 0.3 |
| CA\_n1-n5 | 0.3 | 0.3 |
| CA\_n1-n7 | 0.5 | 0.6 |
| CA\_n1-n8 | 0.3 | 0.3 |
| CA\_n1-n18 | 0.3 | 0.3 |
| CA\_n1-n20 | 0.3 | 0.3 |
| CA\_n1-n26 | 0.3 | 0.3 |
| CA\_n1-n28 | 0.3 | 0.6 |
| CA\_n1-n38 | 0.5 | 0.5 |
| CA\_n1-n40 | 0.5 | 0.5 |
| CA\_n1-n41 | 0.5 | 0.5 |
| CA\_n1-n67 | 0.3 | - |
| CA\_n1-n74 | 0.3 | 0.3 |
| CA\_n1-n75 | 0.3 | - |
| CA\_n1-n77 | 0.6 | 0.8 |
| CA\_n1-n78 | 0.3 | 0.8 |
| CA\_n1-n102 | 0.6 | 0.8 |
| CA\_n1-n105 | 0.3 | 0.6 |
| CA\_n2-n5 | 0.3 | 0.3 |
| CA\_n2-n7 | 0.5 | 0.5 |
| CA\_n2-n12 | 0.3 | 0.3 |
| CA\_n2-n14 | 0.3 | 0.3 |
| CA\_n2-n29 | 0.3 | - |
| CA\_n2-n30 | 0.5 | 0.3 |
| CA\_n2-n41 | 0.5 | 0.45/0.96 |
| CA\_n2-n48 | 0.6 | 0.8 |
| CA\_n2-n66 | 0.5 | 0.5 |
| CA\_n2-n71 | 0.3 | 0.6 |
| CA\_n2-n77 | 0.6 | 0.8 |
| CA\_n2-n78 | 0.6 | 0.8 |
| CA\_n3-n7 | 0.5 | 0.5 |
| CA\_n3-n8 | 0.3 | 0.3 |
| CA\_n3-n18 | 0.3 | 0.3 |
| CA\_n3-n20 | 0.3 | 0.3 |
| CA\_n3-n26 | 0.3 | 0.3 |
| CA\_n3-n28 | 0.3 | 0.3 |
| CA\_n3-n34 | 0.5 | 0.5 |
| CA\_n3-n38 | 0.5 | 0.5 |
| CA\_n3-n40 | 0.5 | 0.5 |
| CA\_n3-n41 | 0.5 | 0.34 / 0.85 |
| CA\_n3-n74 | 0.8 | 0.9 |
| CA\_n3-n77 | 0.6 | 0.8 |
| CA\_n3-n78 | 0.6 | 0.8 |
| CA\_n3-n79 | 0.3 | 0.8 |
| CA\_n3-n102 | 0.3 | 0.8 |
| CA\_n3-n105 | 0.3 | 0.6 |
| CA\_n5-n7 | 0.3 | 0.3 |
| CA\_n5-n12 | 0.8 | 0.4 |
| CA\_n5-n14 | 0.5 | 0.5 |
| CA\_n5-n25 | 0.3 | 0.3 |
| CA\_n5-n28 | 0.5 | 0.5 |
| CA\_n5-n29 | 0.5 | - |
| CA\_n5-n30 | 0.3 | 0.3 |
| CA\_n5-n40 | 0.3 | 0.3 |
| CA\_n5-n41 | 0.6 | 0.3 |
| CA\_n5-n48 | 0.3 | 0.3 |
| CA\_n5-n66 | 0.3 | 0.3 |
| CA\_n5-n71 | 0.5 | 0.5 |
| CA\_n5-n77 | 0.6 | 0.8 |
| CA\_n5-n78 | 0.6 | 0.8 |
| CA\_n7-n8 | 0.3 | 0.6 |
| CA\_n7-n12 | 0.3 | 0.3 |
| CA\_n7-n25 | 0.5 | 0.5 |
| CA\_n7-n26 | 0.3 | 0.3 |
| CA\_n7-n28 | 0.3 | 0.3 |
| CA\_n7-n40 | 0.5 | 0.6 |
| CA\_n7-n46 | 0.3 | - |
| CA\_n7-n66 | 0.5 | 0.5 |
| CA\_n7-n67 | 0.3 | N/A |
| CA\_n7-n71 | 0.6 | 0.3 |
| CA\_n7-n75 | 0.7 | - |
| CA\_n7-n77 | 0.5 | 0.8 |
| CA\_n7-n78 | 0.5 | 0.8 |
| CA\_n7-n79 | 0.5 | 0.8 |
| CA\_n7-n102 | 0.5 | 0.8 |
| CA\_n7-n105 | 0.3 | 0.6 |
| CA\_n8-n20 | 0.4 | 0.4 |
| CA\_n8-n28 | 0.6 | 0.5 |
| CA\_n8-n34 | 0.3 | 0.3 |
| CA\_n8-n38 | 0.6 | 0.3 |
| CA\_n8-n39 | 0.3 | 0.3 |
| CA\_n8-n40 | 0.3 | 0.3 |
| CA\_n8-n41 | 0.6 | 0.3 |
| CA\_n8-n75 | 0.3 | - |
| CA\_n8-n77 | 0.6 | 0.8 |
| CA\_n8-n78 | 0.6 | 0.8 |
| CA\_n8-n79 | 0.3 | 0.8 |
| CA\_n12-n25 | 0.3 | 0.3 |
| CA\_n12-n30 | 0.3 | 0.3 |
| CA\_n12-n41 | 0.3 | 0.3 |
| CA\_n12-n48 | 0.3 | 0.3 |
| CA\_n12-n66 | 0.8 | 0.3 |
| CA\_n12-n71 | 1.0 | 1.0 |
| CA\_n12-n77 | 0.5 | 0.8 |
| CA\_n12-n78 | 0.5 | 0.8 |
| CA\_n13-n25 | 0.3 | 0.3 |
| CA\_n13-n66 | 0.3 | 0.3 |
| CA\_n13-n77 | 0.5 | 0.8 |
| CA\_n14-n30 | 0.3 | 0.3 |
| CA\_n14-n66 | 0.3 | 0.3 |
| CA\_n14-n77 | 0.5 | 0.8 |
| CA\_n18-n28 | 0.5 | 0.5 |
| CA\_n18-n40 | 0.3 | 0.3 |
| CA\_n18-n41 | 0.3 | 0.3 |
| CA\_n18-n74 | 0.3 | 0.3 |
| CA\_n18-n77 | 0.3 | 0.8 |
| CA\_n18-n78 | 0.3 | 0.8 |
| CA\_n20-n28 | 0.5 | 0.5 |
| CA\_n20-n40 | 0.3 | 0.3 |
| CA\_n20-n75 | 0.3 | - |
| CA\_n20-n78 | 0.6 | 0.8 |
| CA\_n20-n67 | 0.5 | - |
| CA\_n24-n41 | 0.3 | 0.46 / 0.97 |
| CA\_n24-n48 | 0.6 | 0.8 |
| CA\_n24-n77 | 0.6 | 0.8 |
| CA\_n25-n29 | 0.3 | - |
| CA\_n25-n38 | 0.5 | 0.5 |
| CA\_n25-n41 | 0.5 | 0.46 / 0.97 |
| CA\_n25-n48 | 0.6 | 0.8 |
| CA\_n25-n66 | 0.5 | 0.5 |
| CA\_n25-n71 | 0.3 | 0.6 |
| CA\_n25-n77 | 0.6 | 0.8 |
| CA\_n25-n85 | 0.3 | 0.6 |
| CA\_n26-n28 | 0.5 | 0.5 |
| CA\_n26-n66 | 0.3 | 0.3 |
| CA\_n26-n70 | 0.3 | 0.3 |
| CA\_n26-n77 | 0.3 | 0.8 |
| CA\_n26-n78 | 0.3 | 0.8 |
| CA\_n28-n34 | 0.3 | 0.3 |
| CA\_n28-n38 | 0.3 | 0.3 |
| CA\_n28-n39 | 0.3 | 0.3 |
| CA\_n28-n40 | 0.3 | 0.3 |
| CA\_n28-n41 | 0.3 | 0.3 |
| CA\_n28-n50 | 0.3 | 0.4 |
| CA\_n28-n71 | 1.1 | 1.1 |
| CA\_n28-n74 | 0.6 | 0.4 |
| CA\_n28-n75 | 0.3 | - |
| CA\_n28-n77 | 0.5 | 0.8 |
| CA\_n28-n78 | 0.5 | 0.8 |
| CA\_n28-n79 | 0.5 | 0.8 |
| CA\_n28-n94 | 0.5 | 0.6 |
| CA\_n28-n102 | 0.5 | 0.8 |
| CA\_n29-n30 | - | 0.3 |
| CA\_n29-n66 | - | 0.3 |
| CA\_n29-n70 | - | 0.3 |
| CA\_n29-n71 | - | 0.5 |
| CA\_n29-n77 | - | 0.8 |
| CA\_n34-n79 | 0.3 | 0.8 |
| CA\_n30-n66 | 0.5 | 0.8 |
| CA\_n30-n77 | 0.3 | 0.8 |
| CA\_n34-n41 | 0.3 | 0.3 |
| CA\_n34-n79 | 0.3 | 0.8 |
| CA\_n38-n40 | 0.53 | 0.53 |
| CA\_n38-n66 | 0.5 | 0.5 |
| CA\_n38-n78 | 0.3 | 0.8 |
| CA\_n38-n79 | 0.3 | 0.8 |
| CA\_n39-n41 | 02 / 0.5 | 02 / 0.5 |
| CA\_n39-n79 | 0.3 | 0.8 |
| CA\_n40-n41 | 0.5 | 0.5 |
| CA\_n40-n77 | - | 0.5 |
| CA\_n40-n78 | - | 0.5 |
| CA\_n40-n79 | 0.3 | 0.8 |
| CA\_n40-n105 | 0.3 | 0.6 |
| CA\_n41-n48 | 0.3 | 0.8 |
| CA\_n41-n50 | 0.3 | 0.4 |
| CA\_n41-n66 | 0.86 / 1.37 | 0.5 |
| CA\_n41-n70 | 0.5 | 0.5 |
| CA\_n41-n71 | 0.3 | 0.6 |
| CA\_n41-n74 | 0.3 | 0.3 |
| CA\_n41-n771 | 0.3 | 0.8 |
| CA\_n41-n781 | 0.3 | 0.8 |
| CA\_n41-n79 | 0.3 | 0.8 |
| CA\_n41-n85 | 0.3 | 0.6 |
| CA\_n46-n48 | - | 0.5 |
| CA\_n46-n77 | - | 0.8 |
| CA\_n46-n78 | - | 0.8 |
| CA\_n46-n96 | - | 0.5 |
| CA\_n48-n53 | 0.53 | 0.33 |
| CA\_n48-n66 | 0.8 | 0.6 |
| CA\_n48-n70 | 0.8 | 0.6 |
| CA\_n48-n71 | 0.3 | 0.3 |
| CA\_n48-n96 | 0.5 | 0.5 |
| CA\_n50-n78 | 02 / 0.53 | 02 / 0.53 |
| CA\_n66-n70 | 0.5 | 0.5 |
| CA\_n66-n71 | 0.3 | 0.3 |
| CA\_n66-n77 | 0.6 | 0.8 |
| CA\_n66-n78 | 0.6 | 0.8 |
| CA\_n66-n85 | 0.3 | 0.3 |
| CA\_n67-n78 | N/A | 0.8 |
| CA\_n70-n71 | 0.3 | 0.6 |
| CA\_n70-n77 | 0.6 | 0.8 |
| CA\_n70-n78 | 0.6 | 0.8 |
| CA\_n71-n77 | 0.5 | 0.8 |
| CA\_n71-n78 | 0.5 | 0.8 |
| CA\_n74-n77 | 0.4 | 0.8 |
| CA\_n74-n78 | 0.4 | 0.8 |
| CA\_n75-n78 | - | 0.8 |
| CA\_n76-n78 | - | 0.8 |
| CA\_n77-n79 | 0.5 | 0.5 |
| CA\_n77-n85 | 0.7 | 0.5 |
| CA\_n77-n102 | 1.5 | 1.5 |
| CA\_n78-n79 | 0.5 / 1.58 | 0.5 / 1.58 |
| CA\_n78-n92 | 0.8 | 0.6 |
| CA\_n78-n102 | 1.5 | 1.5 |
| CA\_n78-n105 | 0.8 | 0.5 |
| NOTE 1: The requirements only apply when the sub-frame and Tx-Rx timings are synchronized between the component carriers. In the absence of synchronization, the requirements are not within scope of these specifications.  NOTE 2: Only applicable for UE supporting inter-band carrier aggregation with uplink in one NR band and without simultaneous Rx/Tx.  NOTE 3: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 5: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz.  NOTE 6: The requirement is applied for UE transmitting on the frequency range of 2545-2690 MHz.  NOTE 7: The requirement is applied for UE transmitting on the frequency range of 2496-2545 MHz.  NOTE 8: The requirements only apply for UE supporting inter-band carrier aggregation with simultaneous Rx/Tx capability, and NR UL carrier frequencies are confined to 3700 MHz-3800MHz for n78 and 4400 MHz-4500MHz for n79. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  NOTE 9: “-” denotes ΔTIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3 the band order from left to right is n1 and n3. | | |

Table 6.2A.4.2.3-2: Void

Table 6.2A.4.2.3-3: Void

##### 6.2A.4.2.4 ΔTIB,c for Inter-band CA (three bands)

Table 6.2A.4.2.4-1: ΔTIB,c due to NR CA (three bands)

|  |  |  |  |
| --- | --- | --- | --- |
| Inter-band CA combination | ΔTIB,c for NR bands (dB)8 | | |
| Component band in order of bands in configuration9 | | |
| CA\_n1-n3-n5 | 0.3 | 0.3 | 0.3 |
| CA\_n1-n3-n7 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n8 | 0.3 | 0.3 | 0.3 |
| CA\_n1-n3-n18 | 0.3 | 0.3 | 0.3 |
| CA\_n1-n3-n20 | 0.3 | 0.3 | 0.3 |
| CA\_n1-n3-n26 | 0.3 | 0.3 | 0.3 |
| CA\_n1-n3-n28 | 0.3 | 0.3 | 0.6 |
| CA\_n1-n3-n38 | 0.5 | 0.5 | 0.3 |
| CA\_n1-n3-n40 | 0.5 | 0.5 | 0.5 |
| CA\_n1-n3-n41 | 0.5 | 0.5 | 0.35 / 0.86 |
| CA\_n1-n3-n75 | 0.3 | 0.3 | - |
| CA\_n1-n3-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n79 | 0.3 | 0.3 | 0.8 |
| CA\_n1-n3-n105 | 0.3 | 0.3 | 0.6 |
| CA\_n1-n5-n7 | 0.5 | 0.3 | 0.6 |
| CA\_n1-n5-n28 | 0.3 | 0.6 | 0.6 |
| CA\_n1-n5-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n8 | 0.5 | 0.6 | 0.6 |
| CA\_n1-n7-n26 | 0.5 | 0.6 | 0.3 |
| CA\_n1-n7-n28 | 0.5 | 0.6 | 0.6 |
| CA\_n1-n7-n38 | 0.5 | - | - |
| CA\_n1-n7-n40 | 0.6 | 0.8 | 0.9 |
| CA\_n1-n7-n67 | 0.5 | 0.5 | - |
| CA\_n1-n7-n75 | 0.5 | 0.6 | - |
| CA\_n1-n7-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n79 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n8-n28 | 0.3 | 0.6 | 0.6 |
| CA\_n1-n8-n40 | 0.3 | 0.3 | 0.5 |
| CA\_n1-n8-n77 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n8-n78 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n8-n79 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n18-n28 | 0.3 | 0.5 | 0.5 |
| CA\_n1-n18-n41 | 0.5 | 0.3 | 0.5 |
| CA\_n1-n18-n77 | 0.3 | 0.3 | 0.8 |
| CA\_n1-n20-n67 | 0.5 | 0.6 | 0.8 |
| CA\_n1-n20-n78 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n26-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n28-n38 | 0.5 | 0.6 | 0.5 |
| CA\_n1-n28-n40 | 0.6 | 0.3 | 0.5 |
| CA\_n1-n28-n41 | 0.5 | 0.6 | 0.6 |
| CA\_n1-n28-n46 | 0.3 | 0.6 | - |
| CA\_n1-n28-n75 | 0.3 | 0.6 | - |
| CA\_n1-n28-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n28-n78 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n28-n79 | - | 0.2 | 0.5 |
| CA\_n1-n28-n102 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n38-n78 | 0.5 | 0.5 | 0.8 |
| CA\_n1-n40-n77 | 0.3 | 0.5 | 0.8 |
| CA\_n1-n40-n78 | 0.3 | 0.5 | 0.8 |
| CA\_n1-n40-n105 | 0.5 | 0.5 | 0.6 |
| CA\_n1-n41-n77 | 0.5 | 0.5 | 0.8 |
| CA\_n1-n41-n79 | 0.5 | 0.5 | 0.8 |
| CA\_n1-n46-n78 | 0.3 | - | 0.8 |
| CA\_n1-n67-n78 | 0.3 | - | 0.8 |
| CA\_n1-n75-n78 | 0.3 | - | 0.8 |
| CA\_n1-n77-n79 | 0.6 | 0.8 | 0.5 |
| CA\_n1-n78-n79 | 0.3 | 0.8 / 1.57 | 0.5 / 1.57 |
| CA\_n1-n78-n102 | 0.6 | 1.5 | 1.5 |
| CA\_n1-n78-n105 | 0.3 | 0.8 | 0.6 |
| CA\_n2-n5-n30 | 0.5 | 0.3 | 0.3 |
| CA\_n2-n5-n41 | 0.5 | 0.6 | 0.45 / 0.96 |
| CA\_n2-n5-n48 | 0.6 | 0.3 | 0.8 |
| CA\_n2-n5-n66 | 0.5 | 0.3 | 0.5 |
| CA\_n2-n5-n77 | 0.6 | 0.8 | 0.8 |
| CA\_n2-n7-n12 | 0.5 | 0.5 | 0.3 |
| CA\_n2-n7-n71 | 0.5 | 0.5 | 0.6 |
| CA\_n2-n12-n30 | 0.5 | 0.3 | 0.3 |
| CA\_n2-n12-n41 | 0.5 | 0.3 | 0.45 / 0.96 |
| CA\_n2-n12-n66 | 0.5 | 0.8 | 0.5 |
| CA\_n2-n12-n77 | 0.6 | 0.3 | 0.8 |
| CA\_n2-n14-n30 | 0.5 | 0.3 | 0.5 |
| CA\_n2-n14-n66 | 0.5 | 0.3 | 0.5 |
| CA\_n2-n14-n77 | 0.5 | 0.3 | 0.8 |
| CA\_n2-n29-n30 | 0.5 | - | 0.3 |
| CA\_n2-n29-n66 | 0.5 | - | 0.5 |
| CA\_n2-n29-n77 | 0.6 | - | 0.8 |
| CA\_n2-n30-n66 | 0.5 | 0.3 | 0.5 |
| CA\_n2-n30-n77 | 0.6 | 0.3 | 0.8 |
| CA\_n2-n48-n66 | 0.6 | 0.8 | 0.6 |
| CA\_n2-n48-n77 | 0.6 | 0.8 | 0.8 |
| CA\_n2-n66-n71 | 0.5 | 0.5 | 0.3 |
| CA\_n2-n66-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n2-n66-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n2-n71-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n5-n7 | 0.5 | 0.3 | 0.5 |
| CA\_n3-n5-n28 | 0.3 | 0.6 | 0.5 |
| CA\_n3-n5-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n7-n8 | 0.5 | 0.5 | 0.6 |
| CA\_n3-n7-n26 | 0.5 | 0.5 | 0.3 |
| CA\_n3-n7-n28 | 0.5 | 0.5 | 0.3 |
| CA\_n3-n7-n38 | 0.5 | - | - |
| CA\_n3-n7-n67 | 0.5 | 0.5 | - |
| CA\_n3-n7-n75 | 0.7 | 0.7 | - |
| CA\_n3-n7-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n7-n79 | 0.5 | 0.5 | 0.8 |
| CA\_n3-n8-n28 | 0.3 | 0.6 | 0.5 |
| CA\_n3-n8-n41 | 0.5 | 0.3 | 0.31 / 0.82 |
| CA\_n3-n8-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n8-n79 | 0.3 | 0.3 | 0.5 |
| CA\_n3-n8-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n18-n28 | 0.3 | 0.5 | 0.3 |
| CA\_n3-n18-n41 | 0.5 | 0.3 | 0.31 / 0.82 |
| CA\_n3-n18-n77 | 0.6 | 0.3 | 0.8 |
| CA\_n3-n20-n28 | 0.3 | 0.5 | 0.5 |
| CA\_n3-n20-n67 | 0.3 | 0.5 | 0.5 |
| CA\_n3-n20-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n26-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n28-n38 | 0.5 | 0.5 | 0.3 |
| CA\_n3-n28-n40 | 0.5 | 0.3 | 0.5 |
| CA\_n3-n28-n41 | 0.5 | 0.3 | 0.31 / 0.82 |
| CA\_n3-n28-n77 | 0.6 | 0.5 | 0.8 |
| CA\_n3-n28-n78 | 0.5 | 0.3 | 0.8 |
| CA\_n3-n28-n79 | 0.3 | 0.5 | 0.8 |
| CA\_n3-n38-n40 | 0.5 | 0.51,3 | 0.5 |
| CA\_n3-n40-n105 | 0.5 | 0.5 | 0.6 |
| CA\_n3-n67-n78 | 0.5 | - | 0.8 |
| CA\_n3-n75-n78 | 0.6 | - | 0.8 |
| CA\_n3-n77-n79 | 0.6 | 0.8 | - |
| CA\_n3-n78-n79 | 0.6 | 0.8 | 0.8 |
| CA\_n3-n78-n105 | 0.6 | 0.8 | 0.6 |
| CA\_n3-n40-n41 | 0.5 | 0.5 | 0.51,3 / 0.82,3 |
| CA\_n3-n40-n77 | 0.6 | 0.5 | 0.8 |
| CA\_n3-n41-n77 | 0.6 | 0.31 / 0.82 | 0.8 |
| CA\_n3-n41-n78 | 0.6 | 0.31 / 0.82 | 0.8 |
| CA\_n3-n41-n79 | 0.3 | 0.31 / 0.82 | 0.8 |
| CA\_n5-n7-n28 | 0.5 | 0.3 | 0.6 |
| CA\_n5-n7-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n7-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n12-n77 | 0.8 | 0.4 | 0.5 |
| CA\_n5-n14-n77 | 0.5 | 0.3 | 0.8 |
| CA\_n5-n25-n66 | 0.3 | 0.5 | 0.5 |
| CA\_n5-n25-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n25-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n29-n77 | 0.8 | - | 0.5 |
| CA\_n5-n30-n66 | 0.3 | 0.3 | 0.5 |
| CA\_n5-n30-n77 | 0.6 | 0.3 | 0.8 |
| CA\_n5-n40-n78 | 0.6 | 0.5 | 0.8 |
| CA\_n5-n41-n66 | 0.6 | 0.85 / 1.36 | 0.5 |
| CA\_n5-n48-n66 | 0.3 | 0.8 | 0.6 |
| CA\_n5-n48-n77 | 0.6 | 0.8 | 0.8 |
| CA\_n5-n66-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n5\_n66-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n7-n8-n28 | 0.3 | 0.6 | 0.5 |
| CA\_n7-n8-n40 | 0.5 | 0.6 | 0.6 |
| CA\_n7-n8-n78 | 0.5 | 0.6 | 0.8 |
| CA\_n7-n12-n25 | 0.5 | 0.3 | 0.5 |
| CA\_n7-n12-n66 | 0.5 | 0.3 | 0.5 |
| CA\_n7-n12-n77 | 0.5 | 0.5 | 0.8 |
| CA\_n7\_n25-n66 | 0.5 | 0.5 | 0.5 |
| CA\_n7-n25-n71 | 0.5 | 0.5 | 0.3 |
| CA\_n7-n25-n77 | 0.5 | 0.6 | 0.8 |
| CA\_n7-n25-n78 | 0.5 | 0.6 | 0.8 |
| CA\_n7-n26-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n7-n28-n38 | 0.3 | 0.3 | 0.3 |
| CA\_n7\_n28-n78 | 0.3 | 0.3 | 0.8 |
| CA\_n7-n46-n78 | 0.5 | - | 0.8 |
| CA\_n7-n66-n71 | 0.5 | 0.5 | 0.5 |
| CA\_n7-n66-n77 | 0.5 | 0.6 | 0.8 |
| CA\_n7\_n66-n78 | 0.5 | 0.6 | 0.8 |
| CA\_n7-n67-n78 | 0.5 | - | 0.8 |
| CA\_n7-n71-n77 | 0.3 | 0.5 | 0.8 |
| CA\_n7-n75-n78 | 0.7 | - | 0.8 |
| CA\_n7-n78-n102 | 0.5 | 1.5 | 1.5 |
| CA\_n8-n20-n75 | 0.4 | 0.4 | - |
| CA\_n8-n28-n75 | 0.6 | 0.5 | - |
| CA\_n8-n28-n78 | 0.6 | 0.5 | 0.8 |
| CA\_n8-n38-n40 | 0.3 | 0.3 | 0.3 |
| CA\_n8-n39-n41 | 0.6 | 0.54 | 0.54 |
| CA\_n8-n39-n79 | 0.3 | 0.3 | - |
| CA\_n8-n40-n41 | 0.3 | 0.33 | 0.33 |
| CA\_n8-n40-n78 | 0.6 | 0.3 | 0.8 |
| CA\_n8-n41-n79 | 0.6 | 0.3 | 0.8 |
| CA\_n8-n78-n79 | 0.6 | 0.8 | 0.8 |
| CA\_n12-n25-n41 | 0.3 | 0.5 | 0.45 / 0.96 |
| CA\_n12-n30-n66 | 0.8 | 0.3 | 0.5 |
| CA\_n12-n30-n77 | 0.5 | 0.3 | 0.5 |
| CA\_n12-n41-n66 | 0.5 | 0.5 | 0.5 |
| CA\_n12-n41-n77 | 0.5 | 0.5 | 0.8 |
| CA\_n12-n66-n77 | 0.8 | 0.6 | 0.8 |
| CA\_n13-n25-n66 | 0.3 | 0.5 | 0.5 |
| CA\_n13-n25-n77 | 0.3 | 0.6 | 0.8 |
| CA\_n13-n66-n77 | 0.5 | 0.6 | 0.8 |
| CA\_n14-n30-n66 | 0.3 | 0.3 | 0.5 |
| CA\_n14-n30-n77 | 0.5 | 0.3 | 0.8 |
| CA\_n14-n66-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n18-n28-n41 | 0.4 | 0.4 | 0.3 |
| CA\_n18-n28-n77 | 0.5 | 0.5 | 0.8 |
| CA\_n18-n41-n77 | 0.3 | 0.3 | 0.8 |
| CA\_n20-n28-n75 | 0.5 | 0.5 | - |
| CA\_n20-n28-n78 | 0.6 | 0.5 | 0.8 |
| CA\_n24-n41-n48 | 0.6 | 0.41 / 0.92 | 0.8 |
| CA\_n24-n41-n77 | 0.6 | 0.45 / 0.96 | 0.8 |
| CA\_n24-n48-n77 | 0.6 | 0.8 | 0.8 |
| CA\_n25-n29-n66 | 0.5 | - | 0.5 |
| CA\_n25-n38-n78 | 0.5 | 0.4 | 0.8 |
| CA\_n25-n41-n66 | 0.5 | 0.85 / 1.36 | 0.5 |
| CA\_n25-n41-n71 | 0.5 | 0.5 | 0.6 |
| CA\_n25-n41-n77 | 0.5 | 0.5 | 0.6 |
| CA\_n25-n41-n78 | 0.6 | 0.5 | 0.8 |
| CA\_n25-n41-n85 | 0.5 | 0.5 | 0.3 |
| CA\_n25-n48-n66 | 0.6 | 0.8 | 0.6 |
| CA\_n25-n66-n71 | 0.5 | 0.5 | 0.6 |
| CA\_n25-n66-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n25-n66-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n25-n66-n85 | 0.5 | 0.5 | 0.8 |
| CA\_n25-n71-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n25-n71-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n25-n77-n85 | 0.6 | 0.8 | 0.3 |
| CA\_n26-n66-n70 | 0.3 | 0.5 | 0.5 |
| CA\_n28-n38-n78 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n39-n40 | 0.3 | 0.3 | 0.3 |
| CA\_n28-n39-n41 | 0.3 | 0.5 | 0.5 |
| CA\_n28-n39-n79 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n40-n41 | 0.3 | 0.5 | 0.5 |
| CA\_n28-n40-n77 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n40-n78 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n40-n79 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n41-n79 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n41-n77 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n41-n78 | 0.5 | 0.3 | 0.8 |
| CA\_n28-n46-n78 | 0.5 | - | 0.8 |
| CA\_n28-n75-n78 | 0.3 | - | 0.8 |
| CA\_n28-n77-n79 | 0.5 | 0.8 | 0.5 |
| CA\_n28-n78-n79 | 0.5 | 0.8 / 1.57 | 0.5 / 1.57 |
| CA\_n28-n78-n102 | 0.5 | 1.5 | 1.5 |
| CA\_n29-n30-n66 | - | 0.3 | 0.5 |
| CA\_n29-n30-n77 | - | 0.3 | 0.5 |
| CA\_n29-n66-n70 | - | 0.5 | 0.5 |
| CA\_n29-n66-n77 | - | 0.6 | 0.8 |
| CA\_n29-n70-n71 | - | 0.3 | 0.6 |
| CA\_n30-n66-n77 | 0.3 | 0.6 | 0.8 |
| CA\_n38-n66-n78 | 0.5 | 0.5 | 0.8 |
| CA\_n39-n40-n41 | 0.3 | 0.3 | 0.3 |
| CA\_n39-n40-n79 | 0.3 | - | 0.8 |
| CA\_n39-n41-n79 | 0.3 | 0.34 | 0.84 |
| CA\_n40-n41-n79 | 0.53 | 0.53 | 0.8 |
| CA\_n40-n78-n105 | 0.3 | 0.8 | 0.5 |
| CA\_n41-n66-n71 | 0.8 / 1.36 | 0.5 | 0.3 |
| CA\_n41-n66-n77 | 0.5 | 0.6 | 0.8 |
| CA\_n41-n66-n78 | 0.5 | 0.6 | 0.8 |
| CA\_n41-n66-n85 | 0.81 / 1.32 | 0.5 | 0.6 |
| CA\_n41-n70-n78 | 0.6 | 0.6 | 0.8 |
| CA\_n41-n71-n77 | 0.3 | 0.5 | 0.8 |
| CA\_n41-n71-n78 | 0.3 | 0.5 | 0.8 |
| CA\_n41-n77-n79 | 0.3 | 0.8 | 0.8 |
| CA\_n41-n77-n85 | 0.6 | 0.8 | 0.8 |
| CA\_n46-n48-n96 | 0.5 | 0.8 | 0.6 |
| CA\_n48-n66-n70 | 0.8 | 0.6 | 0.6 |
| CA\_n48-n66-n71 | 0.5 | 0.5 | 0.3 |
| CA\_n48-n66-n77 | 0.8 | 0.6 | 0.8 |
| CA\_n48-n70-n71 | 0.5 | 0.5 | 0.3 |
| CA\_n48-n70-n77 | 0.8 | 0.6 | 0.8 |
| CA\_n48-n71-n77 | 0.8 | 0.6 | 0.8 |
| CA\_n66-n70-n71 | 0.5 | 0.5 | 0.6 |
| CA\_n66-n70-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n66-n71-n77 | 0.6 | 0.6 | 0.8 |
| CA\_n66-n71-n78 | 0.6 | 0.5 | 0.8 |
| CA\_n66-n77-n85 | 0.6 | 0.8 | 0.8 |
| CA\_n70-n71-n77 | 0.6 | 0.3 | 0.8 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690 MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515 MHz.  NOTE 3: Only applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx among band 40 and 41.  NOTE 4: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx between n39 and n41.  NOTE 5: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz.  NOTE 6: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz.  NOTE 7: The requirements only apply for UE supporting inter-band carrier aggregation with simultaneous Rx/Tx capability, and NR UL carrier frequencies are confined to 3700 MHz-3800MHz for n78 and 4400 MHz-4500MHz for n79. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation.  NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

##### 6.2A.4.2.5 ΔTIB,c for Inter-band CA (four bands)

Table 6.2A.4.2.5-1: ΔTIB,c due to NR CA (four bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Inter-band CA combination | ΔTIB,c for NR bands (dB)5 | | | |
| Component band in order of bands in configuration6 | | | |
| CA\_n1-n3-n5-n7 | 0.6 | 0.6 | 0.3 | - |
| CA\_n1-n3-n5-n78 | 0.6 | 0.6 | 0.3 | 0.8 |
| CA\_n1-n3-n7-n8 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n7-n26 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n7-n28 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n7-n38 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n7-n67 | 0.6 | 0.6 | 0.6 | - |
| CA\_n1-n3-n7-n78 | 0.7 | 0.7 | 0.7 | 0.8 |
| CA\_n1-n3-n7-n79 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n8-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n8-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n18-n28 | 0.3 | 0.3 | 0.5 | 0.5 |
| CA\_n1-n3-n18-n41 | 0.5 | 0.5 | 0.3 | 0.33 / 0.84 |
| CA\_n1-n3-n18-n77 | 0.6 | 0.6 | 0.3 | 0.8 |
| CA\_n1-n3-n26-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n28-n38 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n28-n41 | 0.5 | 0.5 | 0.5 | 0.33 / 0.84 |
| CA\_n1-n3-n28-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n28-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n28-n79 | 0.3 | 0.3 | 0.6 | 0.8 |
| CA\_n1-n3-n40-n77 | 0.7 | 0.7 | 0.7 | 0.8 |
| CA\_n1-n3-n41-n77 | 0.6 | 0.6 | 0.33 / 0.84 | 0.8 |
| CA\_n1-n3-n41-n79 | 0.5 | 0.5 | 0.53 / 0.84 | 0.8 |
| CA\_n1-n3-n67-n78 | 0.6 | 0.6 | - | 0.8 |
| CA\_n1-n3-n77-n79 | 0.6 | 0.6 | 0.8 | 0.8 |
| CA\_n1-n5-n7-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n8-n40 | 0.6 | 0.8 | 0.6 | 0.9 |
| CA\_n1-n7-n8-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n26-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n28-n38 | 0.5 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n7-n28-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n7-n40-n78 | 0.6 | 0.5 | 0.5 | 0.8 |
| CA\_n1-n7-n67-n78 | 0.6 | 0.6 | - | 0.8 |
| CA\_n1-n8-n40-n78 | 0.5 | 0.3 | 0.5 | 0.8 |
| CA\_n1-n8-n78-n79 | 0.3 | 0.6 | 0.8 | 0.5 |
| CA\_n1-n18-n28-n41 | 0.6 | 0.5 | 0.6 | 0.5 |
| CA\_n1-n18-n28-n77 | 0.6 | 0.5 | 0.6 | 0.8 |
| CA\_n1-n18-n41-n77 | 0.5 | 0.5 | 0.5 | 0.8 |
| CA\_n1-n28-n38-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n28-n40-n77 | 0.3 | 0.6 | 0.5 | 0.8 |
| CA\_n1-n28-n40-n78 | 0.3 | 0.6 | 0.5 | 0.8 |
| CA\_n1-n28-n41-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n28-n41-n79 | 0.5 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n28-n77-n79 | 0.6 | 0.6 | 0.8 | 0.8 |
| CA\_n1-n41-n77-n79 | 0.6 | 0.5 | 0.8 | 0.8 |
| CA\_n2-n5-n30-n66 | 0.5 | 0.3 | 0.3 | 0.5 |
| CA\_n2-n5-n30-n77 | 0.6 | 0.6 | 0.3 | 0.8 |
| CA\_n2-n5-n48-n66 | 0.6 | 0.3 | 0.8 | 0.6 |
| CA\_n2-n5-n48-n77 | 0.6 | 0.3 | 0.8 | 0.8 |
| CA\_n2-n5-n66-n77 | 0.5 | 0.3 | 0.5 | 0.8 |
| CA\_n2-n12-n30-n66 | 0.5 | 0.8 | 0.3 | 0.5 |
| CA\_n2-n12-n30-n77 | 0.6 | 0.5 | 0.3 | 0.8 |
| CA\_n2-n12-n66-n77 | 0.6 | 0.8 | 0.6 | 0.8 |
| CA\_n2-n14-n30-n66 | 0.5 | 0.3 | 0.3 | 0.5 |
| CA\_n2-n14-n30-n77 | 0.6 | 0.5 | 0.3 | 0.8 |
| CA\_n2-n14-n66-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n2-n29-n30-n66 | 0.5 | - | 0.3 | 0.5 |
| CA\_n2-n29-n30-n77 | 0.6 | - | 0.3 | 0.8 |
| CA\_n2-n29-n66-n77 | 0.6 | - | 0.6 | 0.8 |
| CA\_n2-n30-n66-n77 | 0.6 | 0.3 | 0.6 | 0.8 |
| CA\_n2-n48-n66-n77 | 0.6 | 0.8 | 0.6 | 0.8 |
| CA\_n2-n66-n71-n78 | 0.5 | 0.5 | 0.3 | 0.5 |
| CA\_n3-n5-n7-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n7-n8-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n7-n26-n78 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n3-n7-n28-n38 | 0.5 | 0.5 | 0.3 | 0.5 |
| CA\_n3-n7-n28-n78 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n3-n7-n67-n78 | 0.6 | 0.6 | - | 0.6 |
| CA\_n3-n18-n28-n41 | 0.5 | 0.4 | 0.4 | 0.33 / 0.84 |
| CA\_n3-n18-n28-n77 | 0.6 | 0.5 | 0.5 | 0.8 |
| CA\_n3-n18-n41-n77 | 0.6 | 0.4 | 0.33 / 0.84 | 0.8 |
| CA\_n3-n28-n40-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n3-n28-n41-n77 | 1 | 0.5 | 0.31 / 0.82 | 0.8 |
| CA\_n3-n28-n41-n78 | 1 | 0.5 | 0.31 / 0.82 | 0.8 |
| CA\_n3-n28-n41-n79 | 0.5 | 0.5 | 0.31 / 0.82 | 0.8 |
| CA\_n3-n28-n77-n79 | 0.6 | 0.5 | 0.8 | 0.8 |
| CA\_n3-n41-n77-n79 | 0.6 | 0.31 / 0.82 | 0.8 | 0.8 |
| CA\_n5-n25-n66-n77 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n25-n66-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n5-n30-n66-n77 | 0.6 | 0.3 | 0.6 | 0.8 |
| CA\_n5-n48-n66-n77 | 0.6 | 0.8 | 0.6 | 0.8 |
| CA\_n7-n8-n40-n78 | 0.5 | 0.3 | 0.5 | 0.8 |
| CA\_n7-n25-n66-n77 | 0.5 | 0.6 | 0.6 | 0.8 |
| CA\_n7-n25-n66-n78 | 0.5 | 0.6 | 0.6 | 0.8 |
| CA\_n12-n30-n66-n77 | 0.8 | 0.3 | 0.6 | 0.8 |
| CA\_n13-n25-n66-n77 | 0.5 | 0.6 | 0.6 | 0.8 |
| CA\_n14-n30-n66-n77 | 0.6 | 0.3 | 0.6 | 0.8 |
| CA\_n18-n28-n41-n77 | 0.5 | 0.5 | 0.33 / 0.84 | 0.8 |
| CA\_n25-n38-n66-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n25-n41-n66-n71 | 0.5 | 0.5 | 0.5 | 0.3 |
| CA\_n25-n41-n66-n77 | 0.5 | 0.83 / 1.34 | 0.5 | 0.8 |
| CA\_n25-n41-n66-n78 | 0.5 | 0.83 / 1.34 | 0.5 | 0.8 |
| CA\_n25-n41-n71-n77 | 0.5 | 0.5 | 0.6 | 0.8 |
| CA\_n25-n41-n71-n78 | 0.5 | 0.5 | 0.6 | 0.8 |
| CA\_n25-n66-n71-n77 | 0.5 | 0.5 | 0.6 | 0.8 |
| CA\_n25-n66-n71-n78 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n28-n41-n77-n79 | 0.5 | 0.3 | 0.8 | 0.8 |
| CA\_n29-n30-n66-n77 | - | 0.3 | 0.6 | 0.8 |
| CA\_n41-n66-n70-n78 | 0.5 | 0.6 | 0.6 | 0.8 |
| CA\_n41-n66-n71-n77 | 0.33 / 0.84 | 1 | 0.5 | 0.8 |
| CA\_n41-n66-n71-n78 | 0.33 / 0.84 | 1 | 0.5 | 0.8 |
| NOTE 1: Applicable for the frequency range of 2515-2690 MHz.  NOTE 2: Applicable for the frequency range of 2496-2515 MHz.  NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz.  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz.  NOTE 5: “-” denotes ΔTIB,c = 0.  NOTE 6: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5-n78 the band order from left to right is n1, n3, n5 and n78. | | | | |

##### 6.2A.4.2.6 ΔTIB,c for Inter-band CA (five bands)

Table 6.2A.4.2.6-1: ΔTIB,c due to NR CA (five bands)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Inter-band CA combination | ΔTIB,c for NR bands (dB)1 | | | | |
| Component band in order of bands in configuration2 | | | | |
| CA\_n1-n3-n5-n7-n78 | 0.6 | 0.6 | 0.6 | 0.6 | 0.8 |
| CA\_n1-n3-n7-n8-n78 | 0.7 | 0.7 | 0.7 | 0.6 | 0.8 |
| CA\_n1-n3-n7-n26-n78 | 0.7 | 0.7 | 0.7 | 0.6 | 0.8 |
| CA\_n1-n3-n7-n28-n38 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| CA\_n1-n3-n7-n28-n78 | 0.7 | 0.7 | 0.7 | 0.6 | 0.8 |
| CA\_n1-n3-n7-n67-n78 | 0.7 | 0.7 | 0.7 | - | 0.8 |
| CA\_ n1-n3-n28-n41-n77 | 0.6 | 1 | 0.6 | 0.63/0.84 | 0.8 |
| CA\_n1-n3-n28-n41-n79 | 0.5 | 0.5 | 0.6 | 0.63/0.84 | 0.8 |
| CA\_n1-n3-n28-n77-n79 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 |
| CA\_n1-n3-n41-n77-n79 | 0.6 | 0.6 | 0.53/0.84 | 0.8 | 0.8 |
| CA\_n1-n28-n41-n77-n79 | 0.6 | 0.6 | 0.6 | 0.8 | 0.8 |
| CA\_n2-n5-n30-n66-n77 | 0.6 | 0.6 | 0.3 | 0.6 | 0.8 |
| CA\_n2-n5-n48-n66-n77 | 0.6 | 0.3 | 0.8 | 0.6 | 0.8 |
| CA\_n2-n12-n30-n66-n77 | 0.6 | 0.8 | 0.3 | 0.6 | 0.8 |
| CA\_n2-n14-n30-n66-n77 | 0.6 | 0.6 | 0.3 | 0.6 | 0.8 |
| CA\_n2-n29-n30-n66-n77 | 0.6 | - | 0.3 | 0.6 | 0.8 |
| CA\_n3-n28-n41-n77-n79 | 1 | 0.5 | 0.8 | 0.8 | 0.8 |
| NOTE 1: “-” denotes ΔTIB,c = 0.  NOTE 2: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5-n7-n78 the band order from left to right is n1, n3, n5, n7 and n78.  NOTE 3: The requirement is applied for UE transmitting on the frequency range of 2545 - 2690 MHz  NOTE 4: The requirement is applied for UE transmitting on the frequency range of 2496 - 2545 MHz | | | | | |

##### 6.2A.4.2.7 ΔTIB,c for Inter-band CA (six bands)

Table 6.2A.4.2.7-1: ΔTIB,c due to NR CA (six bands)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Inter-band CA combination |  | ΔTIB,c for NR bands (dB)1 | | | | |
|  | Component band in order of bands in configuration2 | | | | |
| CA\_n1-n3-n7-n28-n38-n78 | 0.7 | 0.7 | 0.7 | 0.6 | 0.7 | 0.8 |
| NOTE 1: “-” denotes ΔTIB,c = 0.  NOTE 2: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5-n7-n78 the band order from left to right is n1, n3, n5, n7 and n78. | | | | | | |

## 6.2B Transmitter power for NR-DC

### 6.2B.0 General

The requirements apply for inter-band NR-DC with one uplink serving cell configured per CG.

### 6.2B.1 UE maximum output power for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the transmitter power requirements in clause 6.2 apply per band.

For inter-band NR-DC with one uplink assigned per band, the UE maximum output power shall be measured over all component carriers from different bands. If each band has separate antenna connectors, the maximum output power is defined as the sum of maximum output power from each UE antenna connector. The period of measurement shall be at least one sub frame (1 ms). The maximum output power is specified in Table 6.2B.1.3-1.

**Table 6.2B.1.3-1 UE Power Class for inter-band NR-DC**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Uplink CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance  (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| DC\_n1A-n3A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n1A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n2A-n5A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n2A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n2A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n2A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n7A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n3A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n5A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n5A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n5A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n7A-n28A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n7A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n7A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n7A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n12A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n41A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n46A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n28A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n41A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n41A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n41A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n46A-n48A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n46A-n48B |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n46A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n46A-n78A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n48A-n66A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n48A-n70A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n48A-n71A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n48A-n96A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n48B-n96A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n66A-n77A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n77A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n77A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n78A-n79A |  |  |  |  | 23 | +2/-3 |  |  |
| DC\_n78A-n102A |  |  |  |  | 23 | +2/-3 |  |  |
| NOTE 1: An uplink DC configuration in which at least one of the bands has NOTE 3 in Table 6.2.1-1 is allowed to reduce the lower tolerance limit by 1.5 dB when the transmission bandwidths of at least one of the bands is confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high - 4 MHz and FUL\_high.  NOTE 2: PPowerClass is the maximum UE power specified without account of the tolerance  NOTE 3: The maximum power requirement applies to the total transmitted power over both the MCG and SCG.  NOTE 4: Power class 3 is the default power class unless otherwise stated. | | | | | | | | |

### 6.2B.2 UE maximum output power reduction for NR-DC

For inter-band NR-DC with one uplink assigned per band, the requirements in clause 6.2.2 or 6.2F.2 when the uplink belongs to a spectrum sharing defined band apply for each uplink component carrier.

When inter-band NR-DC is configured with intra-band contiguous carrier aggregation in one of the cell groups or both, the requirements in clause 6.2A.2 apply for each cell group configured with uplink contiguous carrier aggregation.

### 6.2B.3 UE additional maximum output power reduction for NR-DC

For inter-band NR-DC with one uplink assigned per band, the requirements in clause 6.2.3 apply for each uplink component carrier.

For inter-band NR-DC with one uplink assigned per band, the requirements in clause 6.2.3 or 6.2F.3 when the uplink belongs to a spectrum sharing defined band apply for each uplink component carrier.

For inter-band NR-DC where the corresponding inter-band CA configuration is specified in Table 6.2A.3.1.3-1, the combined requirements and allowed A-MPR are applicable on both bands when both component carriers are active.

When inter-band NR-DC is configured with intra-band contiguous carrier aggregation in one of the cell groups or both, the requirements in clause 6.2A.3 or 6.2F.3A for shared spectrum defined bands, are applicable for each cell group configured with uplink contiguous carrier aggregation.

6.2B.4 Configured output power for NR-DC

#### 6.2B.4.1 Configured transmitted power level for NR-DC

The UE is allowed to set its configured maximum output power PCMAX,f,*c,*MCGand PCMAX,f,*c,*SCGfor the respective MCG and SCG and its total configured maximum output power for NR-DC operation with as specified in clause 7.6.2 of [8]. The UE is configured with an inter-CG power sharing mode by *NR-DC-PC-mode.*The requirements apply for one uplink serving cell configured per CG and for asynchronous and synchronous NR-DC if not otherwise stated.

Unless otherwise stated, the configured maximum output power PCMAX,f,*c,*MCG(*q*) in physical-channel *q* for carrier *f* of serving cell *c* shall be set within the bounds if contained in the MCG,

PCMAX\_L,f,*c,*MCG (*q*) ≤ PCMAX,f,*c,*MCG(*q*) ≤ PCMAX\_H,f,*c,*MCG (*q*)

and the corresponding PCMAX\_L,f,*c,*SCG (*q*) for a serving cell contained in the SCG,

PCMAX\_L,f,*c,*SCG (*q*) ≤ PCMAX,f,*c,*SCG(*q*) ≤ PCMAX\_H,f,*c,*SCG (*q*)

where PCMAX\_L,f,c,MCG, PCMAX\_H,f,c,MCG, PCMAX\_L,f,c,SCG and PCMAX\_H,f,c,SCG are the limits for a serving cell *c* as specified in clause 6.2.4 modified as follows:

PCMAX\_L,f,c,MCG = MIN{MIN(PEMAX,c , PEMAX,NR-DC, PNR) – ∆TC,c, (PPowerClass,NR-DC – ΔPPowerClass,NR-DC) – MAX(MAX(MPRc+∆MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c +∆TRxSRS, P-MPRc)}

PCMAX\_H,f,c,MCG = MIN{PEMAX,c, PEMAX,NR-DC, PNR, PPowerClass, NR-DC – ΔPPowerClass,NR-DC}

for the MCG and

PCMAX\_L,f,c,SCG = MIN{MIN(PEMAX,c , PEMAX,NR-DC, PNR) – ∆TC,c, (PPowerClass,NR-DC – ΔPPowerClass,NR-DC) – MAX(MAX(MPRc+∆MPRc, A-MPRc)+ ΔTIB,c + ∆TC,c +∆TRxSRS, P-MPRc)}

PCMAX\_H,f,c,SCG = MIN{PEMAX,c, PEMAX,NR-DC, PNR, PPowerClass,NR-DC – ΔPPowerClass,NR-DC}

for the SCG, where

- PEMAX,NR-DC is the value given by the field *p-UE-FR1* of the *PhysicalCellGroupConfig* IE for the MCG as defined in [7];

- PNR is the value given by the field *p-NR-FR1* of the *PhysicalCellGroupConfig* IE as defined in [7];

- PPowerClass,NR-DC is the maximum UE power specified in Table 6.2B.1.3-1 without taking into account the tolerance specified in the Table 6.2B.1.3-1;

- ∆TIB,c is the additional tolerance for serving cell c as specified in clause 6.2B.4.2 for NR-DC; ∆TIB,c = 0 dB otherwise;

- ∆TC,c = 1.5dB when NOTE 2 in Table 6.2B.1.3-1 applies for a serving cell c, otherwise ∆TC,c = 0 dB ;

- ∆MPRc for serving cell c is specified in clause 6.2.2.

- ΔPPowerClass,NR-DC = 0 dB for a power class 3 capable UE.

When MSG or SCG are configured with intra-band contiguous carrier aggregation, then intra-band carrier aggregation PCMAX*,*CA*,*MCG(*q*) and/or PCMAX,CA,SCG(*q*) in physical-channel *q* shall be set within the bounds:

PCMAX\_L,CA, MCG (*q*) ≤ PCMAX,CA,MCG(*q*) ≤ PCMAX\_H,CA,MCG (*q*)

for MSG, and/or

PCMAX\_L,CA,SCG (*q*) ≤ PCMAX,CA,SCG(*q*) ≤ PCMAX\_H,CA,SCG (*q*)

for SCG, where PCMAX\_L,CA,MCG, PCMAX\_H,CA,MCG, PCMAX,CA,SCG and PCMAX\_H,CA,SCG are the limits for a carrier aggregation uplink as specified in clause 6.2A.4.1.1 modified as follows:

PCMAX\_L,CA,MCG = MIN{10 log10 ∑ pEMAX,c  - TC , PEMAX,CA, PEMAX,NR-DC, PNR,MCG, (PPowerClass,NR-DC – ΔPPowerClass,NR-DC) – MAX(MAX(MPR, A-MPR) + ΔTIB,c + TC + TRxSRS, P-MPRc ) }

PCMAX\_H,CA,MCG  = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA , PEMAX,NR-DC, PNR,MCG, PPowerClass,NR-DC – ΔPPowerClass,NR-DC }

for the MCG, and

PCMAX\_L,CA,SCG = MIN{10 log10 ∑ pEMAX,c  - TC , PEMAX,CA, PEMAX,NR-DC, PNR,SCG, (PPowerClass,NR-DC – ΔPPowerClass,NR-DC) – MAX(MAX(MPR, A-MPR) + ΔTIB,c + TC + TRxSRS, P-MPRc ) }

PCMAX\_H,CA,SCG  = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA , PEMAX,NR-DC, PNR,SCG, PPowerClass,NR-DC – ΔPPowerClass,NR-DC}

for SCG.

For a UE provided with *NR-DC-PC-mode* = *Semi-static-mode1*,

= MIN{PEMAX, NR-DC, PPowerClass,NR-DC} + 0.3 dB

with PPowerClass,NR-DC set to power class 3 in case the UE indicates a higher power class in any CG. The UE determines the maximum transmission power for the MCG and the SCG using the respective configured maximum power PCMAX,f,*c,*MCGand PCMAX,f,*c,*SCG.

If for synchronous NR-DC operation a UE is provided *NR-DC-PC-mode* = *Semi-static-mode2*, the is determined as above and

- if at least one symbol of slot of the MCG/SCG is indicated as uplink or flexible to a UE by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated*, if provided, overlaps with a symbol for any ongoing transmission overlapping with slot of the SCG/MCG, the UE determines a maximum power for the transmission on the SCG/MCG overlapping with slot using the configured maximum power PCMAX,f,*c,*SCGor PCMAX,f,*c,*MCG for the SCG or MSG, respectively,

- otherwise (i.e. an ongoing transmission overlapping with slot of the SCG/MCG overlaps with only semi-static downlink symbols within slot of the MCG/SCG), the UE determines a maximum power for the transmission on MCG or the SCG overlapping with slot using the configured maximum power as specified in clause 6.2.4.

If a UE indicates a capability for dynamic power sharing between the MCG and the SCG and is provided with *NR-DC-PC-mode = Dynamic*,

= MIN{PEMAX, NR-DC, PPowerClass,NR-DC}

with PPowerClass,NR-DC set to power class 3 in case the UE indicates a higher power class in any CG. The UE determines the maximum transmission power for the MCG and the SCG using the respective configured maximum power PCMAX,f,*c,*MCGand PCMAX,f,*c,*SCG except

- if UE transmission(s) in slot of the MCG or in slot of the SCG do not overlap in time with any UE transmission(s) on the SCG or the MCG, respectively, the UE determines a maximum transmission power in slot of the MCG or in slot of the SCG using the configured maximum power as specified in clause 6.2.4.

If a UE indicates a capability to determine a total transmission power on the SCG at a first symbol of a transmission occasion on the SCG by determining transmissions on the MCG as specified in clause 7.6.2 of [8], and is provided with *NR-DC-PC-mode = Dynamic*,

= MIN{PEMAX, NR-DC, PPowerClass,NR-DC}

with PPowerClass,NR-DC set to power class 3 in case the UE indicates a higher power class in any CG. The UE determines the maximum transmission power for the MCG and the SCG using the respective configured maximum power PCMAX,f,*c,*MCGand PCMAX,f,*c,*SCG.

The measured total maximum output power PUMAX over both CGs measured over the transmission reference time duration is

PUMAX = 10 log10 (pUMAX,*c,*MCG + pUMAX,*c,*SCG),

where pUMAX,*c,*MSG and pUMAX,*c,*SCG denote the measured output power of serving cells *c* contained in the respective MSG and SCG expressed in linear scale.

The measured total configured maximum output power PUMAX shall be within the following bounds:

PCMAX\_L -TLOW (PCMAX\_L) ≤ PUMAX  ≤ PCMAX\_H + THIGH (PCMAX\_H)

with the tolerances TLOW(PCMAX\_H) and THIGH(PCMAX\_H) for applicable values of PCMAX specified in Table 6.2B.4.1.3-2.

When a subframe *p* on the MSG overlap with a physical-channel *q* on the SCG*,* then for PUMAX evaluation, the subframe *p* on the MCG is takenas reference period TREF and always considered as the reference measurement duration and the following rules are applicable.

TREF and Teval are specified in Table 6.2B.4.1.3-1 when same or different subframe and physical-channel durations are used on the carriers. The PPowerClass shall not be exceeded by the UE during any evaluation period of time.

Table 6.2B.4.1.3-1: PCMAX evaluation window

|  |  |  |
| --- | --- | --- |
| Transmission duration | TREF | Teval |
| Different transmission duration in different CG carriers | MCG subframe | MIN(*Tno\_hopping*, Physical Channel Length) |

For each TREF, the PCMAX\_H is evaluated per Teval and given by the maximum value over the transmission(s) within the Teval as follows:

PCMAX\_H = MAX{PCMAX\_NR-DC\_H(*p,q*), PCMAX\_NR-DC\_H(*p,q+1*), … , PCMAX\_NR-DC\_H(*p,q+n*)}

where PCMAX\_NR-DC\_H entries are the applicable upper limits for each overlapping scheduling unit pairs *(p,q*), (*p, q+1*), up to *(p, q+n*) for each applicable Teval duration, where *q+n* is the last physical-channel on the SCG overlapping with subframe *p* on the MCG, while PCMAX\_L is computed as follows:

PCMAX\_L = MIN{PCMAX\_NR-DC\_L(*p,q*), PCMAX\_NR-DC\_L(*p,q+1*), … , PCMAX\_NR-DC\_L(*p,q+n*)}

where PCMAX\_NR-DC\_L entries are the applicable lower limits for each overlapping scheduling unit pairs *(p,q*), (*p, q+1*) up to *(p, q+n*) for each applicable Teval duration, where *q+n* is the last physical-channel on the SCG overlapping with subframe *p* on the MCG.

For a UE provided with *NR-DC-PC-mode* = *Semi-static-mode1* and configured with pNR,MCG + pNR,SCG ≤ with pNR,MCG and pNR,SCG the values of the PNR for the respective MCG and SCG expressed in linear scale

PCMAX\_NR-DC\_L(*p,q*) = 10 log10 [pCMAX\_L, MCG (*p*) + pCMAX\_L, SCG (*q*)]

PCMAX\_NR-DC\_H(*p,q*) = 10 log10 [pCMAX\_H, MCG (*p*) + pCMAX\_H, SCG (*q*)]

where

pCMAX\_L, MCG, pCMAX\_L, SCG, pCMAX\_H, MCG, pCMAX\_H, SCG can be pCMAX\_L,f,c,MCG, pCMAX\_H,f,c,MCG, pCMAX\_L,f,c,SCG, and pCMAX\_H,f,c,SCG the values of the respective PCMAX\_L,f,c,MCG, PCMAX\_H,f,c,MCG, PCMAX\_L,f,c,MCG, and PCMAX\_H,f,c,SCG expressed in linear scale, or pCMAX\_L,CA,MCG, pCMAX\_H,CA,MCG, pCMAX\_L,CA,SCG, and pCMAX\_H,CA,SCG the values of the respective PCMAX\_L,CA,MCG, PCMAX\_H,CA,MCG, PCMAX\_L,CA,SCG, and PCMAX\_H,CA,SCG expressed in linear scale if the contiguous carrier aggregation is configured in MCG and/or SCG or a combinations of single cell and carrier aggregation while the measured configured maximum power PUMAX  for each CG shall meet the requirements as specified in clause 6.2.4 but with bounds for PCMAX,f,*c,*MCG(*p*) and PCMAX,f,*c,*SCG as specified in this clause or 6.2A.4.1.1 as modified in this clause for contiguous carrier aggregation configured cell group.

If for synchronized NR-DC a UE is provided with *NR-DC-PC-mode* = *Semi-static-mode2* and configured with pNR,MCG + pNR,SCG ≤ with pNR,MCG and pNR,SCG the linear-scale values of the PNR for the respective MCG and SCG

PCMAX\_NR-DC\_L(*p,q*) = 10 log10 [pCMAX\_L, MCG (*p*) + pCMAX\_L, SCG (*q*)]

PCMAX\_NR-DC\_H(*p,q*) = 10 log10 [pCMAX\_H, MCG (*p*) + pCMAX\_H, SCG (*q*)]

while the measured configured maximum power PUMAX for each CG shall meet the requirements specified in Table 6.2.4-2 but with bounds for PCMAX,f,*c,*MCG(*p*) and PCMAX,f,*c,*SCG(*q*) as specified in this clause or 6.2A.4.1.1-1when intra-band carrier aggregation contiguous is configured in the MCG and/or SCG with the bounds PCMAX,CA*,*MCG(*p*) and PCMAX,CA*,*SCG defined in this clause except

- if an ongoing transmission overlapping with physical channel *q* of the SCG or subframe *p* of the MCG overlaps with only semi-static downlink symbols within the respective subframe *p* of the MCG or physical channel *q* of the SCG as indicated to a UE by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated*, if provided,

then the measured configured maximum power PUMAX for the transmission subframe *p* on the MCG or physical channel *q* on the SCG shall meet the requirements as specified in clause 6.2.4 and with bounds for PCMAX,f,*c,*MCG(*p*) or PCMAX,f,*c,*SCG as specified in this clause or Table 6.2A.4.1.1-1when intra-band carrier aggregation contiguous is configured in the MCG and/or SCG with bounds for PCMAX,CA*,*MCG(*p*) and PCMAX,CA*,*SCG defined in this clause For a UE provided with *NR-DC-PC-mode* = *Dynamic*,

PCMAX\_NR-DC\_L(*p,q*) = MIN{10 log10 [pCMAX\_L, MCG (*p*) + pCMAX\_L, SCG (*q*)], }

PCMAX\_NR-DC\_H(*p,q*) = MIN{10 log10 [pCMAX\_H, MCG (*p*) + pCMAX\_H, SCG (*q*)], }

while the measured configured maximum power PUMAX on the MCG shall meet the requirements as specified in clause 6.2.4-2 but with bounds for PCMAX,f,*c,*MCG(*p*) as specified in this clause, or as specified in Table 6.2A.4.1.1-1 when intra-band carrier aggregation contiguous is configured in the MCG with the bounds for PCMAX,CA,MCG(*p*) as specified in this clause and the PUMAX on the SCG shall be within

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

where for single uplink cell SCG

PCMAX\_L = MIN{PCMAX\_L,f,c,SCG (*p*), 10 log10 ( – pNR,MSG)}

PCMAX\_H = MIN{PCMAX\_H,f,c,SCG (*p*), 10 log10 ( – pNR,MSG)}

and for intra-band carrier aggregation configured SCG

PCMAX\_L = MIN{PCMAX\_L,CA,SCG (*p*), 10 log10 ( – pNR,MSG)}

PCMAX\_H = MIN{PCMAX\_H,CA,SCG (*p*), 10 log10 ( – pNR,MSG)}

where PCMAX\_L,CA,SCG and PCMAX\_H,CA,SCG bounds are defined in this clause,

with limits as specified in Table 6.2.4-2 or as specified in Table 6.2A.4.1.1-1 when intra-band carrier aggregation contiguous is configured in the MCG and pNR,MCG the value of the PNR for the MCG expressed in linear scale.

Table 6.2B.4.1.3-2: PCMAX tolerance for NR-DC

|  |  |  |
| --- | --- | --- |
| PCMAX(dBm) | Tolerance  TLOW (PCMAX\_L) (dB) | Tolerance  THIGH (PCMAX\_H) (dB) |
| 23 ≤ PCMAX ≤ 33 | 3.0 | 2.0 |
| 22 ≤ PCMAX < 23 | 5.0 | 2.0 |
| 21 ≤ PCMAX< 22 | 5.0 | 3.0 |
| 20 ≤ PCMAX < 21 | 6.0 | 4.0 |
| 16 ≤ PCMAX < 20 | 5.0 | |
| 11 ≤ PCMAX < 16 | 6.0 | |
| -40 ≤ PCMAX < 11 | 7.0 | |
| NOTE 1: For UEs provided with *NR-DC-PC-mode* = *Semi-static-mode1 or* with *NR-DC-PC-mode* = *Semi-static-mode2*, the upper tolerance Thigh shall be reduced by 0.3 dB for P ≥ 20 dBm. | | |

#### 6.2B.4.2 ΔTIB,c for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the ΔTIB,c for the corresponding inter-band CA configuration as specified in clause 6.2A.4.2 applies.

## 6.2C Transmitter power for SUL

### 6.2C.1 Configured transmitted power for SUL

When a UE is configured with both NR UL and NR SUL carriers in a serving cell with active transmission either on the UL carrier(s) or SUL carrier, the configured transmit power requirements specified in clause 6.2.4 and 6.2A.4 are applicable for the UL carrier(s) and the SUL carrier, respectively.

If a UE supports a different power class than the default UE power class for NR UL band of SUL combination and the supported power class enables the higher maximum output power for SUL combination than that of the default power class:

– if the field of UE capability *maxUplinkDutyCycle- SULcombination-PC2* is not absent and the average percentage of uplink symbols transmitted in a certain evaluation period is larger than the maximum percentage of uplink symbols that the UE indicates by *maxUplinkDutyCycle- SULcombination-PC2* as defined in TS 38.331 (The exact evaluation period is no less than one radio frame); or

– if the IE P-Max as defined in TS 38.331 [7] is provided and set to the maximum output power of the default power class or lower;

– shall apply all requirements for the default power class to the supported power class and set the configured transmitted power as specified in clause 6.2.4;

– else;

– shall apply all requirements for the supported power class and set the configured transmitted power as specified in clause 6.2.4 (regardless of the average percentage of uplink symbols if the field of UE capability maxUplinkDutyCycle-interBandCA-PC2 is absent).

The average percentage of uplink symbols is defined as 50% × ( DutyNR, x /maxDutyNR,x + DutyNR, y /maxDutyNR,y, ). DutyNR, x, DutyNR, y represent the actual percentage of uplink symbols transmitted in the same evaluation period (The exact evaluation period is no less than one radio frame) for NR Band x, NR Band y respectively maxDutyNR,x,maxDutyNR,y represent the field of UE capability *maxUplinkDutyCycle-PC2-FR1* per band as defined in TS 38.331. For NR Band x or NR Band y,

– if power class of one or both of the bands within the band combination is power class 2 and the corresponding UE capability maxUplinkDutyCycle-PC2-FR1 is absent;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 50%;

– else if the band is configured with power class 3;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 100%.

### 6.2C.2 ΔTIB,c

For the UE which supports SUL band combination, ΔTIB,c in Tables below applies. Unless otherwise stated, ΔTIB,c is set to zero.

Table 6.2C.2-1: ΔTIB,c due to SUL

| Band combination for SUL | ΔTIB,c for NR bands (dB)3 | |
| --- | --- | --- |
| Component band in order of bands in configuration4 | |
| SUL\_n1-n80 | 0.3 | 0.3 |
| SUL\_n1-n81 | 0.3 | 0.3 |
| SUL\_n1-n89 | 0.3 | 0.3 |
| SUL\_n3-n84 | 0.3 | 0.3 |
| SUL\_n41-n80 | 0.31 / 0.82 | 0.5 |
| SUL\_n41-n81 | 0.3 | 0.3 |
| SUL\_n41-n83 | 0.3 | 0.3 |
| SUL\_n41-n97 | 0.5 | 0.5 |
| SUL\_n41-n98 | 0.5 | 0.5 |
| SUL\_n41-n99 | 0.41 / 0.92 | 0.3 |
| SUL\_n48-n99 | 0.6 | 0.8 |
| SUL\_n77-n80 | 0.8 | 0.6 |
| SUL\_n77-n84 | 0.8 | 0.6 |
| SUL\_n77-n99 | 0.6 | 0.8 |
| SUL\_n78-n80 | 0.8 | 0.6 |
| SUL\_n78-n81 | 0.8 | 0.6 |
| SUL\_n78-n82 | 0.8 | 0.6 |
| SUL\_n78-n83 | 0.8 | 0.5 |
| SUL\_n78-n84 | 0.8 | 0.3 |
| SUL\_n78-n86 | 0.8 | 0.6 |
| SUL\_n78-n89 | 0.8 | 0.6 |
| SUL\_n79-n83 | 0.8 | 0.5 |
| SUL\_n79-n97 | 0.8 | 0.3 |
| SUL\_n79-n98 | 0.8 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496 - 2515MHz.  NOTE 3: “-” denotes ΔTIB,c = 0.  NOTE 4: The component band order in the configuration should be listed by the order of NR bands such as for SUL\_n41-n81 the order of band is n41 and n81. | | |

Table 6.2C.2-2: ΔTIB,c for SUL band combination (Three bands)

|  |  |  |  |
| --- | --- | --- | --- |
| Band combination for SUL | ΔTIB,c for NR bands (dB)3 | | |
| Component band in order of bands in configuration4 | | |
| CA\_n1\_n78-n80 | 0.6 | 0.8 | 0.6 |
| CA\_n1\_n78-n81 | 0.3 | 0.8 | 0.6 |
| CA\_n1\_n78-n84 | 0.6 | 0.8 | 0.6 |
| CA\_n3\_n41-n80 | 0.5 | 0.31 / 0.82 | 0.5 |
| CA\_n3\_n78-n80 | 0.6 | 0.8 | 0.6 |
| CA\_n3\_n79-n80 | 0.3 | 0.8 | 0.3 |
| CA\_n8\_n78-n81 | 0.6 | 0.8 | 0.6 |
| CA\_n28\_n41-n83 | 0.3 | 0.3 | 0.3 |
| CA\_n28\_n79-n83 | 0.5 | 0.8 | 0.5 |
| CA\_n41\_n79-n80 | 0.31 / 0.82 | 0.8 | 0.3 |
| CA\_n41\_n79-n83 | 0.3 | 0.8 | 0.5 |
| CA\_n41\_n79-n95 | 0.3 | 0.8 | 0.3 |
| CA\_n41\_n79-n97 | 0.5 | 0.5 | 0.5 |
| CA\_n41\_n79-n98 | 0.3 | 0.8 | 0.3 |
| CA\_n78\_n1-n80 | 0.8 | 0.6 | 0.6 |
| CA\_n78\_n1-n81 | 0.8 | 0.3 | 0.6 |
| CA\_n78\_n1-n89 | 0.8 | 0.6 | 0.6 |
| CA\_n78\_n3-n84 | 0.8 | 0.6 | 0.6 |
| CA\_n78\_n80-n84 | 0.8 | 0.6 | 0.6 |
| CA\_n78\_n81-n84 | 0.8 | 0.6 | 0.3 |
| CA\_n79\_n41-n80 | 0.31 / 0.82 | 0.8 | 0.3 |
| CA\_n79\_n41-n83 | 0.3 | 0.8 | 0.5 |
| CA\_n79\_n41-n95 | 0.3 | 0.8 | 0.3 |
| CA\_n79\_n41-n97 | 0.5 | 0.5 | 0.5 |
| CA\_n79\_n41-n98 | 0.3 | 0.8 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515MHz.  NOTE 3: “-” denotes ΔTIB,c = 0.  NOTE 4: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1\_n78-n80 the band order from left to right is n1, n78 and n80. | | | |

Table 6.2C.2-3: ΔTIB,c for SUL band combination (Four bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Band combination for SUL | ΔTIB,c for NR bands (dB)1 | | | |
| Component band in order of bands in configuration2 | | | |
| CA\_n28-n79\_n41-n83 | 0.3 | 0.3 | 0.5 | 0.3 |
| CA\_n28-n41\_n79-n83 | 0.3 | 0.3 | 0.5 | 0.3 |
| CA\_n41A-n95A\_n79A-n98A | 0.3 | 0.8 | - | 0.3 |
| CA\_n41A-n98A\_n79A-n95A | 0.5 | 0.8 | 0.5 | - |
| CA\_n41A-n83A\_n79A-n98A | 0.3 | 0.8 | 0.3 | 0.3 |
| CA\_n41A-n83A\_n79A-n95A | 0.3 | 0.8 | 0.3 | - |
| NOTE 1: “-” denotes ΔTIB,c = 0.  NOTE 2: The component band order in the configuration should be listed by the order of NR bands and SUL band, such as for CA\_n28-n79\_n41-n83 the band order from left to right is n28, n41, n79 and n83. | | | | |

## 6.2D Transmitter power for UL MIMO

### 6.2D.1 UE maximum output power for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power for any transmission bandwidth within the channel bandwidth is specified in Table 6.2D.1-1. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors. The period of measurement shall be at least one sub frame (1 ms).

The requirements shall be met with the UL MIMO configurations of using 2-layer UL MIMO codebook-based transmission with precoding matrix of *W=*. DCI Format for UE configured in PUSCH transmission mode for uplink single-user MIMO shall be used.

Table 6.2D.1-1: UE Power Class for UL MIMO in closed loop spatial multiplexing scheme

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Class 1.5 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| n1 |  |  | 26 | +2/-31 | 23 | +2/-3 |  |  |
| n2 |  |  |  |  | 23 | +2/-31 |  |  |
| n3 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n7 |  |  |  |  | 23 | +2/-31 |  |  |
| n8 |  |  |  |  | 23 | +2/-31 |  |  |
| n24 |  |  |  |  | 23 | +2/-41 |  |  |
| n25 |  |  |  |  | 23 | +2/-31 |  |  |
| n28 |  |  |  |  | 23 | +2/-31 |  |  |
| n30 |  |  |  |  | 23 | +2/-3 |  |  |
| n34 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n38 |  |  |  |  | 23 | +2/-3 |  |  |
| n39 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n40 |  |  | 26 | +2/-31 | 23 | +2/-3 |  |  |
| n41 | 29 | +2/-31 | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n48 |  |  |  |  | 23 | +2/-3 |  |  |
| n66 |  |  |  |  | 23 | +2/-3 |  |  |
| n70 |  |  |  |  | 23 | +2/-3 |  |  |
| n71 |  |  |  |  | 23 | +2/-3 |  |  |
| n77 | 29 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n78 | 29 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n79 | 29 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n80 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n84 |  |  | 26 | +2/-31 | 23 | +2/-3 |  |  |
| n95 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n97 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n98 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n99 |  |  |  |  | 23 | +2/-41 |  |  |
| NOTE 1: The transmission bandwidths confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high – 4 MHz and FUL\_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB  NOTE 2: Power class 3 is the default power class unless otherwise stated | | | | | | | | |

Table 6.2D.1-2: UL MIMO configuration in closed-loop spatial multiplexing scheme

|  |  |  |  |
| --- | --- | --- | --- |
| Transmission scheme | DCI format | Number of layers | TPMI index |
| Codebook based uplink | DCI format 0\_1 | 2 | 0 |
| NOTE 1: The UE is configured with one SRS resource with the parameter *nrofSRS-Ports* set to 2. | | | |

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the maximum output power requirements specified in Table 6.2D.1-1 shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode. For UE supporting uplink full power transmission (ULFPTx) for UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors. The period of measurement shall be at least one sub frame (1 ms).

Table 6.2D.1-3: PUSCH Configuration for uplink full power transmission (ULFPTx)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ULFPTx Mode | Transmission scheme | DCI format | Modulation | Number of layers | Number of Tx Port | TPMI index |
| Mode-1 | Codebook based uplink | DCI format 0\_1 | DFT-s-OFDM, CP-OFDM NOTE3 | 1 | 2 | 2 |
| Mode-2 | Codebook based uplink | DCI format 0\_1 | DFT-s-OFDM, CP-OFDM | 1 | 2 | 0 or 1NOTE2 |
| Mode-full power | Codebook based uplink | DCI format 0\_1 | DFT-s-OFDM, CP-OFDM | 1 | 2 | 0,1 |
| NOTE 1: The UE is configured with one SRS resource with the parameter *nrofSRS-Ports* set to 2.  NOTE 2: TPMI index selected shall be based upon the full power TPMI reported by the UE [8, TS 38.213].  NOTE 3: For PUSCH configured with *ul-FullPowerTransmission* set to *fullpowerMode1*, all the transmitter requirement for CP-OFDM based modulation does not need to be verified if the requirements for 2-layer UL MIMO according to Table 6.2D.1-2 has been verified. | | | | | | |

If the UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.2 apply for at least one antenna connector for the power class as indicated by the *ue-PowerClass* field in capability signalling with the following exception: for UEs indicating *txDiversity-r16*, the requirements in clause 6.2G for the power class indicated by the *ue-PowerClass*.

A UE indicating the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16* for a band shall meet the requirement in clause 6.2 for at least one antenna connector when scheduled for single antenna-port transmission by DCI format 0\_0 or by DCI format 0\_1 for codebook-based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211].

### 6.2D.2 UE maximum output power reduction for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2D.1-1 is specified in Table 6.2.2-1for PC3, Table 6.2D.2-1 for 2Tx PC2 when the UE does not indicate ul-FullPwrMode-r16 or ul-FullPwrMode2-TPMIGroup-r16 for the band and Table 6.2.2-2 for 2Tx PC2 when the UE indicates ul-FullPwrMode-r16 or ul-FullPwrMode2-TPMIGroup-r16 for the band, Table 6.2D.2-2 and Table 6.2D.2-3 for PC1.5 respectively. For UE power class 1.5, the allowed maximum power reduction (MPR) defined in Table 6.2D.2-3 is in accordance with the indicated *modifiedMPR-Behavior* specified in Table L.1-1 for channel bandwidths ≤ 100 MHz. The requirements shall be met with UL MIMO configurations defined in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors.

For UE support uplink full power transmission (ULFPTx) for UL MIMO except the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16*, the allowed MPR for the maximum output power in Table 6.2D.1-1 is specified in Table 6.2.2-1 for PC3, Table 6.2D.2-1 when *TxD* is indicated and Table 6.2.2-2 when *TxD* is not indicated for PC2 , Table 6.2D.2-2 and Table 6.2D.2-3 for PC1.5 respectively, and the requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode. A UE indicating the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16* for a band shall meet the maximum output power requirement with MPR according to clause 6.2.2. When a UE that indicates PC1.5 for a given band is limited to PC2 by the rules in clause 6.2.1, the MPR requirements in Table 6.2.2-2 apply. For UE support uplink full power transmission (ULFPTx) for UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors.

The same MPR requirements shall be applicable to UE with 1-layer UL MIMO transmission (either with or without ULPFTx) as with the UL MIMO configurations of using 2-layer UL MIMO transmission with codebook of.

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

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the corresponding requirements in clause 6.2D.1 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling. A UE indicating the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16* for a band shall meet the requirement in clause 6.2 with MPR according to clause 6.2.2 for at least one antenna connector when scheduled for single antenna-port transmission by DCI format 0\_0 or by DCI format 0\_1 for codebook-based transmission on a single antenna port with precoding matrix *W*=1 [6.3.1.5 TS 38.211].

Table 6.2D.2-1 Maximum power reduction (MPR) for power class 2 with dual Tx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
| Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | ≤ 1 | 0 |
| QPSK | ≤ 3.5 | ≤ 2 | 0.5 |
| 16 QAM | ≤ 3.5 | ≤ 2.5 | ≤ 1.5 |
| 64 QAM | ≤ 3.5 | ≤ 3 | |
| 256 QAM | ≤ 5.5 | | |
| CP-OFDM | QPSK | ≤ 4.0 | ≤ 3.5 | ≤ 2 |
| 16 QAM | ≤ 4.0 | ≤ 3.5 | ≤ 2.5 |
| 64 QAM | ≤ 4.5 | | |
| 256 QAM | ≤ 8.0 | | |

Table 6.2D.2-2 Maximum power reduction (MPR) for power class 1.5 with dual Tx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 6 | ≤ [2] | ≤ 0.5 |
|  | QPSK | ≤ 6.5 | ≤ [2.5] | ≤ 0.5 |
|  | 16 QAM | ≤ 6.5 | ≤ [3.5] | ≤ 1.5 |
|  | 64 QAM | ≤ 6.5 | ≤ [4] | ≤ 3.5 |
|  | 256 QAM | ≤ 6.5 | ≤ 6.5 | ≤ [6.5] |
| CP-OFDM | QPSK | ≤ 6.5 | ≤ [4.5] | ≤ 2 |
|  | 16 QAM | ≤ 6.5 | ≤ [4.5] | ≤ 2.5 |
|  | 64 QAM | ≤ 6.5 | ≤ [5] | ≤ 4.5 |
|  | 256 QAM | ≤ 8.5 | ≤ 8.5 | ≤ [8.5] |

Table 6.2D.2-3 Maximum power reduction (MPR) for power class 1.5 with dual Tx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Modulation | | MPR (dB) | | |
|  | | Edge RB allocations | Outer RB allocations | Inner RB allocations |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 6 | ≤ 1.5 | ≤ 0 |
|  | QPSK | ≤ 6.5 | ≤ 2 | ≤ 0 |
|  | 16 QAM | ≤ 6.5 | ≤ 3 | ≤ 1 |
|  | 64 QAM | ≤ 6.5 | ≤ 3.5 | ≤ 3 |
|  | 256 QAM | ≤ 6.5 | ≤ 5.5 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 6.5 | ≤ 4 | ≤ 1.5 |
|  | 16 QAM | ≤ 6.5 | ≤ 4 | ≤ 2 |
|  | 64 QAM | ≤ 6.5 | ≤ 4.5 | ≤ 4 |
|  | 256 QAM | ≤ 7.5 | ≤ 7.5 | ≤ 7.5 |
| NOTE 1: This table is targeted to large FWA form factor with 20 dB or above antenna isolation. | | | | |

Inner, outer and edge allocations are as defined in section 6.2.2 except for PC1.5 edge allocations which is for LCRB ≤ 4 RBs instead of LCRB ≤ 2 RBs for other power classes.

### 6.2D.3 UE additional maximum output power reduction for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the A-MPR values specified in clause 6.2.3 shall apply to the maximum output power specified in Table 6.2D.1-1. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connector. Unless stated otherwise, an A-MPR of 0 dB shall be used.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the A-MPR values specified in clause 6.2.3 shall apply to the maximum output power specified in Table 6.2D.1-1. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode. For UE support uplink full power transmission (ULFPTx) for UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connector.

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

If the UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook-based transmission, the corresponding requirements in clause 6.2D.1 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling. A UE indicating the feature *ul-FullPwrMode-r16* or *ul-FullPwrMode2-TPMIGroup-r16* for a band shall meet the requirement in clause 6.2 for at least one connector with A-MPR according to clause 6.2.3 when scheduled for single antenna-port transmission by DCI format 0\_0 or by DCI format 0\_1 for codebook-based transmission on a single antenna port with precoding matrix *W*=1 [6.3.1.5 TS 38.211].

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

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

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

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

- MPRc is specified in clause 6.2D.2;

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

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

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

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

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

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

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

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

If the UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook-based transmission, the corresponding requirements in clause 6.2D.1 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling.

## 6.2E Transmitter power for V2X

### 6.2E.1 UE maximum output power for V2X

#### 6.2E.1.1 General

When NR V2X UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the allowed NR V2X UE maximum output power is specified in Table 6.2E.1.1-0.

Table 6.2E.1.1-0: NR V2X UE Power Class

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| NR band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) |
| n14 | 31 | +2/-3 |  |  | 23 | ±2 |
| n38 |  |  |  |  | 23 | ±2 |
| n47 |  |  | 26 | +2/-3 | 23 | ±2 |
| n79 |  |  |  |  | 23 | +2/-3 |

When a UE is configured for NR V2X sidelink transmissions in NR Band n47, the V2X UE shall meet the following additional requirements for transmission within the frequency ranges 5855-5925 MHz:

- The maximum mean power spectral density shall be restricted to 23 dBm/MHz EIRP when the network signaling value NS\_33 is indicated.

where the network signaling values are specified in clause 6.2E.3.

NOTE: The PSD limit in EIRP shall be converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11].

For NR V2X UE supporting SL MIMO or Tx diversity, the maximum output power requirements in Table 6.2E.1.1-1 is defined as the sum of the maximum output power from each UE antenna connector. The period of measurement shall be at least one sub frame (1 ms). For UE supporting SL MIMO, the requirements shall be met with the SL MIMO configurations specified in Table 6.2D.1-2.

Table 6.2E.1.1-1: NR V2X UE Power Class for SL-MIMO

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
|  |  |  |  |  |  |  |  |  |
| n38 |  |  |  |  | 23 | +2/-3 |  |  |
| n47 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n79 |  |  |  |  | 23 | +2/-3 |  |  |

If the UE transmits on one antenna connector at a time, the requirements in Table 6.2E.1.1-0 shall apply to the active antenna connector.

#### 6.2E.1.2 UE maximum output power for V2X con-current operation

For the inter-band NR V2X con-current operation, the maximum output power is specified in Table 6.2E.1.2-1 for each operating band. The period of measurement shall be at least one sub frame (1ms).

Table 6.2E.1.2-1: Power Class for NR V2X inter-band con-current combination (two bands)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR V2X con-current operating band Configuration | NR band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance  (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| V2X\_n1A-n47A | n1 |  |  |  |  | 23 | ±2 |  |  |
| n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n5A-n47A | n5 |  |  |  |  | 23 | ±2 |  |  |
| n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n8A-n47A | n8 |  |  |  |  | 23 | ±2 |  |  |
| n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n39A-n47A | n39 |  |  |  |  | 23 | +2/-3 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n40A-n47A | n40 |  |  |  |  | 23 | +2/-3 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n41A-n47A | n41 |  |  |  |  | 23 | +2/-3 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n71A-n47A | n71 |  |  |  |  | 23 | +2/-34 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n78A-n47A | n78 |  |  |  |  | 23 | +2/-3 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| V2X\_n79A-n47A | n79 |  |  |  |  | 23 | +2/-3 |  |  |
|  | n47 |  |  |  |  | 23 | +2/-3 |  |  |
| NOTE 1: For the con-current band combinations, the simultaneous transmission and reception of sidelink and Uu interfaces can be supported while operation is agnostic of the service used on each interface.  NOTE 2: PPowerClass is the maximum output power specified without taking into account the tolerance for each operating band.  NOTE 3: For inter-band con-current operation, the aggregation power apply to the total transmitted power over all component carriers (per UE).  NOTE 4: 4 refers to the transmission bandwidths (Figure 5.6-1) confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high – 4 MHz and FUL\_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB | | | | | | | | | |

For the intra-band con-current NR V2X operation, the maximum output power is specified in Table 6.2E.1.2-2. The period of measurement shall be at least one sub frame (1ms).

Table 6.2E.1.2-2: NR V2X UE Power Class for intra-band con-current combination

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR V2X con-current operating band Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance  (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| V2X\_n79B |  |  | 26 | +2/-32 | 23 | +2/-32 |  |  |
| NOTE 1: Void.  NOTE 2: PPowerClass is the maximum UE power specified without taking into account the tolerance  NOTE 3: For intra-band con-current aggregation the maximum power requirement apply to the total transmitted power over all component carriers (per UE).  NOTE 4: Power Class 3 is the default power class unless otherwise stated. | | | | | | | | |

### 6.2E.2 UE maximum output power reduction for V2X

#### 6.2E.2.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, this clause specifies the allowed Maximum Power Reduction (MPR) power for V2X physical channels and signals due to PSCCH/PSSCH, PSFCH and S-SSB transmission.

#### 6.2E.2.2 MPR for Power class 2 and Power class 3 V2X UE

For contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed MPR for the maximum output power for NR V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2E.2.2-1 for Power class 3 NR V2X UE and Table 6.2E.2.2-2 for power class 2 NR V2X UE.

Table 6.2E.2.2-1: Maximum Power Reduction (MPR) for power class 3 NR V2X

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation | | Channel bandwidth/MPR (dB) | |
|  | | Outer RB allocations | Inner RB allocations |
| CP-OFDM | QPSK | ≤ 4.5 | ≤ 2.5 |
|  | 16QAM | ≤ 4.5 | ≤ 2.5 |
|  | 64 QAM | ≤ 4.5 | |
|  | 256 QAM | ≤ 7.0 | |

Table 6.2E.2.2-2: Maximum Power Reduction (MPR) for power class 2 NR V2X

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation | | Channel bandwidth/MPR (dB) | |
|  | | Outer RB allocations | Inner RB allocations |
|  | QPSK | ≤ 5.5 | ≤ 2.5 |
| CP-OFDM | 16QAM |
|  | 64 QAM | ≤ 6 | ≤ 4.5 |
|  | 256 QAM | ≤ 7.0 | |

For NR V2X UE supporting SL MIMO or Tx diversity, the allowed MPR for the maximum output power for NR V2X physical channels PSCCH and PSSCH are specified in Table 6.2E.2.2-3 for power class 2 UE.

Table 6.2E.2.2-3: Maximum Power Reduction (MPR) for power class 2 NR V2X with dual Tx

|  |  |  |  |
| --- | --- | --- | --- |
| **Modulation** | | **Channel bandwidth/MPR (dB)** | |
| **Outer RB allocations** | **Inner RB allocations** |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 3.0 |
| 16QAM |
| 64 QAM | ≤ 7.0 | ≤ 5.5 |
| 256 QAM | ≤ 9.0 | |

Where the following parameters are defined to specify valid RB allocation ranges for Outer and Inner RB allocations:

NRB is the maximum number of RBs for a given Channel bandwidth and sub-carrier spacing defined in Table 5.3.2-1.

RBStart,Low = max(1, floor(LCRB/2))

where max() indicates the largest value of all arguments and floor(x) is the greatest integer less than or equal to x.

RBStart,High = NRB – RBStart,Low – LCRB

The RB allocation is an Inner RB allocation if the following conditions are met

RBStart,Low ≤ RBStart ≤ RBStart,High,and

LCRB ≤ ceil(NRB/2)

where ceil(x) is the smallest integer greater than or equal to x.

The RB allocation is an Outer RB allocation for all other allocations which are not an Inner RB allocation.

For PSFCH with single RB transmission for PC3 NR V2X UE, the required MPR is defined as follow

MPR\_PSFCH = 3.5 dB

For contiguous and non-contiguous allocation for simultaneous PSFCH transmission for PC3 NR V2X UE, the required MPR are specified as follow

MPR\_PSFCH = CEIL {MA\_PSFCH, 0.5}

Where MA\_PSFCH for power class 3 is defined as follows

MA\_PSFCH = 7.5 ; 0.00< NGap/NRB ≤ 0.55

= 12.0 ; 0.55< NGap/NRB ≤1.0

For PSFCH with single RB transmission for PC2 NR V2X UE, the required MPR is defined as follow

MPR\_PSFCH = 4.5 dB

For contiguous and non-contiguous allocation for simultaneous PSFCH transmission for PC2 NR V2X UE, the required MPR are specified as follow

MPR\_PSFCH = CEIL {MA\_PSFCH, 0.5}

Where MA is defined as follows

Where MA\_PSFCH for power class 2 is defined as follows

MA\_PSFCH = 8.5 ; 0.00 ≤ NGap/NRB < 0.4

= 10.0 ; 0.4 ≤ NGap/NRB < 0.55

= 14.0 ; 0.55 ≤ NGap/NRB ≤ 1.0

Where,

NGap is the gap RB amount between RBstart and RBend for contiguous and non-contiguous allocation simultaneous PSFCH transmission. (NGap = RBend - RBstart)

CEIL{MA, 0.5} means rounding upwards to closest 0.5dB.

The allowed MPR for the maximum output power for NR V2X physical channels on S-SSB transmission shall be specified in Table 6.2E.2.2-2 for power class 3 and power class 2.

Table 6.2E.2.2-2: Maximum Power Reduction (MPR) for S-SSB transmission for power class 3 and power class 2 NR V2X

|  |  |  |
| --- | --- | --- |
| Channel | MPRS-SSB (dB) | |
|  | Outer RB allocations | Inner RB allocations |
| S-SSB | ≤ 6.0 | ≤ 2.5 |

For NR V2X UE with two transmit antenna connectors, the allowed Maximum Power Reduction (MPR) values specified in clause 6.2E.2 for PC3 and PC2 shall apply to the maximum output power specified in Table 6.2E.1.1-1. For UE supporting SL MIMO, the requirements shall be met with SL MIMO configurations defined in Table 6.2D.1-2. For UE supporting SL MIMO or Tx diversity, the maximum output power is defined as the sum of the maximum output power from each UE antenna connector.

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

#### 6.2E.2.3 MPR for Power class 2 and Power class 3 V2X con-current operation

For the inter-band con-current NR V2X operation, the allowed maximum power reduction (MPR) for the maximum output power shall be applied per each component carrier. The MPR requirements in clause 6.2.2 apply for NR Uu operation in licensed band, and the MPR requirements in clause 6.2E.2 apply for NR sidelink operation in licensed band or Band n47.

For the intra-band con-current NR V2X operation with contiguous RB allocation, the allowed maximum power reduction (MPR) for NR V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2E.2.3-1 for Power class 3 V2X con-current UE.

Table 6.2E.2.3-1: MPR for contiguous RB allocation for power class 3 NR V2X con-current UE

|  |  |  |  |
| --- | --- | --- | --- |
| Higher Modulation order between Sidelink and Uplink | | MPR for bandwidth class B(dB) | |
| Inner RB allocation | Outer RB allocation |
| CP-OFDM | QPSK | ≤ 2.5 | ≤ 4.5 |
| 16QAM | ≤ 2.5 | ≤ 4.5 |
| 64QAM | ≤ 4.5 | ≤ 5.0 |
| 256QAM | ≤ 6.0 | ≤ 6.0 |

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

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

In contiguous NR V2X intra-band con-current operation, a contiguous allocation is an inner allocation if

RBStart,Low ≤ RBStart\_SL&UL ≤ RBStart,High,and NRB\_alloc ≤ ceil(NRB,agg /2),

where

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

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

with

NRB\_alloc= LCRB1 ∙ 2µ1 + LCRB2 ∙ 2µ2

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

NRB,agg=NRB1∙2µ1+ NRB2∙2µ2.

If LCRB1 =0, RBStart\_SL&UL = NRB1∙2µ1+ RBStart2∙2µ2,

if LCRB1 > 0, RBStart\_SL&UL = RBStart1∙2µ1.

Where, µ1 and µ2 is 0, 1 and 2 for SCS of 15kHz, 30kHz and 60kHz respectively.

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

For the intra-band con-current NR V2X operation with non-contiguous RB allocation, the allowed maximum power reduction (MPR) for NR V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2E.2.3-2 for Power class 3 V2X con-current UE.

Table 6.2E.2.3-2: MPR for non-contiguous RB allocation for power class 3 NR V2X con-current UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Higher Modulation order between Sidelink and Uplink | | MPR for bandwidth class B(dB) | | |
| Inner RB allocation | Outer1 RB allocation | Outer2 RB allocation |
| CP-OFDM | QPSK | ≤ 2.5 | ≤ 4.0 | ≤ 4.5 |
| 16QAM | ≤ 2.5 | ≤ 4.0 | ≤ 4.5 |
| 64QAM | ≤ 4.5 | ≤ 4.5 | ≤ 5.0 |
| 256QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |

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

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

In contiguous NR V2X intra-band con-current operation, a non-contiguous RB allocation is a non-contiguous Inner RB allocation if the following conditions are met:

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

where

NRB\_alloc = (NRB1 - RBStart1)∙ 2µ1 + (RBStart2 + LCRB2 ) ∙ 2µ2, RBStart\_SL&UL = RBStart1∙2μ1

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

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

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

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

In contiguous NR V2X intra-band con-current operation, a non-contiguous RB allocation is a non-contiguous outer 1 RB allocation if the following conditions are met:

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

where

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

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

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

In contiguous NR V2X intra-band con-current operation, a non-contiguous allocation is an Outer 2 allocation if it is neither a non-contiguous Inner allocation nor an Outer 1 allocation.

For PSFCH with single RB transmission for PC3 NR V2X intra-band con-current UE, the required MPR is specified in clause 6.2E.2.2 shall be applied.

For the allowed MPR for S-SSB transmission for PC3 NR V2X intra-band con-current UE, the required MPR is specified in clasue 6.2E.2.2 shall be applied.

For the intra-band con-current NR V2X operation with contiguous RB allocation in contiguous carrier, the allowed maximum power reduction (MPR) for NR V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2E.2.3-3 for Power class 2 V2X con-current UE.

Table 6.2E.2.3-3: MPR for contiguous RB allocation for power class 2 NR V2X con-current UE

|  |  |  |  |
| --- | --- | --- | --- |
| Higher Modulation order between Sidelink and Uplink | | MPR for bandwidth class B(dB) | |
| Inner RB allocation | Outer RB allocation |
| CP-OFDM | QPSK | ≤ 3.0 | ≤ 5.5 |
| 16QAM | ≤ 4.0 | ≤ 5.5 |
| 64QAM | ≤ 5.5 | ≤ 6.0 |
| 256QAM | ≤ 7.5 | ≤ 7.5 |

For the intra-band con-current NR V2X operation with non-contiguous RB allocation in contiguous carrier, the allowed maximum power reduction (MPR) for NR V2X physical channels PSCCH and PSSCH shall be as specified in Table 6.2E.2.3-4 for Power class 2 V2X con-current UE.

Table 6.2E.2.3-4: MPR for non-contiguous RB allocation for power class 2 NR V2X con-current UE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Higher Modulation order between Sidelink and Uplink | | MPR for bandwidth class B(dB) | | |
| Inner RB allocation | Outer1 RB allocation | Outer2 RB allocation |
| CP-OFDM | QPSK | ≤ 3.0 | ≤ 5.5 | ≤ 6.0 |
| 16QAM | ≤ 4.5 | ≤ 5.5 | ≤ 6.5 |
| 64QAM | ≤ 5.5 | ≤ 6.5 | ≤ 7.0 |
| 256QAM | ≤ 8.0 | ≤ 8.0 | ≤ 8.0 |

The parameters in clause 6.2E.2.3 are considered to determine MPR values according to RB allocation.

For PSFCH with single RB transmission for PC2 NR V2X intra-band con-current UE, the required MPR is specified in clause 6.2E.2.2 shall be applied.

For the allowed MPR for S-SSB transmission for PC2 NR V2X intra-band con-current UE, the required MPR is specified in clause 6.2E.2.2 shall be applied.

#### 6.2E.2.4 MPR for Power class 1 UE in Band n14

For NR Public Safety (PS) UE with contiguous allocation of PSCCH and PSSCH simultaneous transmission, the allowed NR PS UE maximum output power reduction for power class 1 UE shall meet the NR V2X MPR values specified in Table 6.2E.2.2-1 of clause 6.2E.2.2.

For NR Public Safety (PS) UE of single or multiple PSFCH simultaneous transmission, the allowed NR PS UE maximum output power reduction for power class 1 UE shall meet the NR V2X MPR values for PC3 UE’s PSFCH transmission in clause 6.2E.2.2.

For NR Public Safety (PS) UE of S-SSB transmission, the allowed NR PS UE maximum output power reduction for power class 1 UE shall meet the NR V2X MPR values specified in Table 6.2E.2.2-2 of clause 6.2E.2.2.

### 6.2E.3 UE additional maximum output power reduction for V2X

#### 6.2E.3.1 General

For the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in clause 6.2E.2 and A-MPR requirements specified in current clause.

Additional emission requirements can be indicated by the network or pre-configured radio parameters. 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 V2X 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 6.2.1-1. Outer and inner allocation notation used in clause 6.2E.3 is defined in clause 6.2E.2. In absence of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2E.3.1-1: Additional Maximum Power Reduction (A-MPR) for PC3 NR V2X

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Network Signalling value | Requirements (clause) | NR Band | Channel bandwidth (MHz) | Resources Blocks (*N*RB) | A-MPR (dB) |
| NS\_01 |  | Table 5.2E.1-1 | 10, 20, 30, 40 | Table 5.3.2-1 | N/A |
| NS\_06 | 6.5.2.3.4 (A-SEM) | n14 | 5, 10 | Table 5.3.2-1 | N/A |
| NS\_33 | 6.5E.2.3.1 (A-SEM)  6.5E.3.4 (A-SE) | n47 | 10 | Clause 6.2E.3.2 | |
| NS\_52 | 6.5E.2.3.2 (A-SEM) | n47 | 40 | Clause 6.2E.3.3 | |

Table 6.2E.3.1-2: Mapping of network signaling label

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR V2X operating bands | Value of additionalSpectrumEmission | | | | | | | | |
|  | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| n142 | NS\_01 | NS\_06 |  |  |  |  |  |  |
| n38 | NS\_01 |  |  |  |  |  |  |  |
| n47 | NS\_01 | NS\_33 | NS\_52 |  |  |  |  |  |
| NOTE 1: [*additionalSpectrumEmission*] corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7].  NOTE 2: For the NR PS UE in n14, same A-MPR shall be applied for PC1 PS UE since PC1 PS UE for Band n14 is not targeted for smartphone form factor. | | | | | | | | | |

For UE with two transmit antenna connectors, the A-MPR values specified in clause 6.2E.3.2 and 6.2E.3.3 shall apply to the maximum output power specified in Table 6.2E.1.1-1. The requirements shall be met with the SL MIMO configurations specified in Table 6.2D.1-2. For UE supporting SL MIMO or Tx Diversity, the maximum output power is defined as the sum of the maximum output power from each UE antenna connector. Unless stated otherwise, an A-MPR of 0 dB shall be used.

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

#### 6.2E.3.2 A-MPR for V2X UE by NS\_33

When NS\_33 is indicated by the network or pre-configured radio parameters for NR V2X UE, the additional maximum output power reduction specified as

A-MPR = CEIL {MA, 0.5}

Where MA is defined as follows

MA = A-MPRBase + Gpost connector\* A-MPRStep

CEIL{MA, 0.5} means rounding upwards to closest 0.5dB.

A-MPRBase and A-MPRStep are specified in Tables 6.2E.3.2-1, 6.2E.3.2-2 is allowed when network signalling value is provided*.* A-MPRBase is the default A-MPR value when no Gpost connector is declared. The supported post antenna connector gain Gpost connector is declared by the UE following the principle described in annex I in [11]. The A-MPRstep is the increase in A-MPR allowance to allow UE to meet tighter conducted A-SE and A-SEM requirements with higher value of declared Gpost connector.

For the contiguous PSSCH and PSCCH transmission when NS\_33 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements specified in Table 6.2E.3.2-1 and 6.2E.3.2-2 for power class 3. And A-MPR requirements specified in Table 6.2E.3.2-2a and 6.2E.3.2-2b for power class 2 are allowed for NR V2X UE.

Table 6.2E.3.2-1: PC3 A-MPR for PSSCH/PSCCH by NS\_33 (at Fc =5860MHz)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Carrier frequency [MHz] | Resources Blocks (*L*CRB) | Start Resource  Block | A-MPRBase (dB) | | |
|  |  |  | QPSK/16QAM | 64QAM | 256QAM |
| 5860 | ≥ 10 and ≤ 15 | 0 | ≤ 24 | | |
|  |  | ≥ 1 and ≤ 3 | ≤19 | | |
|  | ≥ 10 and ≤ 15 | ≥ 26 and ≤ 38 | ≤6 | | |
|  | ≥ 10 and ≤ 15 | ≥38 | ≤ 6 | | |
|  | ≥ 10 and ≤ 20 | ≥ 12 and ≤ 14 | ≤11 | | |
|  |  | ≥ 15 and ≤ 19 | ≤9.5 | | |
|  |  | ≥ 20 and ≤ 25 | ≤8.0 | | |
|  | > 15 and < 25 | ≥ 25 | ≤ 8 | | |
|  | ≥ 10 and < 40 | ≥ 4 and ≤7 | ≤ 16 | | |
|  |  | ≥ 8 and ≤ 11 | ≤ 13.5 | | |
|  | ≥ 20 and < 40 | ≥ 0 and ≤ 3 | ≤ 22 | | |
|  | ≥ 25 and < 40 | ≥ 16 and ≤ 21 | ≤ 9.5 | | |
|  |  | ≥ 22 and ≤ 27 | ≤ 8.0 | | |
|  | ≥ 24 and ≤ 40 | ≥ 12 and ≤ 15 | ≤ 12 | | |
|  | 40 and 45 | 0 and 1 | ≤ 19 | | |
|  |  | ≥ 2 and ≤ 5 | ≤ 16 | | |
|  |  | ≥ 6 and ≤ 11 | ≤ 13.5 | | |
|  | >45 | ≥ 0 | ≤ 16 | | |
| NOTE 1: A-MPRstep =1.2 dB is applied for RBstart 0 and 1 and A-MPRstep =0.7 dB is applied for all other RBstart  NOTE 2: Applicable for Channel Bandwidth = 10 MHz | | | | | |

Table 6.2E.3.2-2: PC3 A-MPR for PSSCH/PSCCH by NS\_33 (at other carrier frequency)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Carrier frequency [MHz] | RB allocations | A-MPRBase (dB) | | | | A-MPRstep (dB) |
|  |  | QPSK | 16QAM | 64QAM | 256QAM |
| 5870, 5880, 5890, 5900, 5910, 5920 | Inner | ≤ 3.0 | | ≤ 5.0 | ≤ 6.0 | 0.5 |
|  | Outer | ≤ 4.5 | |  |  |  |
| NOTE 1: Inner and Outer RB allocations are defined in clause 6.2E.2.2  NOTE 2: Applicable for Channel Bandwidth = 10 MHz | | | | | | |

Table 6.2E.3.2-2a: PC2 A-MPR for PSCCH/PSSCH by NS\_33 (at Fc=5860MHz)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Carrier frequency [MHz] | Resource Block (LCRB) | Start Resource Block | A-MPR(dB) | | |
| QPSK/16QAM | 64QAM | 256QAM |
| 5860 | ≥ 10 and ≤ 15 | 0 and 1 | ≤ 24 | | |
| 2 and 3 | ≤ 22 | | |
| 4 | ≤ 20 | | |
| ≥ 10 and ≤ 25 | ≥ 5 and ≤ 7 | ≤ 17.5 | | |
| ≥ 10 and ≤ 30 | 10 | ≤ 16 | | |
| ≥ 10 | 8 and 9 | ≤ 16 | | |
| ≥ 11 and ≤ 14 | ≤ 14.5 | | |
| ≥ 15 and ≤ 19 | ≤ 13 | | |
| ≥ 20 and ≤ 24 | ≤ 11.5 | | |
| ≥ 25 and ≤ 29 | ≤ 10 | | |
| ≥ 30 | ≤ 8.5 | | |
| ≥ 20 and ≤ 24 | 1 | ≤ 22 | | |
| ≥ 20 and ≤ 30 | 0 | ≤ 22 | | |
| 2 and 3 | ≤ 20 | | |
| 4 | ≤ 17.5 | | |
| ≥ 25 and ≤ 40 | 1 | ≤ 20 | | |
| ≥ 30 | ≥ 5 and ≤ 7 | ≤ 16 | | |
| ≥ 36 | 0 | ≤ 20 | | |
| ≥ 2 and ≤ 4 | ≤ 17.5 | | |
| 10 | ≤ 14.5 | | |
| ≥ 45 | 1 | ≤ 17.5 | | |
| NOTE 1: A-MPRstep =1.2 dB is applied for RBstart 0 and 1 and A-MPRstep =0.7 dB is applied for all other RBstart  NOTE 2: Applicable for Channel Bandwidth = 10 MHz | | | | | |

Table 6.2E.3.2-2b: PC2 A-MPR for PSSCH/PSCCH by NS\_33 (at other carrier frequency)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Carrier frequency [MHz] | RB allocations | A-MPR (dB) | | | |
| QPSK | 16QAM | 64QAM | 256QAM |
| 5870,5910,5920 | outer | ≤ 8.5 | | | ≤ 8.5 |
| inner | ≤ 6.0 | | |
| 5880,5890,5900 | outer | ≤ 6.0 | | | ≤ 6.5 |
| inner | ≤ 3.5 | | ≤ 4.5 |
| NOTE 1: Inner and Outer RB allocations are defined in clause 6.2E.2.1  NOTE 2: Applicable for Channel Bandwidth = 10 MHz | | | | | |

For the simultaneous PSFCH transmission when NS\_33 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements specified in Table 6.2E.3.2-3 for power class 3 and in Table 6.2E.3.2-3a for power class 2.

Table 6.2E.3.2-3: PC3 A-MPR for simultaneous PSFCH by NS\_33

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth  [MHz] | Center Frequency  [MHz] | RB allocation | A-MPRBase (dB) | | | A-MPRstep (dB) |
|  |  |  | 0 ≤ NGap / NRB < 0.15 | 0.15≤ NGap / NRB < 0.3 | 0.3≤ NGap / NRB ≤ 1 |  |
| 10 | 5860 | NRB =1 | 19.0 | | | 1.0 |
|  | NRB > 1 | 22.0 | | |  |
|  | 5870, 5880, 5890, 5900, 5910, 5920 | NRB =1 | 5 | | | 0.8 |
| NRB > 1 | 14 | 7 | 18.5 |  |
| Note 1: NGap is the gap RB amount between RBstart and RBend for contiguous and non-contiguous allocation simultaneous PSFCH transmission. (NGap = RBend - RBstart) | | | | | | |

Table 6.2E.3.2-3a: PC2 A-MPR for simultaneous PSFCH by NS\_33

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Channel Bandwidth  [MHz] | Center Frequency  [MHz] | RB allocation | A-MPRBase (dB) | | | A-MPRstep (dB) |
|  |  |  | 0 ≤ NGap / NRB < 0.2 | 0.2≤ NGap / NRB < 0.4 | 0.4≤ NGap / NRB ≤ 1 |  |
| 10 | 5860 | NRB =1 | 25.0 | | | 1.0 |
|  | NRB > 1 | 22.0 | | |  |
|  | 5870, 5880, 5890, 5900, 5910, 5920 | NRB =1 | 5 | | | 0.8 |
| NRB > 1 | 16.5 | 12 | 20 |  |
| Note 1: NGap is the gap RB amount between RBstart and RBend for contiguous and non-contiguous allocation simultaneous PSFCH transmission. (NGap = RBend - RBstart) | | | | | | |

For the S-SSB transmission when NS\_33 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements specified in Table 6.2E.3.2-4 for power class 3 and in Table 6.2E.3.2-5 for power class 2.

Table 6.2E.3.2-4: PC3 A-MPR for S-SSB transmission by NS\_33

|  |  |  |  |
| --- | --- | --- | --- |
| Carrier Frequency (MHz) | RBStart \* 12\*SCS  [MHz] | A-MPRBase (dB) | AMPRStep (dB) |
| 5860 | ≤1.0 | ≤ 25 | 0.6 |
|  | >1.0 and ≤2.0 | ≤ 19 |  |
|  | >2.0 and ≤3.24 | ≤ 12 |  |
|  | >3.24 and ≤3.6 | ≤ 10 |  |
|  | >3.6 | ≤ 9 |  |
| 5870, 5880, 5890, 5900, 5910, 5920 | ≤1.0 | ≤ 7.0 | 0.85 |
|  | >1.0 and ≤1.6 | ≤ 6.5 |  |
|  | >1.6 and ≤2.6 | ≤ 5.8 |  |
|  | >2.6 and ≤3.24 | ≤ 4.5 |  |
|  | >3.24 and ≤4.32 | ≤ 5.5 |  |
|  | >4.32 | ≤ 6.5 |  |

Table 6.2E.3.2-5: PC2 A-MPR for S-SSB transmission by NS\_33

|  |  |  |  |
| --- | --- | --- | --- |
| Carrier Frequency (MHz) | RBStart \* 12\*SCS  [MHz] | A-MPRBase (dB) | AMPRStep (dB) |
| 5860 | ≤1.0 | ≤ 25 | 0.6 |
|  | >1.0 and ≤2.0 | ≤ 19 |  |
|  | >2.0 and ≤3.24 | ≤ 12 |  |
|  | >3.24 and ≤3.6 | ≤ 10 |  |
|  | >3.6 | ≤ 14 |  |
| 5870, 5880, 5890, 5900, 5910, 5920 | ≤1.0 | ≤ 7.0 | 0.85 |
|  | >1.0 and ≤1.6 | ≤ 6.5 |  |
|  | >1.6 and ≤2.6 | ≤ 5.8 |  |
|  | >2.6 and ≤3.24 | ≤ 4.5 |  |
|  | >3.24 and ≤4.32 | ≤ 5.5 |  |
|  | >4.32 | ≤ 6.5 |  |

#### 6.2E.3.3 A-MPR for Power class 3 V2X UE by NS\_52

When NS\_52 is indicated by the network or pre-configured radio parameters for NR V2X UE, the additional maximum output power reduction specified as

A-MPR = CEIL {MA, 0.5}

Where MA is defined as follows

MA = A-MPR

CEIL{MA, 0.5} means rounding upwards to closest 0.5dB.

For the contiguous PSSCH and PSCCH transmission when NS\_52 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements.

Table 6.2E.3.3-1: A-MPR for PSSCH/PSCCH by NS\_52

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Carrier frequency(MHz) | Modulation | A-MPR(dB) | | |
|  |  | Region 1 | Region 2 | Region 3 |
| 5885 | QPSK | ≤ 15 | ≤ 8.0 | ≤ 5.5 |
|  | 16QAM |  | ≤ 8.0 | ≤ 5.5 |
|  | 64QAM |  | ≤ 8.5 | ≤ 5.5 |
|  | 256QAM |  | ≤ 8.5 | ≤ 6.0 |
| Note1: Void. | | | | |

Where the following parameters are defined to specify valid RB allocation ranges for Region1, Region2 and Region3 according to RB allocations:

Table 6.2E.3.3-1a: A-MPR Region definitions for PSSCH/PSCCH by NS\_52

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier frequency (MHz) | A-MPR parameters for region definitions | | A-MPR |
|  |  | RBstart or RBend | LCRB |  |
| 40 | 5885 | **RBstart** ≤ floor(NRB\*0.2) or **RBend** ≥ NRB - floor(NRB\*0.2) | **LCRB** ≤floor(NRB\*0.2) | Region 1 |
|  |  | The RB allocation is in Region 2 allocation for all other allocations which are not a Region1 or Region3 allocation. | | Region 2 |
|  |  | floor(NRB /3.5) ≤ **RBstart** ≤ NRB –floor(NRB /3.5) – LCRB | **LCRB** ≤ceil(NRB/3.5) | Region 3 |

NRB is the maximum number of RBs for a given Channel bandwidth and sub-carrier spacing defined in Table 5.3.2-1 [3].

For the simultaneous PSFCH transmission when NS\_52 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements

Table 6.2E.3.3-2: A-MPR for simultaneous PSFCH by NS\_52

|  |  |  |
| --- | --- | --- |
| Channel Bandwidth [MHz] | Carrier frequency [MHz] | A-MPR (dB) |
| 40 MHz | 5885 | 23.5 |

For the S-SSB transmission when NS\_52 is indicated by the network or pre-configured radio parameters for NR V2X UE, the NR UE allow the follow A-MPR requirements

Table 6.2E.3.2-3: A-MPR for S-SSB transmission by NS\_52

|  |  |  |
| --- | --- | --- |
| Carrier Frequency [MHz] | RBStart \* 12\*SCS  [MHz] | A-MPR (dB) |
| 5885 | ≤ 7 | ≤ 16 |
|  | > 7 and ≤ 12 | ≤ 10.5 |
|  | > 12 and ≤ 19 | ≤ 4.0 |
|  | > 19 and ≤ 25 | ≤ 10.5 |
|  | > 25 | ≤ 16 |

#### 6.2E.3.4 A-MPR for V2X con-current operation

For the inter-band con-current NR V2X operation, the allowed additional maximum power reduction (A-MPR) for the maximum output power shall be applied per each component carrier. The A-MPR requirements in clause 6.2.3 apply for NR Uu operation in licensed band, and the A-MPR requirements in clause 6.2E.3.2 and 6.2E.3.3 apply for NR sidelink operation in Band n47.

For the intra-band con-current NR V2X operation, the A-MPR requirements in [6.2E.3.4] apply for NR Uu and SL con-current operation in the licensed band.

### 6.2E.4 Configured transmitted power for V2X

#### 6.2E.4.1 General

The NR V2X UE is allowed to set its configured maximum output power PCMAX,f,*c* for carrier f of serving cell *c* in each slot. The configured maximum output power PCMAX,f,*c* is set within the following bounds:

PCMAX\_L,f,c ≤ PCMAX,f,*c* ≤ PCMAX\_H,f,*c* with

PCMAX\_L,f, *c* = MIN {PEMAX,*c*, PPowerClass, V2X – MAX(MAX(MPR*c* , A-MPR*c*) + TIB,*c* , P-MPR*c*), PRegulatory,c }

PCMAX\_H,f, c = MIN {PEMAX,c, PPowerClass, V2X, PRegulatory,c }

where

- PCMAX,f,*c* is configured for PSSCH\PSCCH, S-SSB and PSFCH, respectively;

- For the total transmitted power PCMAX,PSSCH/PSCCH, PEMAX,c is the value given by IE *sl-maxTransPower*, defined by TS 38.331

- For the total transmitted power PCMAX,S-SSB, the PCMAX\_L,f,*c* and PCMAX\_H,f,*c* are defined as follows:

PCMAX\_L,f,*c* = MIN {PPowerClass, V2X – MAX(MAX(MPR*c* , A-MPR*c*) + TIB,*c* , P-MPR*c*), PRegulatory,c}

PCMAX\_H,f,*c* = MIN {PPowerClass, V2X, PRegulatory,c}

- For the total transmitted power PCMAX,PSFCH, PEMAX,c is the value given by IE *sl-maxTransPower* when single resource pool configured is transmitted at a given time and sum of the IEs *sl-maxTransPower* when multiple resource pools configured are transmitted at a given time, defined by TS 38.331.

- PPowerClass,V2X is the maximum UE power specified in Table 6.2E.1.1-1 without taking into account the tolerance specified in the Table 6.2E.1.1-1;

- MPR*c* and A-MPR*c* for serving cell *c* are specified in clause 6.2E.2 and clause 6.2E.3 for PSSCH\PSCCH, S-SSB and PSFCH, respectively;

- TIB,c, and P-MPR*c* are specified in clause 6.2.4

- PRegulatory,c= 10 - Gpost connector dBm the V2X UE is within the protected zone [12] of CEN DSRC tolling system and operating in Band n47; PRegulatory,c= 33 - Gpost connector dBm otherwise.

The maximum output power P*CMAX,PSSCH* and P*CMAX,PSCCH* are derived from PCMAX,c based on 0dB PSD offset between PSSCH and PSCCH.

For the measured configured maximum output power PUMAX,*c* for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions, the same requirement as in clause 6.2.4 shall be applied.

For NR V2X UE supporting SL MIMO or Tx Diversity, the transmitted power is configured per each UE.

For NR V2X UE with two transmit antenna connectors at the same time, the tolerance is specified in Table 6.2E.4.1-1. The requirements shall be met with SL MIMO configurations specified in Table 6.2D.1-2.

Table 6.2E.4.1-1: PCMAX,*c* tolerance schemes for MIMO

|  |  |  |
| --- | --- | --- |
| PCMAX,*c*(dBm) | Tolerance TLOW(PCMAX\_L,*c*) (dB) | Tolerance THIGH(PCMAX\_H,*c*) (dB) |
| PCMAX,*c* = 26 | 3.0 | 2.0 |
| 23 ≤ PCMAX,*c* < 26 | 3.0 | 2.0 |
| 22 ≤ PCMAX,*c* < 23 | 5.0 | 2.0 |
| 21 ≤ PCMAX,*c* < 22 | 5.0 | 3.0 |
| 20 ≤ PCMAX,*c* < 21 | 6.0 | 4.0 |
| 16 ≤ PCMAX,*c* < 20 | 5.0 | |
| 11 ≤ PCMAX,*c* < 16 | 6.0 | |
| -40 ≤ PCMAX,*c* < 11 | 7.0 | |

#### 6.2E.4.2 Configured transmitted power for inter-band V2X con-current operation

When a UE is configured for simultaneous NR V2X sidelink and NR uplink transmissions for inter-band con-current operation, the UE is allowed to set its configured maximum output power PCMAX,*c*,*NR*and PCMAX,*c*,*V2X*for the configured NR uplink carrier and the configured NR V2X carrier, respectively, and its total configured maximum output power PCMAX,c.

The configured maximum output power PCMAX *c*,*NR(p)* in slot *p* for the configured NR uplink carrier shall be set within the bounds:

PCMAX\_L,*c,NR* (*p*) ≤ PCMAX,*c,NR* (*p*) ≤ PCMAX\_H,*c,NR* (*p*)

where PCMAX\_L,*c,NR* andPCMAX\_H,*c,NR* are the limit as specified in clause 6.2E.4.1.

The configured maximum output power PCMAX *c*,*V2X (q)* in slot *q* for the configured NR V2X carrier shall be set within the bounds:

PCMAX,*c,V2X* (*q*) ≤ PCMAX\_H,*c,V2X* (*q*)

where PCMAX\_H,*c,V2X* is the limit as specified in clause 6.2E.4.

The total UE configured maximum output power PCMAX (*p,q*) in a slot *p* of NR uplink carrier and a slot *q* of NR V2X sidelink that overlap in time shall be set within the following bounds for synchronous and asynchronous operation unless stated otherwise:

PCMAX\_L (*p,q*) ≤ PCMAX (*p,q*) ≤ PCMAX\_H (*p,q*)

with

PCMAX\_L (*p,q*) = PCMAX\_L,*c,NR* (*p*)

PCMAX\_H (*p,q*) = 10 log10 [pCMAX\_H,*c,NR*(*p*) + pCMAX\_H,*c,V2X*(*q*)]

where pCMAX\_H*,c,V2X* and pCMAX\_H,*c,NR*are the limits PCMAX\_H,*c,V2X* (*q*) and PCMAX\_H,*c,NR* (*p*) expressed in linear scale.

The measured total maximum output power PUMAX over both the NR uplink and NR V2X carriers is

PUMAX = 10 log10 [pUMAX,*c,NR* + pUMAX,*c,V2X*],

where pUMAX,*c,NR*  denotes the measured output power of serving cell *c* for the configured NR uplink carrier, and pUMAX,*c,V2X* denotes the measured output power for the configured NR V2X carrier expressed in linear scale.

When a UE is configured for synchronous V2X sidelink and uplink transmissions,

PCMAX\_L(*p, q*)  – TLOW (PCMAX\_L(*p, q*)) ≤ PUMAX  ≤ PCMAX\_H(*p, q*) + THIGH (PCMAX\_H(*p, q*))

where PCMAX\_L (*p,q*) and PCMAX\_H (*p,q*) are the limits for the pair (*p,q*) and with the tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX specified in Table 6.2E.4.1-1.. PCMAX\_L may be modified for any overlapping portion of slots *(p, q)* and *(p +1, q+1).*

#### 6.2E.4.3 Configured transmitted power for intra-band V2X con-current operation

For intra-band con-current operation, if transmission of Uu and SL does not overlap in time, the configured output power PCMAX,*c* specified in clause 6.2E.4.1 and 6.2.4 apply for SL and Uu transmission respectively; otherwise, if transmission of Uu and SL overlap in time, the configured maximum output power PCMAX,*c* on serving cell *c* for SL and Uu shall be set as specified in clause 6.2E.4.1 and in clause 6.2.4, but with MPR*c* = MPR and A-MPR*c* = A-MPR with MPR and A-MPR as determined by subclause 6.2E.2.3 for both PC3 and PC2 and subclause 6.2E.3.4, respectively. There is one power management term for the UE, denoted P-MPR, and P-MPR*c* = P-MPR.

The total configured maximum output power PCMAX shall be set within the following bounds:

PCMAX\_L ≤ PCMAX ≤ PCMAX\_H

For intra-band concurrent operation when same slot pattern is used in all aggregated serving cells,

PCMAX\_L  = MIN{10 log10 ∑ pEMAX,c  - TC , PPowerClass,con-current – MAX(MAX(MPR, A-MPR) + ΔTIB,c + TC, P-MPR) }

PCMAX\_H  = MIN{10 log10 ∑ pEMAX,c , PPowerClass,con-current}

where

- pEMAX,c is the linear value of PEMAX,*c* which is given by IE *P-Max* for Uu serving cell *c* or by IE *sl-MaxTransPower* for SL defined in [7];

- PPowerClass,con-current is the maximum UE power specified in Table 6.2E.1.2-2 without taking into account the tolerance;

- MPR and A-MPR are specified in clause 6.2E.2 and 6.2E.3, respectively;

- TIB,c is the additional tolerance for serving cell *c* as specified in clause 6.2E.4.3

- P-MPR is the power management term for the UE;

- TC is the highest value TC,c among all serving cells *c*;

For intra-band concurrent operation, when at least one different numerology/slot pattern is used in aggregated cells, the UE is allowed to set its configured maximum output power PCMAX,c(i),i for serving cell c(i) of slot numerology type *i*, and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,c(i),i (p) in slot p of serving cell c(i) on slot numerology type *i* shall be set within the following bounds:

PCMAX\_L,f,c(i),i (p) ≤ PCMAX,f,c(i), i (p) ≤ PCMAX\_H,f,c(i),i (p)

where PCMAX\_L,f,c (i),i (p) and PCMAX\_H,f,c(i),i (p) are the limits for a serving cell c(i) of slot numerology type i as specified in clause 6.2.4.

The total UE configured maximum output power PCMAX (p,q) in a slot p of slot numerology or symbol pattern *i*, and a slot q of slot numerology or symbol pattern *j* that overlap in time shall be set within the following bounds unless stated otherwise:

PCMAX\_L(p,q) ≤ PCMAX (p,q) ≤ PCMAX\_H (p,q)

When slots p and q have different transmissions lengths and belong to different cells on same band for intra-band operation:

PCMAX\_L (p,q) = MIN {10 log10 [pCMAX\_L,f,c(i),Uu,i (p) + pCMAX\_L,f,c(i),V2X,j (q)], PPowerClass,con-current}

PCMAX\_H (p,q) = MIN {10 log10 [pCMAX\_ H,f,c(i), Uu,,i (p) + pCMAX\_ H,f,c(i),V2X,j (q)], PPowerClass,con-current}

where pCMAX\_L,f,c (i),Uu,i and pCMAX\_ H,f,c(i),Uu,i are the respective limits PCMAX\_L,f,c (i),Uu,i and PCMAX\_H,f,c(i),Uu,i expressed in linear scale.

TREF and Teval are specified in Table 6.2E.4.3-1 when same and different slot patterns are used in aggregated carriers. For each TREF, the PCMAX\_L is evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L over the one or more Teval is then applied for the entire TREF. PPowerClass,Concurrent shall not be exceeded by the UE during any period of time.

Table 6.2E.4.3-1: PCMAX evaluation window for different slot and channel durations

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| TREF of largest slot duration over both UL and SL CCs | Physical channel length | Min(Tno\_hopping, Physical Channel Length) |

The measured maximum output power PUMAX over all serving cells with same slot pattern shall be within the following range:

PCMAX\_L – MAX{TL, TLOW(PCMAX\_L) } ≤ PUMAX  ≤ PCMAX\_H + THIGH(PCMAX\_H)

PUMAX = 10 log10 ∑ pUMAX,c

where pUMAX,c denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX are specified in Table 6.2E.4.3-2. The tolerance TL is the absolute value of the lower tolerance for applicable NRV2X concurrent operation configuration as specified in Table 6.2 E.1.2-2 for intra-band NR V2X concurrent operation.

The measured maximum output power PUMAX over all serving cells, when at least one slot has a different transmission numerology or slot pattern, shall be within the following range:

P'CMAX\_L– MAX{TL, TLOW (P'CMAX\_L)} ≤ P'UMAX  ≤ P'CMAX\_H + THIGH (P'CMAX\_H)

P'UMAX = 10 log10 ∑ p'UMAX,c

where p'UMAX,c denotes the average measured maximum output power for serving cell *c* expressed in linear scale over TREF. The tolerances TLOW(P'CMAX) and THIGH(P'CMAX) for applicable values of P'CMAX are specified in Table 6.2E.4.3-2. The tolerance TL is the absolute value of the lower tolerance for applicable NR V2X concurrent operation configuration as specified in Table 6.2E.1.2-2 for intra-band NR V2X concurrent operation.

where:

P'CMAX\_L  = MIN{ MIN {10log10∑( pCMAX\_L,f,c(i),i), PPowerClass,concurrent} over all overlapping slots in TREF}

P'CMAX\_H = MAX{ MIN{10 log10 ∑ pEMAX,c , PPowerClass,concurrent} over all overlapping slots in TREF}

Table 6.2E.4.3-2: PCMAX tolerance for SL intra-band con-current operation

|  |  |  |
| --- | --- | --- |
| PCMAX (dBm) | Tolerance TLOW(PCMAX) (dB) | Tolerance THIGH(PCMAX) (dB) |
| 26 ≤ PCMAX < 23 | 3 | 2 |
| 21 ≤ PCMAX ≤ 23 | 2.0 | |
| 20 ≤ PCMAX < 21 | 2.5 | |
| 19 ≤ PCMAX < 20 | 3.5 | |
| 18 ≤ PCMAX < 19 | 4.0 | |
| 13 ≤ PCMAX < 18 | 5.0 | |
| 8 ≤ PCMAX < 13 | 6.0 | |
| -40 ≤ PCMAX < 8 | 7.0 | |

A UE supporting sidelink operation can be configured by higher layers with one or more sidelink resource pools. A sidelink resource pool can be associated with either sidelink resource allocation mode 1 or sidelink resource allocation mode 2.

For sidelink resource allocation in either mode 1 or mode 2, if UE is in RRC\_CONNECTED state, and the preparation procedure time for transmission of sidelink physical channel is available before of PUSCH preparation procedure time, for transmission of Uu and SL not overlap in time, the configured output power PCMAX,*c* specified in clause 6.2E.4.1 and in clause 6.2.4 apply for SL and Uu transmission respectively, otherwise, the configured maximum output power PCMAX specified in this clause shall apply.

For sidelink resource allocation mode 2, if UE is in RRC\_IDLE state, sidelink transmission is based on pre-configured sidelink resource pool, the UE configured output power is determined by sidelink only, where the configured output power specified in clause 6.2E.4.1 apply.

For sidelink resource allocation mode 2, if UE is in RRC\_INACTIVE state, and Uu does not support SDT, the configured output power specified in clause 6.2E.4.1 apply, otherwise, the configured maximum output power PCMAX in this clause shall apply.

## 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 |  |  |  |  | 23 | +2/-3 | 20 | +2/-3 |
| n96 |  |  |  |  | 23 | +2/-3 | 20 | +2/-3 |
| n102 |  |  |  |  | 23 | +2/-3 | 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 shall meet the following additional requirements for maximum mean transmission power density specified in Table 6.2F.1-2 when NS is signaled and when transmission overlaps with any portion of the specified frequency range. In case transmission overlaps multiple frequency ranges, the lowest power density requirement applies.

Table 6.2F.1-2: Additional requirements for transmit power density

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR Band | NS value | Channel bandwidth (MHz) | Frequency range (MHz) | Maximum mean power density (dBm/MHz) |
| n46 | NS\_28 | 20, 40, 60, 80 | 5150 – 5350 | 10 |
|  |  |  | 5470 – 5725 |  |
|  | NS\_29 | 20 | 5170 – 5330 | 10 |
|  |  |  | 5490 – 5730 |  |
|  |  | 40 | 5170 – 5330 | 7 |
|  |  |  | 5490 – 5730 |  |
|  |  | 60, 80 | 5170 – 5330 | 4 |
|  |  |  | 5490 – 5730 |  |
|  | NS\_30 | 20, 40, 60, 80 | 5150 – 5350 | 11 |
|  |  |  | 5470 – 5725 |  |
|  | NS\_31 | 20 | 5150 - 5230 | 10 |
|  |  |  | 5250 – 5350 |  |
|  |  |  | 5470 – 5725 |  |
|  |  |  | 5725 - 5850 |  |
|  |  |  | 5230 – 5250 | 4 |
|  |  | 40 | 5150 - 5230 | 7 |
|  |  |  | 5250 – 5350 |  |
|  |  |  | 5470 – 5725 |  |
|  |  |  | 5725 - 5850 |  |
|  |  |  | 5230 – 5250 | 4 |
|  |  | 60, 80 | 5150 - 5230 | 4 |
|  |  |  | 5250 – 5350 |  |
|  |  |  | 5470 – 5725 |  |
|  |  |  | 5725 - 5850 |  |
|  |  |  | 5230 – 5250 |  |
| n96 | NS\_53 | 20, 40, 60, 80, 100 | 5925 – 7125 | -1 |
|  | NS\_54 | 20, 40, 60, 80 | 5925 – 6425 | 17 |
|  | 6525 – 6875 |  |
|  | NS\_59 | 20, 40, 60, 80, 100 | 5925 – 7125 | 5 |
|  | NS\_60 | 20, 40, 60, 80, 100 | 5925 – 7125 | 2 |
|  | NS\_61 | 20, 40, 60, 80 | 5925 - 6425 | 1 |
|  | NS\_66 | 20, 40, 60, 80, 100 | 5925 - 7125 | -8 |
|  | NS\_67 | 20, 40, 60, 80, 100 | 5925 - 7125 | -5 |
| n102 | NS\_58 | 20, 40, 60, 80, 100 | 5945 – 6425 | 10 |
|  | NS\_64 | 20, 40, 60, 80, 100 | 5945 – 6425 | 1 |
|  | NS\_65 | 20, 40, 60, 80, 100 | 5945 – 6425 | 11 |
|  | NS\_68 | 20, 40, 60, 80, 100 | 5945 – 6425 | 1 |

### 6.2F.1A UE maximum output power for CA

#### 6.2F.1A.1 UE maximum output power for inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the transmitter power requirements in clause 6.2 apply.

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the requirements in clause 6.2.2 apply for the NR uplink carrier and clause 6.2F.2 for the carrier operating with shared spectrum access.

For inter-band carrier aggregation with uplink assigned to two NR bands and including one of the bands listed in Table 6.2F.1-1, UE maximum output power shall be measured over all component carriers from different bands. If each band has separate antenna connectors, maximum output power is defined as the sum of maximum output power from each UE antenna connector. The period of measurement shall be at least one sub frame (1 ms). The maximum output power is specified in Table 6.2A.1.3-1.

Table 6.2F.1A.1-1 void

#### 6.2F.1A.2 UE maximum output power for intra-band contiguous CA

For uplink intra-band contiguous carrier aggregation, the maximum output power is specified in Table 6.2F.1A.2-1. For downlink intra-band contiguous carrier aggregation with a single uplink component carrier configured in the NR-U band, the maximum output power is specified in Table 6.2F.1-1 for power class 5.

Table 6.2F.1A.2-1: UE Power Class for intra-band contiguous CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
| CA\_n96B |  |  |  |  |  |  | 20 | +2/-3 |
| CA\_n96C |  |  |  |  |  |  | 20 | +2/-3 |
| NOTE 1: PPowerClass is the maximum UE power specified without taking into account the tolerance.  NOTE 2: Power class 5 is default power class unless otherwise stated. | | | | | | | | |

### 6.2F.1B UE maximum output power for NR-DC

For inter-band NR-DC with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the requirements in clause 6.2.2 apply for the NR uplink carrier and clause 6.2F.2 for the carrier operating with shared spectrum access.

For inter-band NR-DC with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the UE maximum output power shall be measured over all component carriers from different bands. If each band has separate antenna connectors, the maximum output power is defined as the sum of maximum output power from each UE antenna connector. The period of measurement shall be at least one sub frame (1 ms). The maximum output power is specified in Table 6.2B.1.3-1.

### 6.2F.1D UE maximum output power for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power for any transmission bandwidth within the channel bandwidth is specified in Table 6.2F.1D-1. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors. The period of measurement shall be at least one sub frame (1 ms).

The requirements shall be met with the UL MIMO configurations of using 2-layer UL MIMO transmission with codebook of. DCI Format for UE configured in PUSCH transmission mode for uplink single-user MIMO shall be used.

Table 6.2F.1D-1 UE Power Class for UL MIMO in closed loop spatial multiplexing scheme

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
| n46 |  |  |  |  | 23 | +2/-3 | 20 | +2/-3 |
| n96 |  |  |  |  | 23 | +2/-3 | 20 | +2/-3 |
| n102 |  |  |  |  | 23 | +2/-3 | 20 | +2/-3 |
| NOTE 1: Powerclass 5 is default power class unless otherwise stated. | | | | | | | | |

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

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

For UE maximum output power reduction, the general requirements of clause 6.2.2 do not apply but instead the UE is allowed to reduce the maximum output power due to higher order modulations and transmit bandwidth configurations for power class 5 according to Table 6.2F.2-1 and Table 6.2F.2-2.

For wideband operation only sub-bands which are contiguously transmitted are considered in the current version of the specification as defined in clause 6.1F.

Table 6.2F.2-1 Maximum power reduction (MPR) for shared spectrum access UE power class 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | | |
|  |  | Full2 (dB) | Partial3 (dB) | Exception for 100MHz Full5 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ 1.5 | ≤ 2.5 |  |
|  | 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 | ≤ 4.5 |
|  | 16 QAM | ≤ 4.0 | ≤ 4.0 | ≤ 4.5 |
|  | 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.  NOTE 2: The MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: Exception for 100MHz Full RB allocation MPR applies when all RB’s in all sub-bands for 100MHz wideband operation are fully allocated and sub-bands are transmitted according to the wideband configurations of Table 6.2F.2-2. | | | | |

Table 6.2F.2-2 Exception MPR mapping for wideband operation

|  |  |
| --- | --- |
| Wideband operation channel bandwidth (MHz) | Sub-band configuration exceptions |
| 40 | 10, 01 |
| 60 | None |
| 80 | 1100, 0011, 0100, 0010 |
| 100 | 00111, 11100, 00011, 11000 |
| NOTE 1: The sub-band configuration is represented as a bitmap where ‘1’ indicates that a sub-band is transmitted and ‘0’ indicates a sub-band is not transmitted. The bitmap is ordered with MSB mapped to the lowest frequency sub-band and LSB mapped to highest frequency sub-band within the wideband channel.  NOTE 2: Void. | |

Table 6.2F.2-3 Maximum power reduction (MPR) for shared spectrum access UE power class 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | | |
|  |  | Full2 (dB) | Partial3 (dB) | Exception for 100MHz Full5 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ 1.0 | ≤ 1.5 |  |
|  | QPSK | ≤ 1.0 | ≤ 2.0 |  |
|  | 16 QAM | ≤ 1.5 | ≤ 2.5 |  |
|  | 64 QAM | ≤ 2.0 | ≤ 3.0 |  |
|  | 256 QAM | ≤ 4.5 | ≤ 4.5 |  |
| CP-OFDM | QPSK | ≤ 2.0 | ≤ 3.5 | ≤ [4.5] |
|  | 16 QAM | ≤ 2.5 | ≤ 3.5 | ≤ [4.5] |
|  | 64 QAM | ≤ 4.0 | ≤ 4.5 |  |
|  | 256 QAM | ≤ 6.5 | ≤ 6.5 |  |
| NOTE 1: The MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel.  NOTE 2: The MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: Exception for 100MHz Full RB allocation MPR applies when all RB’s in all sub-bands for 100MHz wideband operation are fully allocated and sub-bands are transmitted according to the wideband configurations of Table 6.2F.2-2. | | | | |

Table 6.2F.2-4 Maximum power reduction (MPR)

for shared spectrum access UE power class 3 with dual Tx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | | |
|  |  | Full2 (dB) | Partial3 (dB) | Exception for 100MHz Full5 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ [2.0] | ≤ [3.0] |  |
|  | QPSK | ≤ [2.0] | ≤ [3.0] |  |
|  | 16 QAM | ≤ [2.5] | ≤ [3.0] |  |
|  | 64 QAM | ≤ [2.5] | ≤ [3.5] |  |
|  | 256 QAM | ≤ [4.5] | ≤ [4.5] |  |
| CP-OFDM | QPSK | ≤ [3.5] | ≤ [4.0] | ≤ [5.0] |
|  | 16 QAM | ≤ [3.5] | ≤ [4.0] | ≤ [5.0] |
|  | 64 QAM | ≤ [4.5] | ≤ [4.5] |  |
|  | 256 QAM | ≤ [6.5] | ≤ [6.5] |  |
| NOTE 1: The MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel.  NOTE 2: The MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: Exception for 100MHz Full RB allocation MPR applies when all RB’s in all sub-bands for 100MHz wideband operation are fully allocated and sub-bands are transmitted according to the wideband configurations of Table 6.2F.2-2. | | | | |

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

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

#### 6.2F.2A.1 UE maximum output power reduction for inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the requirements in clause 6.2.2 apply for the NR uplink carrier and clause 6.2F.2 for the carrier operating with shared spectrum access.

When inter-band carrier aggregation is configured with intra-band contiguous carrier aggregation in one of the bands, the requirements in clause 6.2A.2 apply for the NR uplink contiguous carrier aggregation and 6.2F.2A.2 apply for the shared spectrum band.

#### 6.2F.2A.2 UE maximum output power reduction for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2A.1.1-1 with contiguous RB allocation is specified in Table 6.2F.2A.2-1 and Table 6.2F.2A.2-2 for UE power class 5 CA bandwidth classes B and C. For UE maximum output power reduction, the general requirements of clause 6.2.2 do not apply but instead the UE is allowed to reduce the maximum output power due to higher order modulations and transmit bandwidth configurations for power class 5 according to Table 6.2F.2A.2-1 and Table 6.2F.2A.2-2.

For wideband operation only sub-bands which are contiguously transmitted are considered in the current version of the specification as defined in clause 6.1F.

Table 6.2F.2A.2-1 Maximum power reduction (MPR) for power class 5 shared spectrum access intra-band contiguous CA for bandwidth class B and class C.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | | |
|  |  | Full2 (dB) | Partial3 (dB) | Exception for Full5 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ [3.0] | | ≤ [4.0] |
|  | QPSK | ≤ [3.0] | | ≤ [4.0] |
|  | 16 QAM | ≤ [3.5] | | ≤ [4.5] |
|  | 64 QAM | ≤ [4.5] | | ≤ [5.0] |
|  | 256 QAM | ≤ [6.0] | | ≤ [6.0] |
| CP-OFDM | QPSK | ≤ [4.0] | | ≤ [5.5] |
|  | 16 QAM | ≤ [4.5] | | ≤ [6.0] |
|  | 64 QAM | ≤ [6.0] | | ≤ [6.5] |
|  | 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.  NOTE 2: The MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocated or all RB’s in all contiguously transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2A.2-2..  NOTE 3: The MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] excluding the wideband configurations of Table 6.2F.2A.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: Exception for Full RB allocation MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and sub-bands are transmitted according to the wideband configurations of Table 6.2F.2A.2-2. | | | | |

Table 6.2F.2A.2-2 Exception MPR mapping for intra-band CA wideband operation

|  |  |  |
| --- | --- | --- |
| Wideband operation channel bandwidth (MHz) | Sub-band configuration exceptions | |
| 20+20 | 1-1 | 1-0, 0-1 |
| 20+40 | 1-11, 1-10, 0-01, 0-10, 0-11, 1-00 | None |
| 20+60 | 1-111, 1-110, 0-111, 0-110, 1-000, 0-001 | 0-010, 0-100, 0-011, 1-100 |
| 20+80 | 1-1111, 1-1110, 0-1111, 0-1110, 0-1100, 0-0100, 0-0111, 1-1000, 0-0011, 0-1000, 0-0010, 1-0000, 0-0001 | 1-1100, 0-0111 |
| 40+20 | 11-1, 01-1, 11-0, 00-1, 01-0, 01-1, 10-0 | None |
| 40+40 | 11-11, 11-10, 01-11, 01-10, 10-00, 00-01 | 00-10, 01-00, 00-11, 11-00 |
| 40+60 | 11-111, 11-110, 01-111, 01-110, 01-100, 00-100, 00-111, 11-000, 00-011, 01-000, 00-010, 10-000,00-001 | 11-100, 00-111 |
| 40+80 | 11-1111, 11-1110, 01-1111, 01-1110, 11-1100, 00-1111, 01-1100, 00-1110, 00-1100, 11-0000, 00-0011, 01-0000, 00-0010, 10-0000, 00-0001 | 11-1000, 00-0111, 01-1000, 00-0110, 00-1000, 00-0100 |
| 60+20 | 111-1, 111-0, 011-1, 011-0, 100-0, 000-1 | 001-0, 010-0, 001-1, 110-0 |
| 60+40 | 111-11, 111-10, 011-11, 011-10, 011-00, 001-00, 001-10, 001-11, 110-00, 000-11, 010-00, 000-10, 100-00, 000-01 | 111-00, 001-11 |
| 60+60 | 111-111, 111-110, 011-111, 011-110, 111-100, 001-111, 011-100, 001-110, 001-100, 110-000, 000-011, 010-000, 000-010, 100-000, 000-001 | 111-000, 000-111, 011-000, 000-110, 001-000, 000-100 |
| 60+80 | 111-1111, 111-1110, 111-1100, , 011-1111, 011-1110, 011-1100, 001-1111, 001-1110, 001-1100, 001-1000, 000-1100, 000-1000, 000-1000, 001-0000, 000-0100, 110-0000, 000-0011, 010-0000, 000-0010, 100-0000, 000-0001 | 111-1000, 000-1111, 011-1000, 000-1110, 111-0000, 000-0111, 011-0000, 000-0110 |
| 80+20 | 1111-1, 1111-0, 0111-1, 0111-0, 0110-0, 0010-0, 0011-1, 1100-0, 0001-1, 0100-0, 0001-0, 1000-0, 0000-1 | 1110-0, 0011-1 |
| 80+40 | 1111-11, 1111-10, 0111-11, 0111-10, 1111-00, 0011-11, 0111-00, 0011-10, 0011-00, 1100-00, 0000-11, 0100-00, 0000-10, 1000-00, 0000-01 | 1110-00, 0001-11, 0110-00, 0001-10, 0010-00, 0001-00 |
| 80+60 | 1111-111, 1111-110, 1111-100, 0111-111, 0111-110, 0111-100, 0011-111, 0011-110, 0011-100, 0011-000, 0001-100, 0001-000, 0001-000, 0010-000, 0000-100, 1100-000, 0000-011, 01000-00, 0000-010, 1000-000, 0000-001 | 1111-000, 0001-111, 0111-000, 0001-110, 1110-000, 0000-111, 0110-000, 0000-110 |
| 80+80 | 1111-1111, 1111-1110, 1111-1100, 0111-1111, 0111-1110, 0111-1100, 0011-1111, 0011-1110, 0011-1100, 0011-1000, 0001-1100, 0001-1000, 1110-0000,  0000-0111, 0110-0000, 0000-0110, 0010-0000, 0000-0100, 1100-0000, 0000-0011, 0100-0000, 0000-0010, 1000-0000, 0000-0001 | 1111-1000, 0001-1111, 0111-1000, 0001-1110, 1111-0000, 0000-1111, 0111-0000, 0000-1110, 0011-0000, 0000-1100, 0001-0000, 0000-1000 |
| NOTE 1: The sub-band configuration is represented as a bitmap where ‘1’ indicates that a sub-band is transmitted and ‘0’ indicates a sub-band is not transmitted. The bitmap is ordered with MSB mapped to the lowest frequency sub-band and LSB mapped to highest frequency sub-band within the wideband channel. | | |

### 6.2F.2D UE maximum output power reduction for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2F.1D-1 is specified in Table 6.2F.2-1 for power class 5, and in Table 6.2F.2-3 and Table 6.2F.2-4 for power class 3. The requirements shall be met with UL MIMO configurations defined in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors.

For UE supporting uplink full power transmission (ULFPTx) for UL MIMO, the allowed MPR for the maximum output power in Table 6.2F.1D-1 is specified in Table 6.2F.2-1 for power class 5, and in Table 6.2F.2-3 and Table 6.2F.2-4 for power class 3, and the requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode.

The same MPR requirements shall be applicable to UE with 1-layer UL MIMO transmission (either with or without ULPFTx) as with the UL MIMO configurations of using 2-layer UL MIMO transmission with codebook of.

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

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission, the requirements in clause 6.2F.2 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling.

### 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 | 20, 40, 60, 80 |  | N/A |
| NS\_28 | 6.5F.3.3.1 | n46 | 20, 40, 60, 80 |  | 6.2F.3.2 |
| NS\_29 | 6.5F.3.3.2 | n46 | 20, 40, 60, 80 |  | 6.2F.3.3 |
| NS\_30 | 6.5F.3.3.3 | n46 | 20, 40, 60, 80 |  | 6.2F.3.4 |
| NS\_31 | 6.5F.3.3.4 | n46 | 20, 40, 60, 80 |  | 6.2F.3.5 |
| NS\_53 | 6.5F.3.3.5 | n96 | 20, 40, 60, 80, 100 |  | 6.2F.3.6 |
| NS\_54 | 6.5F.3.3.5 | n96 | 20, 40, 60, 80 |  | 6.2F.3.7 |
| NS\_58 | 6.5F.3.3.6 | n102 | 20, 40, 60, 80 |  | 6.2F.3.8 |
| NS\_59 |  | n96 | 20, 40, 60, 80, 100 |  | 6.2F.3.9 |
| NS\_60 | 6.5F.3.3.5 | n96 | 20, 40, 60, 80, 100 |  | 6.2F.3.10 |
| NS\_61 | 6.5F.3.3.7 | n96 | 20, 40, 60, 80 |  | 6.2F.3.11 |
| NS\_63 | 6.5F.3.3.8 | n102 | 20, 40, 80 |  | 6.2F.3.12 |
| NS\_64 | 6.5F.3.3.9 | n102 | 20, 40, 60, 80, 100 |  | 6.2F.3.13 |
| NS\_65 |  | n102 | 20, 40, 60, 80, 100 |  | 6.2F.3.14 |
| NS\_66 | 6.5F.3.3.5 | n96 | 20, 40, 60, 80, 100 |  | 6.2F.3.15 |
| NS\_67 | 6.5F.3.3.5 | n96 | 20, 40, 60, 80, 100 |  | 6.2F.3.16 |
| NS\_68 |  | n102 | 20, 40, 60, 80, 100 |  | 6.2F.3.17 |
| NS\_69 | 6.5F.3.3.8 | n102 | 20, 40, 80 |  | 6.2F.3.18 |
| 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 |  |  | Reserved |
| n96 | NS\_01 | NS\_53 | NS\_54 | NS\_59 | NS\_60 | NS\_61 |  | Reserved |
| n102 | NS\_01 | NS\_58 | NS\_63 |  |  |  |  | Reserved |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR band | Value of extendedAdditionalSpectrumEmission | | | | | | | |
| **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
| n96 | NS\_66 | NS\_67 |  |  |  |  |  |  |
| n102 | NS\_64 | NS\_65 | NS\_68 | NS\_69 |  |  |  |  |
| NOTE: *extendedAdditionalSpectrumEmission* corresponds to an information element of the name [EXTENDED\_ additionalSpectrumEmission] defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

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

When "NS\_28" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.2-1.

Table 6.2F.3.2-1: A-MPR for NS\_28 power class 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | | RB Allocation (Note 3) |
|  |  | Full (dB) | Partial (dB) | Full/Partial |
| DFT-s-OFDM | PI/2 BPSK**4** | ≤ 4.0 | ≤ 6.0 | See Table 6.2F.2-1 |
| QPSK | ≤ 4.0 | ≤ 6.0 |
|  | 16 QAM | ≤ 4.5 | ≤ 6.0 |
|  | 64 QAM | ≤ 4.5 | ≤ 6.5 |
|  | 256 QAM | ≤ 5.5 | ≤ 6.5 |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 7.0 |
|  | 16 QAM | ≤ 6.0 | ≤ 7.5 |  |
|  | 64 QAM | ≤ 6.5 | ≤ 7.5 |  |
|  | 256 QAM | ≤ 7.0 | ≤ 7.5 |  |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5160, 5340, 5480, and 5700 MHz, 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5170, 5190, 5310, 5330, 5490, and 5510 MHz, 60 MHz channels centered at the nearest NR-ARFCN corresponding to 5180, 5200, 5220, 5280, 5300, 5320, 5500, 5520, 5540, 5680 MHz, and 80 MHz channels centered at the nearest NR-ARFCN corresponding to 5190, 5210, 5290, 5310, 5510, and 5530 MHz.  NOTE 3: Applicable for all valid channels other than those enumerated under NOTE 2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: In current release larger CBW than 80MHz are not applicable for this network signalling. | | | | |

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

When "NS\_29" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.3-1.

Table 6.2F.3.3-1: A-MPR for NS\_29 power class 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | |
|  |  | 20 MHz | 40 MHz | | 60 MHz, 80 MHz | |
|  |  | Full/Partial | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | See Table 6.2F.2-1 | ≤ 2.0 | ≤ 4.0 | ≤ 4.0 | ≤ 6.0 |
| QPSK | ≤ 2.0 | ≤ 4.0 | ≤ 4.0 | ≤ 6.0 |
|  | 16 QAM | ≤ 2.5 | ≤ 4.0 | ≤ 4.0 | ≤ 6.0 |
|  | 64 QAM | ≤ 3.5 | ≤ 4.5 | ≤ 4.5 | ≤ 6.0 |
|  | 256 QAM | ≤ 5.0 | ≤ 5.5 | ≤ 5.5 | ≤ 6.0 |
| CP-OFDM | QPSK |  | ≤ 3.5 | ≤ 4.5 | ≤ 4.0 | ≤ 6.0 |
|  | 16 QAM |  | ≤ 4.0 | ≤ 4.5 | ≤ 4.0 | ≤ 6.0 |
|  | 64 QAM |  | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 |
|  | 256 QAM |  | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 3: Larger CBW than 80MHz are not applicable for this network signalling. | | | | | | |

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

When “NS\_30” is indicated in the cell, the A-MPR is specified in Table 6.2F.3.4-1 for power class 5 and Table 6.2F.3.4-2 for power class 3.

Table 6.2F.3.4-1: A-MPR for NS\_30 power class 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | | RB Allocation (Note 3) | | RB Allocation (Note 4) |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full/Partial |
| DFT-s-OFDM | PI/2 BPSK**5** | ≤ 9.0 | ≤ 15.0 | ≤ 2.5 | ≤ 5.0 | See Table 6.2F.2-1 |
| QPSK | ≤ 9.0 | ≤ 15.0 | ≤ 2.5 | ≤ 5.0 |
|  | 16 QAM | ≤ 9.0 | ≤ 15.5 | ≤ 3.0 | ≤ 5.0 |
|  | 64 QAM | ≤ 9.0 | ≤ 15.5 | ≤ 4.5 | ≤ 5.5 |  |
|  | 256 QAM | ≤ 9.0 | ≤ 16.0 | ≤ 5.5 | ≤ 5.5 |  |
| CP-OFDM | QPSK | ≤ 9.0 | ≤ 14.0 | ≤ 4.0 | ≤ 6.0 |  |
|  | 16 QAM | ≤ 9.5 | ≤ 14.5 | ≤ 4.0 | ≤ 6.0 |  |
|  | 64 QAM | ≤ 9.5 | ≤ 15.0 | ≤ 5.5 | ≤ 6.5 |  |
|  | 256 QAM | ≤ 9.5 | ≤ 15.0 | ≤ 7.0 | ≤ 7.0 |  |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5160, 5340, 5480, and 5700 MHz, 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5170, 5190, 5310, 5330, 5490, and 5510 MHz, 60 MHz channels centered at the nearest NR-ARFCN corresponding to 5180, 5200, 5220, 5280, 5300, 5320, 5500, 5520, 5540, 5680 MHz, and 80 MHz channels centered at the nearest NR-ARFCN corresponding to 5190, 5210, 5290, 5310, 5510, and 5530 MHz.  NOTE 3: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5180 and 5320 MHz, and 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5230 and 5270 MHz.  NOTE 4: Applicable for all valid channels other than those enumerated under NOTE 2 and NOTE 3.  NOTE 5: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 6: In current release larger CBW than 80MHz are not applicable for this network signalling. | | | | | | |

Table 6.2F.3.4-2: A-MPR for NS\_30 power class 3 with single Tx

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | | RB Allocation (Note 3) | | RB Allocation (Note 4) |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full/Partial |
| DFT-s-OFDM | PI/2 BPSK**5** | ≤ 12.0 | ≤ 15.5 | ≤ 3.5 | ≤ 5.5 | See Table MPR table for PC3 |
| QPSK | ≤ 12.5 | ≤ 16.0 | ≤ 4.0 | ≤ 6.5 |
| 16 QAM | ≤ 12.5 | ≤ 16.0 | ≤ 4.5 | ≤ 7.0 |
| 64 QAM | ≤ 13.0 | ≤ 16.0 | ≤ 4.5 | ≤ 7.0 |
| 256 QAM | ≤ 13.0 | ≤ 16.0 | ≤ 4.5 | ≤ 7.0 |
| CP-OFDM | QPSK | ≤ 14.0 | ≤ 16.5 | ≤ 6.0 | ≤ 7.5 |
|  | 16 QAM | ≤ 14.0 | ≤ 16.5 | ≤ 6.0 | ≤ 7.5 |
|  | 64 QAM | ≤ 14.0 | ≤ 16.5 | ≤ 6.0 | ≤ 7.5 |
|  | 256 QAM | ≤ 14.0 | ≤ 16.5 | ≤ 6.5 | ≤ 7.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5160, 5340, 5480, and 5700 MHz, 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5170, 5190, 5310, 5330, 5490, and 5510 MHz, 60 MHz channels centered at the nearest NR-ARFCN corresponding to 5180, 5200, 5220, 5280, 5300, 5320, 5500, 5520, 5540, 5680 MHz, and 80 MHz channels centered at the nearest NR-ARFCN corresponding to 5190, 5210, 5290, 5310, 5510, and 5530 MHz.  NOTE 3: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5180 and 5320 MHz, and 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5230 and 5270 MHz.  NOTE 4: Applicable for all valid channels other than those enumerated under NOTE 2 and NOTE 3.  NOTE 5: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 6: In current release larger CBW than 80MHz are not applicable for this network signalling. | | | | | | |

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

When "NS\_31" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.5-1.

Table 6.2F.3.5-1: A-MPR for NS\_31 power class 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | RB Allocation (Note 3) | |
|  |  | Full/Partial | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK**4** | See Table 6.2F.2-1 | ≤ 4.0 | ≤ 6.5 |
| QPSK | ≤ 4.0 | ≤ 6.5 |
| 16 QAM | ≤ 4.0 | ≤ 6.5 |
|  | 64 QAM | ≤ 4.0 | ≤ 6.5 |
|  | 256 QAM |  | ≤ 5.0 | ≤ 6.5 |
| CP-OFDM | QPSK |  | ≤ 5.5 | ≤ 6.5 |
|  | 16 QAM |  | ≤ 5.5 | ≤ 7.0 |
|  | 64 QAM |  | ≤ 5.5 | ≤ 7.0 |
|  | 256 QAM |  | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5180, 5200, 5220, 5280, 5300, 5320, 5500, 5520, 5540, 5560, 5580, 5600, 5620, 5640, 5660, 5680, 5745, 5765, 5785, and 5805 MHz.  NOTE 3: Applicable for all valid channels and bandwidths other than those enumerated in NOTE 2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | |

#### 6.2F.3.6 A-MPR for NS\_53

When “NS\_53” is indicated in the cell, the A-MPR is specified in Table 6.2F.3.6-1 for power class 5 and in Table 6.2F.3.6-2 for power class 3.

Table 6.2F.3.6-1: A-MPR for NS\_53 power class 5

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
|  |  | 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100MHz | |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 3.0 | ≤ 5.5 | ≤ [1.5] | ≤ [2.5] |
| QPSK | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 3.0 | ≤ 5.5 | ≤ [1.5] | ≤ [2.5] |
|  | 16 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 3.0 | ≤ 5.5 | ≤ [1.5] | ≤ [2.5] |
|  | 64 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.0 | ≤ 5.5 | ≤ [2.0] | ≤ [3.0] |
|  | 256 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 5.0 | ≤ 7.0 | ≤ 5.0 | ≤ 5.5 | ≤ [3.5] | ≤ [4.5] |
| CP-OFDM | QPSK | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.0 | ≤ 5.5 | ≤ [3.5] | ≤ [4.5] |
|  | 16 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.0 | ≤ 5.5 | ≤ [4.0] | ≤ [4.5] |
|  | 64 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 6.5 | ≤ 8.5 | ≤ 5.5 | ≤ 6.5 | ≤ 5.5 | ≤ 5.5 | ≤ [5.5] | ≤ [5.5] |
|  | 256 QAM | ≤ 9.0 | ≤ 12.0 | ≤ 7.0 | ≤ 8.5 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ [7.0] | ≤ [7.0] |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

Table 6.2F.3.6-2: A-MPR for NS\_53 power class 3 with single Tx

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| QPSK | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 16 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 64 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 256 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| CP-OFDM | QPSK | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 16 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 64 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 7.5 |
| 256 QAM | ≤ 12.0 | ≤ 14.5 | ≤ 9.0 | ≤ 11.5 | ≤ 7.0 | ≤ 10.0 | ≤ 6.5 | ≤ 8.5 | ≤ 6.5 | ≤ 7.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

#### 6.2F.3.7 A-MPR for NS\_54

When “NS\_54” is indicated in the cell, the A-MPR is specified in Table 6.2F.3.7-1 for power class 5 and Table 6.2F.3.7-2 for power class 3.

Table 6.2F.3.7-1: A-MPR for NS\_54 power class 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | RB Allocation (Note 3) | |
|  |  | Full/Partial | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK4 | See Table 6.2F.2-1 | ≤ 2.5 | ≤ 5.0 |
| QPSK | ≤ 2.5 | ≤ 5.0 |
|  | 16 QAM |  | ≤ 3.0 | ≤ 5.0 |
|  | 64 QAM |  | ≤ 3.5 | ≤ 5.0 |
|  | 256 QAM |  | ≤ 5.0 | ≤ 6.0 |
| CP-OFDM | QPSK |  | ≤ 4.5 | ≤ 6.0 |
|  | 16 QAM |  | ≤ 4.5 | ≤ 6.0 |
|  | 64 QAM |  | ≤ 5.5 | ≤ 6.0 |
|  | 256 QAM |  | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for all valid channels and bandwidths other than those enumerated in NOTE 3.  NOTE 3: Applicable for 40 MHz channels centered at the nearest NR-ARFCN corresponding to [5965 MHz], 60 MHz channels centered at the nearest NR-ARFCN corresponding to [5975 and 5995 MHz], and 80 MHz channels centered at the nearest NR-ARFCN corresponding to [5985 MHz].  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | |

Table 6.2F.3.7-2: A-MPR for NS\_54 power class 3 with single Tx

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | RB Allocation (Note 3) | |
|  |  | Full/Partial | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK**4** | See Table PC3 MPR | ≤ 2.0 | ≤ 4.5 |
| QPSK | ≤ 3.0 | ≤ 5.0 |
| 16 QAM | ≤ 3.5 | ≤ 5.0 |
| 64 QAM |  | ≤ 3.5 | ≤ 5.0 |
|  | 256 QAM |  | ≤ 5.0 | ≤ 6.0 |
| CP-OFDM | QPSK |  | ≤ 4.5 | ≤ 6.0 |
|  | 16 QAM |  | ≤ 5.0 | ≤ 6.0 |
|  | 64 QAM |  | ≤ 5.0 | ≤ 6.0 |
|  | 256 QAM |  | ≤ 6.5 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for all valid channels and bandwidths other than those enumerated in NOTE 3 and NOTE 5.  NOTE 3: Applicable for 40 MHz channels centered at the nearest NR-ARFCN corresponding to [5965 MHz], 60 MHz channels centered at the nearest NR-ARFCN corresponding to [5975 and 5995 MHz], and 80 MHz channels centered at the nearest NR-ARFCN corresponding to [5985 MHz].  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | |

#### 6.2F.3.8 A-MPR for NS\_58

When “NS\_58” is indicated in the cell, the A-MPR is specified in Table 6.2F.3.8-1 for power class 5. The Table 6.2F.3.8-2 is applicable for power class 3 with single Tx.

Table 6.2F.3.8-1: A-MPR for NS\_58 power class 5

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | |
|  |  | Full2 (dB) | Partial3 (dB) |
| DFT-s-OFDM | Pi/2 BPSK4 | ≤ 1.5 | ≤ 2.5 |
|  | QPSK | ≤ 2.0 | ≤ 3.5 |
|  | 16 QAM | ≤ 2.5 | ≤ 4.0 |
|  | 64 QAM | ≤ 3.5 | ≤ 4.5 |
|  | 256 QAM | ≤ 5.0 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 4.5 |
|  | 16 QAM | ≤ 4.0 | ≤ 4.5 |
|  | 64 QAM | ≤ 5.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel.  NOTE 2: The A-MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The A-MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: The A-MPR applies instead of MPR for 20 MHz channel centered at the nearest NR-ARFCN corresponding to 5955 MHz, 40 MHz channel at the nearest NR-ARFCN corresponding to 5965 MHz, 60 MHz channel at the nearest NR-ARFCN corresponding to 5975 MHz, and 80 MHz channel at the nearest NR-ARFCN corresponding to 5985 MHz. For all other channels, A-MPR is zero and MPR as specified in Table 6.2F.2-1 applies. | | | |

Table 6.2F.3.8-2: A-MPR for NS\_58 power class 3 with single Tx

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | |
|  |  | Full2 (dB) | Partial3 (dB) |
| DFT-s-ODFM | Pi/2 BPSK4 | ≤ 1.5 | ≤ 4.5 |
|  | QPSK | ≤ 2.0 | ≤ 4.5 |
|  | 16 QAM | ≤ 2.5 | ≤ 4.5 |
|  | 64 QAM | ≤ 3.0 | ≤ 4.5 |
|  | 256 QAM | ≤ 4.5 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 5.0 |
|  | 16 QAM | ≤ 4.0 | ≤ 5.0 |
|  | 64 QAM | ≤ 4.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 6.5 | ≤ 7.0 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel.  NOTE 2: The A-MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The A-MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 5: The A-MPR applies instead of MPR for 20 MHz channel centered at the nearest NR-ARFCN corresponding to 5955 MHz, 40 MHz channel at the nearest NR-ARFCN corresponding to 5965 MHz, 60 MHz channel at the nearest NR-ARFCN corresponding to 5975 MHz, 80 MHz channel at the nearest NR-ARFCN corresponding to 5985 MHz. For all other channels, A-MPR is zero and MPR as specified in Table 6.2F.2-1 applies. | | | |

#### 6.2F.3.9 A-MPR for NS\_59

When "NS\_59" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.9-1.

Table 6.2F.3.9-1: A-MPR for NS\_59 power class 5

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | |
| 20 MHz | |
| Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 3.0 | ≤ 5.5 |
|  | QPSK | ≤ 3.0 | ≤ 5.5 |
|  | 16 QAM | ≤ 3.0 | ≤ 5.5 |
|  | 64 QAM | ≤ 3.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 5.0 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 3.5 | ≤ 5.5 |
|  | 16 QAM | ≤ 4.0 | ≤ 5.5 |
|  | 64 QAM | ≤ 5.5 | ≤ 5.5 |
|  | 256 QAM | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | |

#### 6.2F.3.10 A-MPR for NS\_60

When "NS\_60" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.10-1 for power class 5. The Table 6.2F.3.10-2 is applicable for power class 3 with single Tx and Table 6.2F.3.10-2 is applicable for power class 3 with dual Tx.

Table 6.2F.3.10-1: A-MPR for NS\_60 power class 5

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK**2** | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 5.5 | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.5 |
| QPSK | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 5.5 | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.5 |
| 16 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 5.5 | ≤ 4.0 | ≤ 5.0 | ≤ 3.5 | ≤ 5.0 |
| 64 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 5.5 | ≤ 4.0 | ≤ 5.0 | ≤ 3.5 | ≤ 5.0 |
| 256 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 |
| 16 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.0 | ≤ 5.5 | ≤ 4.5 | ≤ 5.5 |
| 64 QAM | ≤ 6.0 | ≤ 8.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 | ≤ 5.5 |
| 256 QAM | ≤ 7.0 | ≤ 8.5 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 3: For larger channels than 80MHz the A-MPR is zero and MPR as specified in Table 6.2F.2-1 applies. | | | | | | | | | |

Table 6.2F.3.10-2: A-MPR for NS\_60 power class 3 with single Tx

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 2.5 | ≤ 5.0 |
| QPSK | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 2.5 | ≤ 5.0 |
| 16 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 2.5 | ≤ 5.0 |
| 64 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 2.5 | ≤ 5.5 |
| 256 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 4.5 | ≤ 6.0 | ≤ 4.5 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 4.0 | ≤ 6.0 | ≤ 3.5 | ≤ 5.0 |
| 16 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 4.0 | ≤ 6.0 | ≤ 3.5 | ≤ 5.0 |
| 64 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 4.0 | ≤ 6.0 | ≤ 4.0 | ≤ 5.0 |
| 256 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 5.5 | ≤ 6.5 | ≤ 5.5 | ≤ 6.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

Table 6.2F.3.10-2: A-MPR for NS\_60 power class 3 with dual Tx

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 3.0 | ≤ 5.5 |
| QPSK | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 3.0 | ≤ 5.5 |
| 16 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 3.0 | ≤ 5.5 |
| 64 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 3.0 | ≤ 6.0 | ≤ 3.0 | ≤ 5.5 |
| 256 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 4.5 | ≤ 7.0 | ≤ 4.5 | ≤ 6.0 | ≤ 4.5 | ≤ 5.5 |
| CP-OFDM | QPSK | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 5.0 | ≤ 7.0 | ≤ 4.5 | ≤ 6.0 | ≤ 4.5 | ≤ 5.5 |
| 16 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 5.0 | ≤ 7.0 | ≤ 4.5 | ≤ 6.0 | ≤ 4.5 | ≤ 5.5 |
| 64 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 5.0 | ≤ 7.0 | ≤ 4.5 | ≤ 6.0 | ≤ 4.5 | ≤ 5.5 |
| 256 QAM | ≤ 9.5 | ≤ 11.5 | ≤ 6.0 | ≤ 9.0 | ≤ 5.0 | ≤ 7.0 | ≤ 5.5 | ≤ 6.5 | ≤ 5.5 | ≤ 6.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

#### 6.2F.3.11 A-MPR for NS\_61

When "NS\_61" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.11-1.

Table 6.2F.3.11-1: A-MPR for NS\_61 power class 5

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 7.5 | ≤ 10.0 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| QPSK | ≤ 7.5 | ≤ 10.0 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 7.5 | ≤ 10.0 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 6.5 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.5 | ≤ 10.5 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | |

#### 6.2F.3.12 A-MPR for NS\_63

When "NS\_63" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.12-1.

Table 6.2F.3.12-1: A-MPR for NS\_63 power class 5

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | RB Allocation  (Note 3, Note 4) | |
|  |  | Full/Partial | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK4 | See Table PC5 MPR | ≤ 2.0 | ≤ 3.0 |
| QPSK | ≤ 2.5 | ≤ 3.5 |
| 16 QAM | ≤ 3.0 | ≤ 3.5 |
|  | 64 QAM |  | ≤ 3.5 | ≤ 4.5 |
|  | 256 QAM |  | ≤ 5.0 | ≤ 5.5 |
| CP-OFDM | QPSK |  | ≤ 4.5 | ≤ 5.0 |
|  | 16 QAM |  | ≤ 4.5 | ≤ 5.5 |
|  | 64 QAM |  | ≤ 5.5 | ≤ 5.5 |
|  | 256 QAM |  | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for all valid channels and bandwidths other than those enumerated in NOTE 3 and NOTE 4.  NOTE 3: Applicable for 40 MHz channels centered at the nearest NR-ARFCN corresponding to [5965 MHz], 60 MHz channels centered at the nearest NR-ARFCN corresponding to [5975 and 5995 MHz], and 80 MHz channels centered at the nearest NR-ARFCN corresponding to [5985 MHz].  NOTE 4: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to [6415 MHz], 40 MHz channels centered at the nearest NR-ARFCN corresponding to [6405 MHz] and 80 MHz channels centered at the nearest NR-ARFCN corresponding to [6385 MHz].  NOTE 5: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 6: Channel bandwidth sizes of 60MHz and 100MHz are not applicable for this network signalling. | | | | |

#### 6.2F.3.13 A-MPR for NS\_64

When "NS\_64" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.13-1.

Table 6.2F.3.13-1: A-MPR for NS\_64 power class 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation (Note 2) | | RB Allocation (Note 3) | |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | **Pi/2 BPSK4** | ≤ 12 | ≤ 14 | ≤ 8 | ≤ 10 |
|  | QPSK | ≤ 12 | ≤ 14 | ≤ 8 | ≤ 10 |
|  | 16 QAM | ≤ 12 | ≤ 15 | ≤ 9 | ≤ 10 |
|  | 64 QAM | ≤ 12 | ≤ 15 | ≤ 11 | ≤ 11 |
|  | 256 QAM | ≤ 13 | ≤ 15 | ≤ 13 | ≤ 14 |
| CP-OFDM | QPSK | ≤ 13 | ≤ 15 | ≤ 10 | ≤ 10 |
|  | 16 QAM | ≤ 13 | ≤ 15 | ≤ 11 | ≤ 11 |
|  | 64 QAM | ≤ 13 | ≤ 15 | ≤ 13 | ≤ 13 |
|  | 256 QAM | ≤ 15 | ≤ 15 | ≤ 15 | ≤ 15 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated or when not all transmitted sub-bands for wideband operation are transmitted.  NOTE 2: Applicable for 20 MHz channels centered at the nearest NR-ARFCN corresponding to 5955 MHz, 40 MHz channels centered at the nearest NR-ARFCN corresponding to 5965 MHz, 60 MHz channels centered at the nearest NR-ARFCN corresponding to 5975 and 5995 MHz and 80 MHz channels centered at the nearest NR-ARFCN corresponding to 5985 MHz.  NOTE 3: Applicable for all valid channels other than those enumerated under NOTE 2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | |

#### 6.2F.3.14 A-MPR for NS\_65

When "NS\_65" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.14-1.

Table 6.2F.3.14-1: A-MPR for NS\_65 power class 5

|  |  |  |  |
| --- | --- | --- | --- |
| Pre-coding | Modulation | RB Allocation | |
|  |  | Full2 (dB) | Partial3 (dB) |
| DFT-s-ODFM | Pi/2 BPSK**4** | ≤ 6.0 | ≤ 6.0 |
|  | QPSK | ≤ 6.0 | ≤ 6.0 |
|  | 16 QAM | ≤ 6.0 | ≤ 6.0 |
|  | 64 QAM | ≤ 6.0 | ≤ 6.0 |
|  | 256 QAM | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 6.0 |
|  | 16 QAM | ≤ 6.0 | ≤ 6.0 |
|  | 64 QAM | ≤ 6.0 | ≤ 6.0 |
|  | 256 QAM | ≤ 6.5 | ≤ 7.0 |
| NOTE 1: The A-MPR shall apply to all SCS in all active 20 MHz sub-bands contiguously allocated in the channel.  NOTE 2: The A-MPR for Full RB allocation applies to all RB’s in all transmitted 20 MHz or larger channels that are fully allocatedor all RB’s in all contiguously transmitted sub-bands for wideband operation that are fully allocated excluding the wideband configurations of Table 6.2F.2-2.  NOTE 3: The A-MPR for Partial RB allocation applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10] or transmitted sub-bands for wideband operation are transmitted according to the wideband configurations of Table 6.2F.2-2.  NOTE 4: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | |

#### 6.2F.3.15 A-MPR for NS\_66

When "NS\_66" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.15-1.

Table 6.2F.3.15-1: A-MPR for NS\_66 power class 5

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| QPSK | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 16 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 64 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 256 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| CP-OFDM | QPSK | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 16 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 64 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| 256 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 | ≤ 8.5 | ≤ 11.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

#### 6.2F.3.16 A-MPR for NS\_67

When "NS\_67" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.16-1.

Table 6.2F.3.16-1: A-MPR for NS\_67 power class 5

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| QPSK | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 16 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 64 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 256 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| CP-OFDM | QPSK | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 16 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 64 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| 256 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11.0 | ≤ 6.5 | ≤ 9.5 | ≤ 6.0 | ≤ 8.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

#### 6.2F.3.17 A-MPR for NS\_68

When "NS\_68" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.17-1.

Table 6.2F.3.17-1: A-MPR for NS\_68 power class 5

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | | 100 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| QPSK | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

#### 6.2F.3.18 A-MPR for NS\_69

When "NS\_69" is indicated in the cell, the A-MPR is specified in Table 6.2F.3.18-1.

Table 6.2F.3.18-1: A-MPR for NS\_69 power class 5

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | |
| 20 MHz | | 40 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | PI/2 BPSK2 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.5 | ≤ 6.5 | ≤ 7.0 |
| QPSK | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.5 | ≤ 6.5 | ≤ 7.0 |
| 16 QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.5 | ≤ 6.5 | ≤ 7.0 |
| 64 QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.5 | ≤ 6.5 | ≤ 7.0 |
| 256 QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.5 | ≤ 6.5 | ≤ 7.0 |
| CP-OFDM | QPSK | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 8.0 | ≤ 6.5 | ≤ 8.5 |
| 16 QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 8.0 | ≤ 6.5 | ≤ 8.5 |
| 64 QAM | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 8.0 | ≤ 6.5 | ≤ 8.5 |
| 256 QAM | ≤ 7.0 | ≤ 6.0 | ≤ 6.0 | ≤ 8.0 | ≤ 7.0 | ≤ 8.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0.  NOTE 3: Channel bandwidth sizes of 60MHz and 100MHz are not applicable for this network signalling. | | | | | | | |

### 6.2F.3A UE additional maximum output power reduction for CA

#### 6.2F.3A.1 UE additional maximum output power reduction for inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the requirements in clause 6.2.3 apply for the NR uplink carrier and clause 6.2F.3 for the carrier operating with shared spectrum access.

### 6.2F.3D UE additional maximum output power reduction for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the A-MPR values specified in clause 6.2F.3 shall apply to the maximum output power specified in Table 6.2F.1D-1. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2. For UE supporting UL MIMO, the maximum output power is defined as the sum of the maximum output power from both UE antenna connector.

For UE supporting uplink full power transmission (ULFPTx) for UL MIMO, the A-MPR values specified in clause 6.2F.3 shall apply to the maximum output power specified in Table 6.2F.1D-1. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode.

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

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

### 6.2F.4 Configured transmitted power

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

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

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

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

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

- MPRc is specified in clause 6.2F.2D;

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

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

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

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

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

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

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

|  |  |  |
| --- | --- | --- |
| PCMAX,*c*(dBm) | Tolerance TLOW(PCMAX\_L,*c*) (dB) | Tolerance THIGH(PCMAX\_H,*c*) (dB) |
| PCMAX,*c* = 23 | 3.0 | 2.0 |
| 20 ≤ PCMAX,*c* < 23 | 3.0 | 2.0 |
| 19 ≤ PCMAX,*c* < 20 | 5.0 | 2.0 |
| 18 ≤ PCMAX,*c* < 19 | 5.0 | 3.0 |
| 17 ≤ PCMAX,*c* < 18 | 6.0 | 4.0 |
| 13 ≤ PCMAX,*c* < 17 | 5.0 | |
| 8 ≤ PCMAX,*c* < 13 | 6.0 | |
| -40 ≤ PCMAX,*c* < 8 | 7.0 | |

## 6.2G Transmitter power for Tx Diversity

### 6.2G.1 UE maximum output power for Tx Diversity

For UE supporting Tx Diversity, the maximum output power as indicated by UE power class in Table 6.2.1-1is defined as the sum of the maximum output power from both UE antenna connectors. The period of measurement shall be at least one sub frame (1 ms).

When a UE indicates PC1.5 for a given band it achieves maximum power by means of Tx Diversity in the current version of the spec. Therefore, Tx Diversity is implied for PC1.5 even if the UE does not indicate txDiversity-r16 in the UE capabilities.

### 6.2G.2 UE maximum output power reduction for Tx Diversity

For UE supporting Tx diversity, the allowed MPR for the maximum output power is specified in Table 6.2.2-1, Table 6.2D.2-1, Table 6.2D.2-2 and Table 6.2D.2-3 for UE power class 3, 2 and 1.5 respectively. For UE power class 1.5, the allowed maximum power reduction (MPR) defined in Table 6.2D.2-3 is in accordance with the indicated *modifiedMPR-Behavior* specified in Table L.1-1 for channel bandwidths ≤ 100 MHz. The maximum output power is defined as the sum of the maximum output power at each UE antenna connector. If a UE that supports PC1.5 has to apply the requirements of PC2 according to the rules in clause 6.2.1, the MPR requirements in Table 6.2.2-2 apply

### 6.2G.3 UE additional maximum output power reduction for Tx Diversity

For UE supporting Tx diversity, the A-MPR values specified in clause 6.2.3 shall apply to the maximum output power specified in Table 6.2.1-1, and the maximum output power is defined as the sum of the maximum output power at each UE antenna connector. Unless stated otherwise, an A-MPR of 0 dB shall be used.

### 6.2G.4 Configured transmitted power for Tx Diversity

For UE supporting Tx diversity, the transmitted power is configured per each UE.

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

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

- MPRc is specified in clause 6.2G.2;

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

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

where TLOW(PCMAX\_L,*c*) and THIGH(PCMAX\_H,*c*) are defined as the tolerance and applies to PCMAX\_L,*c* and PCMAX\_H,*c* separately, while TL is the absolute value of the lower tolerance in Table 6.2.1-1 for the applicable operating band.

For UE supporting Tx diversity, the tolerance is specified in Table 6.2G.4-1.

Table 6.2G.4-1: PCMAX,*c* tolerance for Tx Diverstiy

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

## 6.2H Transmitter power for CA with UL MIMO

### 6.2H.1 Transmitter power for intra-band UL contiguous CA with UL MIMO

#### 6.2H.1.1 UE maximum output power for intra-band UL contiguous CA with UL MIMO

For intra-band UL contiguous CA and UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the maximum output power is defined as the sum of the maximum output power from both UE antenna connectors and all UL CCs. The period of measurement shall be at least one sub frame (1 ms), as specified in Table 6.2H.1.1-1. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2 and 6.2D.1-3 for 2 layer configuration and ULFPTx configuration respectively.

Table 6.2H.1.1-1: UE Power Class for intra-band UL contiguous CA with UL MIMO in closed loop spatial multiplexing scheme

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 4 (dBm) | Tolerance (dB) |
| CA\_n41C |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| CA\_n78C |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| NOTE 1: If all transmitted resource blocks over all component carriers are confined within FUL\_low and FUL\_low + 4 MHz or/and FUL\_high – 4 MHz and FUL\_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB  NOTE 2: PPowerClass is the maximum UE power specified without taking into account the tolerance | | | | | | | | |

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.2A.1.1 apply for at least one antenna connector for the power class as indicated by the *ue-PowerClass* field in capability signalling.

#### 6.2H.1.2 UE maximum output power reduction for intra-band UL contiguous CA with UL MIMO

For intra-band UL contiguous CA and UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2H.1.1-1 is specified in Table 6.2A.2.1-1, Table 6.2A.2.1-2 for power class 3 CA; Table 6.2A.2.1-1b, Table 6.2A.2.1-4 for power class 2 CA.

The requirements shall be met with UL MIMO configurations defined in Table 6.2D.1-2 and 6.2D.1-3 for 2 layer configuration and ULFPTx configuration respectively. For the UE maximum output power modified by MPR, the power limits specified in clause 6.2H.1.4 apply.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.2A.2.1 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling.

#### 6.2H.1.3 UE additional maximum output power reduction for intra-band UL contiguous CA with UL MIMO

For intra-band UL contiguous CA and UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the A-MPR values specified in clause 6.2A.3 shall apply to the maximum output power specified in Table 6.2H.1.1-1. The requirements shall be met with UL MIMO configurations defined in Table 6.2D.1-2 and 6.2D.1-3 for 2 layer configuration and ULFPTx configuration respectively.

For the UE maximum output power modified by A-MPR, the power limits specified in clause 6.2H.1.4 apply.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.2 A.3.1 apply for the power class as indicated by the *ue-PowerClass* field in capability signaling.

#### 6.2H.1.4 Configured transmitted power for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA with UL MIMO, the transmitted power is configured per each UE.

The definitions of configured maximum output power PCMAX,*c*, the lower bound PCMAX\_L,*c*, and the higher bound PCMAX\_H,*c* specified in clause 6.2A.4.1.1 shall apply to UE supporting intra-band UL contiguous CA with UL MIMO, where

- ΔPPowerClass and ∆TC,c are specified in clause 6.2A.4 unless otherwise stated;

- PPowerClass,CA is the maximum UE power specified in Table 6.2H.1.1-1 without taking into account the tolerance;

- MPR, AMPR is specified in clause 6.2H.1.2 and 6.2H.1.3;

The measured configured maximum output power PUMAX over all serving cells shall be within the following bounds:

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

where TLOW(PCMAX\_L) and THIGH(PCMAX\_H) are defined as the tolerance and applies to PCMAX\_L and PCMAX\_H separately, while TL is the absolute value of the lower tolerance in Table 6.2 H.1.1-1 for the applicable operating band.

For UE supporting intra-band UL contiguous CA with UL MIMO, the tolerance is specified in Table 6.2H1..4-1.

Table 6.2H.1.4-1: PCMAX tolerance for intra-band UL contiguous CA with UL MIMO

|  |  |  |
| --- | --- | --- |
| PCMAX (dBm) | Tolerance TLOW(PCMAX) (dB) | Tolerance THIGH(PCMAX) (dB) |
| 23 < PCMAX ≤ 26 | 3.0 | 2.0 |
| 21 ≤ PCMAX ≤ 23 | 2.0 | |
| 20 ≤ PCMAX < 21 | 2.5 | |
| 19 ≤ PCMAX < 20 | 3.5 | |
| 18 ≤ PCMAX < 19 | 4.0 | |
| 13 ≤ PCMAX < 18 | 5.0 | |
| 8 ≤ PCMAX < 13 | 6.0 | |
| -40 ≤ PCMAX < 8 | 7.0 | |

## 6.2I Transmitter power for RedCap

### 6.2I.1 Maximum output power for RedCap

For Redcap UE, the requirements for power class 3 specified in clause 6.2.1 apply.

## 6.3 Output power dynamics

### 6.3.1 Minimum output power

The minimum controlled output power of the UE is defined as the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the power is set to a minimum value.

The minimum output power is defined as the mean power in at least one sub-frame 1 ms. The minimum output power shall not exceed the values specified in Table 6.3.1-1.

Table 6.3.1-1: Minimum output power

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth | (MHz) | 5,10,15,20 | 25,30,35,40,45,50 | 60,70,80,90,100 |
| REF\_SCS | (kHz) | 15 | | 30 |
| Minimum output power | (dBm) | -40 | -40+10log10 (BWChannel /20) | -40+10log10 (BWChannel /20) |
| Measurement bandwidth | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | | |
| NOTE: The minimum output power value is rounded to the nearest number down to one decimal point. | | | | |

### 6.3.2 Transmit OFF power

Transmit OFF power is defined as the mean power in the channel bandwidth when the transmitter is OFF. The transmitter is considered OFF when the UE is not allowed to transmit on any of its ports..

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1 ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.2-1.

Table 6.3.2-1: Transmit OFF power

|  |  |  |  |
| --- | --- | --- | --- |
| **Channel bandwidth** | (MHz) | 5,10,15,20,25,30,35,40,45,50 | 60,70,80,90,100 |
| **REF\_SCS** | (kHz) | 15 | 30 |
| **Transmit OFF power** | (dBm) | -50 | |
| **Measurement bandwidth** | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | |
| NOTE : “NRB” in the formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | |

### 6.3.3 Transmit ON/OFF time mask

#### 6.3.3.1 General

The transmit power time mask defines the transient period(s) allowed

- between transmit OFF power as defined in clause 6.3.2 and transmit ON power symbols (transmit ON/OFF)

- between continuous ON-power transmissions with power change or RB hopping is applied. When a UE signals the transient period capability, the transient period value (*tp)* can be 2, 4, or 7μs. If no capability is signalled, the default transient period value of 10μs applies.

In case of RB hopping, and in following figures where *tpstart* is specified, the transient period is shared symmetrically when the transient period is 10usec. If the UE signals a transient period (*tp*) of 2, 4 or 7μs, the transient period start position is given by *tpstart* in Table 6.3.3.1-1.

Table 6.3.3.1-1 tpstart  values

| tp  (μs) | tpstart (μs) |
| --- | --- |
| 2 | -0.5 |
| 4 | -1 |
| 7 | -2.7 |
| NOTE 1: Negative values mean that the transient period starts before the symbol boundary | |

Unless otherwise stated the requirements in clause 6.5 apply also in transient periods.

In the following clauses, following definitions apply:

- A slot or long subslot transmission is a transmission with more than 2 symbols.

- A short subslot transmission is a transmission with 1 or 2 symbols.

#### 6.3.3.2 General ON/OFF time mask

The general ON/OFF time mask defines the observation period between transmit OFF and ON power and between transmit ON and OFF power for each SCS. ON/OFF scenarios include: contiguous, and non-contiguous transmission, etc

The OFF power measurement period is defined in a duration of at least one slot excluding any transient periods. The ON power is defined as the mean power over one slot excluding any transient period.



Figure 6.3.3.2-1: General ON/OFF time mask for NR UL transmission in FR1

#### 6.3.3.3 Transmit power time mask for slot and short or long subslot boundaries

The transmit power time mask for slot and a long subslot transmission boundaries defines the transient periods allowed between slot and long subslot PUSCH transmissions. For PUSCH-PUCCH and PUSCH-SRS transitions and multiplexing the time masks in clause 6.3.3.7 apply.

The transmit power time mask for slot or long subslot and short subslot transmission boundaries defines the transient periods allowed between slot or long subslot and short subslot transmissions. The time masks in clause 6.3.3.8 apply.

The transmit power time mask for short subslot transmission boundaries defines the transient periods allowed between short subslot transmissions. The time masks in clause 6.3.3.9 apply.

#### 6.3.3.4 PRACH time mask

The PRACH ON power is specified as the mean power over the PRACH measurement period excluding any transient periods as shown in Figure 6.3.3.4-1. The measurement period for different PRACH preamble format is specified in Table 6.3.3.4-1.

Table 6.3.3.4-1: PRACH ON power measurement period

|  |  |  |
| --- | --- | --- |
| PRACH preamble format | SCS (kHz) | Measurement period (ms) |
| 0 | 1.25 | 0.903125 |
| 1 | 1.25 | 2.284375 |
| 2 | 1.25 | 3.352604 |
| 3 | 5 | 0.903125 |
| A1 | 15 | 0.142708 |
|  | 30 | 0.071354 |
| A2 | 15 | 0.285417 |
|  | 30 | 0.142708 |
| A3 | 15 | 0.428125 |
|  | 30 | 0.2140625 |
| B1 | 15 | 0.140365 |
|  | 30 | 0.070182 |
| B4 | 15 | 0.83046875 |
|  | 30 | 0.415234375 |
| A1/B1 | 15 | 0.142708 ms for first six occasion 0.140365 ms for the last occasion |
|  | 30 | 0.071354 ms for first six occasion 0.070182 ms for the last occasion |
| A2/B2 | 15 | 0.285417 ms for first two occasion 0.278385 ms for the third occasion |
|  | 30 | 0.142708 ms for first two occasion 0.1391925 ms for the third occasion |
| A3/B3 | 15 | 0.428125 ms for the first occasion 0.41640625 ms for the second occasion |
|  | 30 | 0.2140625 ms for the first occasion 0.208203125 ms for the second occasion |
| C0 | 15 | 0.10703125 |
|  | 30 | 0.053515625 |
| C2 | 15 | 0.333333 |
|  | 30 | 0.166667 |
| NOTE: For PRACH on PRACH occasion start from the beginning of 0.5 ms or span the boundary of 0.5 ms of the subframe, the measurement period will plus 0.032552 μs | | |



Figure 6.3.3.4-1: PRACH ON/OFF time mask

#### 6.3.3.5 Void

#### 6.3.3.6 SRS time mask

For SRS transmission mapped to one OFDM symbol, the ON power is defined as the mean power over the symbol duration excluding any transient period; See Figure 6.3.3.6-1



Figure 6.3.3.6-1: Single SRS time mask for NR UL transmission

For SRS transmission mapped to two or more OFDM symbols the ON power is defined as the mean power for each symbol duration excluding any transient period. For consecutive SRS transmissions without power change, Figure 6.3.3.6-2 applies.



Figure 6.3.3.6-2: Consecutive SRS time mask for the case when no power change is required with SRS usage other than antenna switching.

When power change between consecutive SRS transmissions is required, then Figure 6.3.3.6-3 and Figure 6.3.3.6-4 apply.

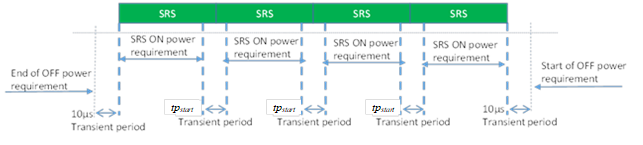


Figure 6.3.3.6-3: Consecutive SRS time mask for the case when power change is required and when 15 kHz and 30 kHz SCS is used in FR1 with SRS usage other than antenna switching.



Figure 6.3.3.6-4: Consecutive SRS time mask for the case when power change is required and when 60 kHz SCS is used in FR1, when the transient period is 10 µs

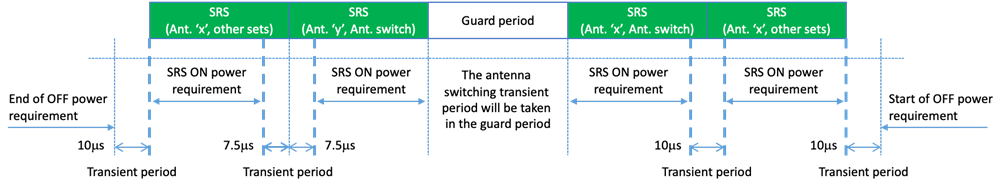


Figure 6.3.3.6-5: FR1 Time mask for 15 kHz and 30 kHz SCS for the case when consecutive SRS switching usage is between antenna switching & other sets

where "other sets" belongs to a "usage set" other than the set for antenna switching. The usage sets for SRS switching are defined in clause 6.2.1 of TS 38.214 [10].

NOTE: Guard period of one symbol is defined between two SRS resources of an SRS resource set for antenna switching for 15kHz, 30kHz and 60kHz SCS in Table 6.2.1.2-1 of TS 38.214 [10].

The above transient period applies to all the transmit CCs in CA with the CC sounding SRS. UE RF requirements do not apply during this transient period.

#### 6.3.3.7 PUSCH-PUCCH and PUSCH-SRS time masks

The PUCCH/PUSCH/SRS time mask defines the observation period between sounding reference symbol (SRS) and an adjacent PUSCH/PUCCH symbol and subsequent UL transmissions. The time masks apply for all types of frame structures and their allowed PUCCH/PUSCH/SRS transmissions unless otherwise stated.

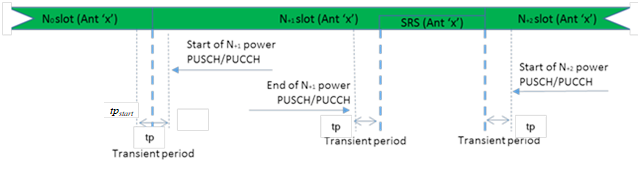


Figure 6.3.3.7-1: PUCCH/PUSCH/SRS time mask when there is a transmission before or after or both before and after SRS, when sounded on the same antenna (Ant 'x')

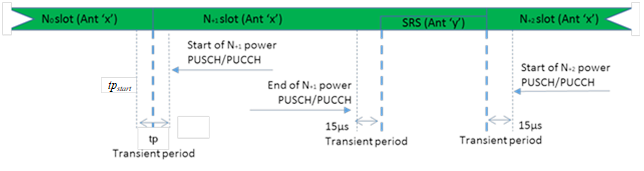


Figure 6.3.3.7-2: PUCCH/PUSCH/SRS time mask when there is a transmission before or after or both before and after SRS, when sounded on a different antenna (Ant 'x' and Ant 'y' are different antenna ports)



Figure 6.3.3.7-3: Consecutive long subslot transmission and long subslot transmission time mask

This transient period of 15 µsec applies before and after SRS transmission to all the transmit CCs in CA with the CC sounding SRS. UE RF requirements do not apply during this transient period.

When there is no transmission preceding SRS transmission or succeeding SRS transmission, then the same time mask applies as shown in Figure 6.3.3.7-1.

#### 6.3.3.8 Transmit power time mask for consecutive slot or long subslot transmission and short subslot transmission boundaries

The transmit power time mask for consecutive slot or long subslot transmission and short slot transmission boundaries defines the transient periods allowed between such transmissions.

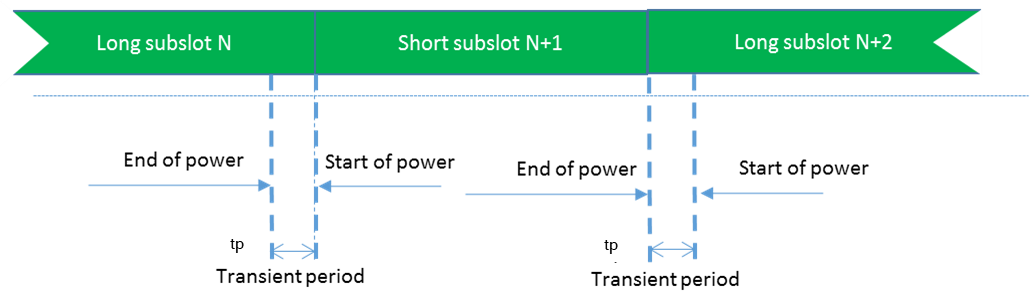


Figure 6.3.3.8-1: Consecutive slot or long subslot transmission and short subslot transmission time mask

#### 6.3.3.9 Transmit power time mask for consecutive short subslot transmissions boundaries

The transmit power time mask for consecutive short subslot transmission boundaries defines the transient periods allowed between short subslot transmissions.

The transient period shall be equally shared as shown on Figure 6.3.3.9-2.

Figure 6.3.3.9-1: Void

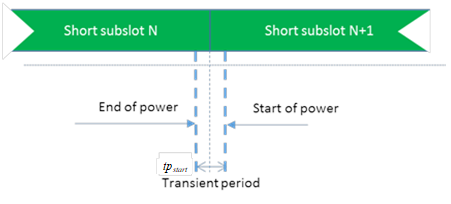


Figure 6.3.3.9-2: Consecutive short subslot transmissions time mask



Figure 6.3.3.9-3: Consecutive short subslot (1 symbol gap) time mask for the case when transient period is required on both sides of the symbol and when 60 kHz SCS is used in FR1, where the transient period is 10 µs

### 6.3.4 Power control

#### 6.3.4.1 General

The requirements on power control accuracy apply under normal conditions.

#### 6.3.4.2 Absolute power tolerance

The absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame (1 ms) at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 20 ms. The tolerance includes the channel estimation error.

The minimum requirement specified in Table 6.3.4.2-1 apply in the power range bounded by the minimum output power as specified in clause 6.3.1 and the maximum output power as specified in clause 6.2.1.

Table 6.3.4.2-1: Absolute power tolerance

|  |  |
| --- | --- |
| Conditions | Tolerance |
| Normal | ± 9.0 dB |

#### 6.3.4.3 Relative power tolerance

The relative power tolerance is the ability of the UE transmitter to set its output power in a target sub-frame (1 ms) relatively to the power of the most recently transmitted reference sub-frame (1 ms) if the transmission gap between these sub-frames is less than or equal to 20 ms.

The minimum requirements specified in Table 6.3.4.3-1 apply when the power of the target and reference sub-frames are within the power range bounded by the minimum output power as defined in clause 6.3.1 and the measured PUMAX as defined in clause 6.2.4.

To account for RF Power amplifier mode changes, 2 exceptions are allowed for each of two test patterns. The test patterns are a monotonically increasing power sweep and a monotonically decreasing power sweep over a range bounded by the requirements of minimum power and maximum power specified in clauses 6.3.1 and 6.2.1, respectively. For those exceptions, the power tolerance limit is a maximum of ± 6.0 dB in Table 6.3.4.3-1.

Table 6.3.4.3-1: Relative power tolerance

|  |  |  |  |
| --- | --- | --- | --- |
| Power step P (Up or down)  (dB) | All combinations of PUSCH and PUCCH transitions (dB) | All combinations of PUSCH/PUCCH and SRS transitions between sub-frames (dB) | PRACH (dB) |
| ΔP < 2 | ± 2.0 (NOTE) | ± 2.5 | ± 2.0 |
| 2 ≤ ΔP < 3 | ± 2.5 | ± 3.5 | ± 2.5 |
| 3 ≤ ΔP < 4 | ± 3.0 | ± 4.5 | ± 3.0 |
| 4 ≤ ΔP < 10 | ± 3.5 | ± 5.5 | ± 3.5 |
| 10 ≤ ΔP < 15 | ± 4.0 | ± 7.0 | ± 4.0 |
| 15 ≤ ΔP | ± 5.0 | ± 8.0 | ± 5.0 |
| NOTE: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods: for a power step ΔP ≤ 1 dB, the relative power tolerance for transmission is ± 0.7 dB. | | | |

#### 6.3.4.4 Aggregate power tolerance

The aggregate power control tolerance is the ability of the UE transmitter to maintain its power in a sub-frame (1 ms) during non-contiguous transmissions within 21 ms in response to 0 dB commands with respect to the first UE transmission and all other power control parameters as specified in TS 38.213 [8] kept constant.

The minimum requirement specified in Table 6.3.4.4-1 apply in the power range bounded by the minimum output power as specified in clause 6.3.1 and the maximum output power as specified in clause 6.2.1.

Table 6.3.4.4-1: Aggregate power tolerance

|  |  |  |
| --- | --- | --- |
| TPC command | UL channel | Aggregate power tolerance within 21 ms |
| 0 dB | PUCCH | ± 2.5 dB |
| 0 dB | PUSCH | ± 3.5 dB |

## 6.3A Output power dynamics for CA

### 6.3A.1 Minimum output power for CA

#### 6.3A.1.1 Minimum output power for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the minimum output power is defined per carrier and the requirement is specified in clause 6.3.1.

#### 6.3A.1.2 Minimum output power for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, the minimum output power is defined per carrier and the requirement is specified in clause 6.3.1.

#### 6.3A.1.3 Minimum output power for inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the minimum output power requirements in clause 6.3.1 apply.

For inter-band carrier aggregation with two uplink contiguous carrier assigned to one NR band, the minimum output power requirements in subclause 6.3A.1.1apply for those carriers. For inter-band carrier aggregation with uplink assigned to two NR bands, the minimum output power is defined per carrier and the requirement is specified in clause 6.3.1.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the minimum output power requirements in subclause 6.3A.1.2 apply for those carriers.

For inter-band carrier aggregation with uplink assigned to two NR bands, the minimum output power is defined per carrier and the requirement is specified in clause 6.3.1.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the minimum output power requirements specified in subclause 6.3.1 apply for the NR band supporting one component carrier, and for the NR band supporting two contiguous component carriers the requirements specified in subclause 6.3A.1.1 apply.

#### 6.3A.1.4 Void

### 6.3A.2 Transmit OFF power for CA

#### 6.3A.2.1 Transmit OFF power for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the transmit OFF power specified in clause 6.3.2 is applicable for each component carrier when the transmitter is OFF on all component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit on any of its ports.

#### 6.3A.2.2 Transmit OFF power for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, the transmit OFF power specified in clause 6.3.2 is applicable for each component carrier when the transmitter is OFF on all component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit on any of its ports.

#### 6.3A.2.3 Transmit OFF power for inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the transmit OFF power requirements in subclause 6.3.2 apply.

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the transmit OFF power requirements in subclause 6.3A.2.1 apply for those carriers.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the transmit OFF power requirements in subclause 6.3A.2.2 apply for those carriers.

For inter-band carrier aggregation with uplink assigned to two NR bands, the transmit OFF power specified in clause 6.3.2 is applicable for each component carrier when the transmitter is OFF on all component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit on any of its ports.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the transmit OFF power requirements specified in subclause 6.3.2 apply for the NR band supporting one component carrier, and for the NR band supporting two contiguous component carriers the requirements specified in subclause 6.3A.2.1 apply.

#### 6.3A.2.4 Void

### 6.3A.3 Transmit ON/OFF time mask for CA

#### 6.3A.3.1 Transmit ON/OFF time mask for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the general output power ON/OFF time mask specified in clause 6.3.3.1 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in clause 6.3.3.1 shall only be applicable for each component carrier when all the component carriers are OFF.

#### 6.3A.3.2 Transmit ON/OFF time mask for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, the general output power ON/OFF time mask specified in clause 6.3.3.1 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in clause 6.3.3.1 shall only be applicable for each component carrier when all the component carriers are OFF.

#### 6.3A.3.3 Transmit ON/OFF time mask for inter-band CA

##### 6.3A.3.3.1 General

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the transmit ON/OFF time mask requirements in subclause 6.3.3 apply.

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the transmit ON/OFF time mask requirements in subclause 6.3A.3.1 apply for those carriers.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the transmit ON/OFF time mask requirements in subclause 6.3A.3.2 apply for those carriers.

For inter-band carrier aggregation with uplink assigned to two NR bands, the general output power ON/OFF time mask specified in clause 6.3.3.1 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in clause 6.3.3.1 shall only be applicable for each component carrier when all the component carriers are OFF.

Time masks for Tx switching due to switching period are defined in clauses 6.3A.3.3.2-6.3A.3.3.6 for both single TAG and dual-TAG scenarios. When a UE is configured with dual-TAG, for up to two band pairs with at least two cells corresponding to two TAGs invloved in one switching event, the timing advance difference should be considered additive to the switching period. The UE may omit uplink transmission on OFDM symbols that partially or fully overlap with the switching period.

##### 6.3A.3.3.2 Time mask for switching between two uplink carriers

In addition to the requirements in 6.3A.3.3.1 and the maximum output power requirement specified in Table 6.2A.1.3-1 with uplink assigned to two NR bands, the switching time mask specified in this clause is applicable for an uplink band pair of a inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR UL carrier 1 is capable of one transmit antenna connector and NR UL carrier 2 is capable of two transmit antenna connectors with 3dB boosting on the maximum output power for CA power class 3 when the capability *uplinkTxSwitching-PowerBoosting* is present and the IE *uplinkTxSwitchingPowerBoosting* is enabled, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2 as specified in [38.306].

The switching periods described in Figure 6.3A.3.3.2-1a and Figure 6.3A.3.3.2-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

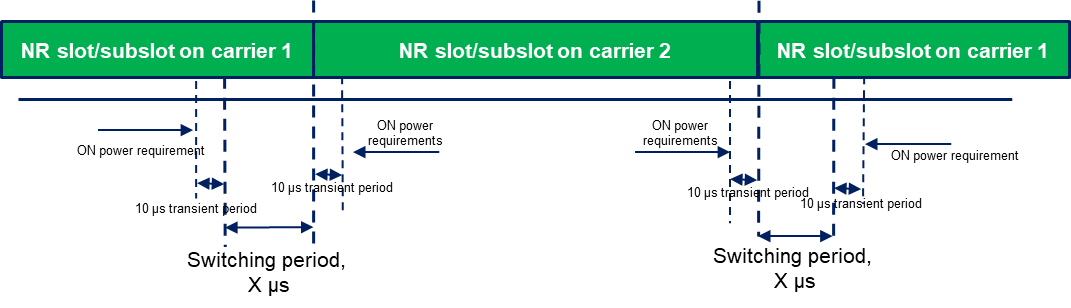


Figure 6.3A.3.3.2-1a: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1

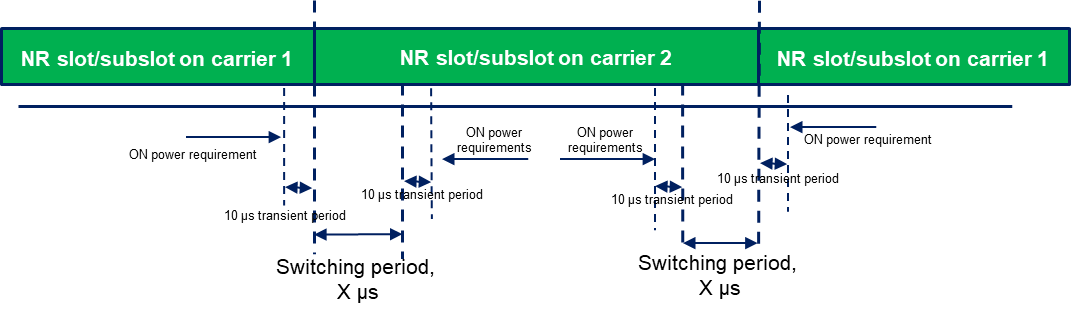


Figure 6.3A.3.3.2-1b: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The following applies for the uplink switching cases specified in clause 6.1.6.2 of [10] with *uplinkTxSwitchingOption* set to either *switchedUL* or *dualUL* when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod*on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of both non-co-located and co-located and synchronized network deployment for the two uplink carriers.

The time mask is applicable to uplink transmissions when configured with *switchedUL* or *dualUL*.

##### 6.3A.3.3.3 Time mask for switching between two uplink carriers with two transmit antenna connectors

In addition to the requirements in 6.3A.3.3.1 and the maximum output power requirement specified in Table 6.2A.1.3-1 with uplink assigned to two NR bands, the switching time mask specified in this clause is applicable for an uplink band pair of a inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod2T2T* is present, and is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR UL carrier 1 is capable of two transmit antenna connectors and NR UL carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between two-layer transmission with two antenna ports and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 1 and carrier 2.

The switching periods described in Figure 6.3A.3.3.3-1a and Figure 6.3A.3.3.3-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod2T2T*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

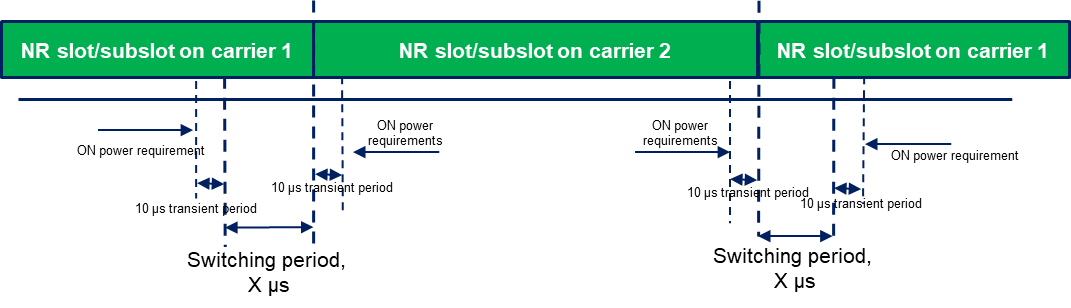


Figure 6.3A.3.3.3-1a: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1

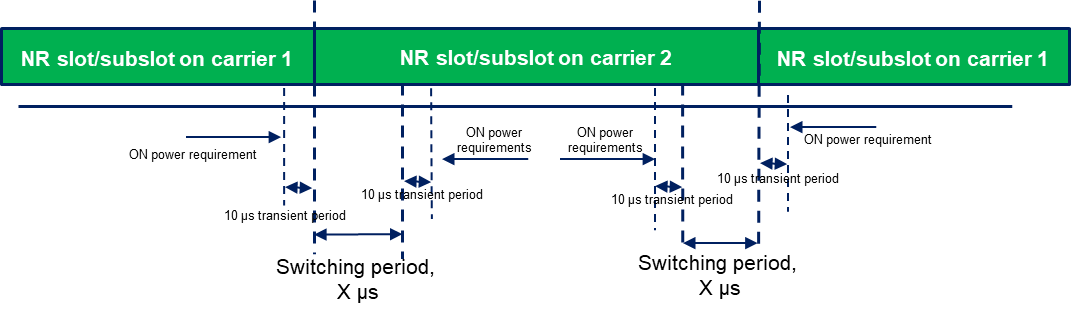


Figure 6.3A.3.3.3-1b: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The following applies for the uplink switching cases specified in clause 6.1.6.2 of [10] with *uplinkTxSwitchingOption* set to either *switchedUL* or *dualUL* when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod2T2T*on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of both non-co-located and co-located and synchronized network deployment for the two uplink carriers.

.

The time mask is applicable to uplink transmissions when configured with *switchedUL* or *dualUL*.

##### 6.3A.3.3.4 Time mask for switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors

In addition to the requirements in 6.3A.3.3.1 and the maximum output power requirement specified in Table 6.2A.1.3-1 with uplink assigned to two NR bands, the switching time mask specified in this clause is applicable for an uplink band pair of a inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR UL carrier 1 in band A is capable of one transmit antenna connector, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink bands following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2 and carrier 3 in band B.

The switching periods described in Figure 6.3A.3.3.4-1a and Figure 6.3A.3.3.4-1b are located in either NR band A or band B as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod* .

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

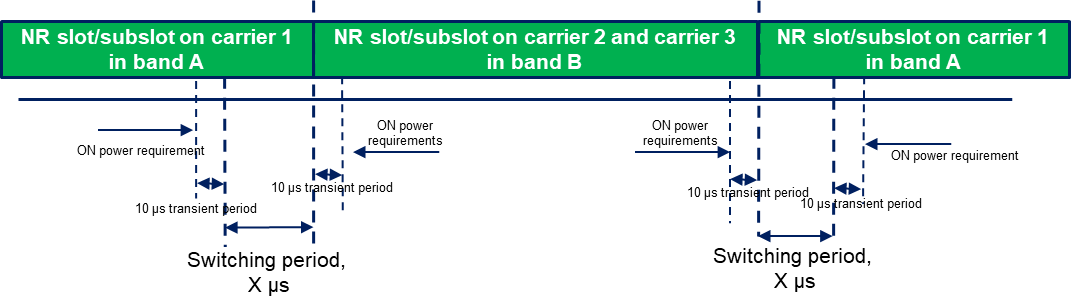


Figure 6.3A.3.3.4-1a: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band A

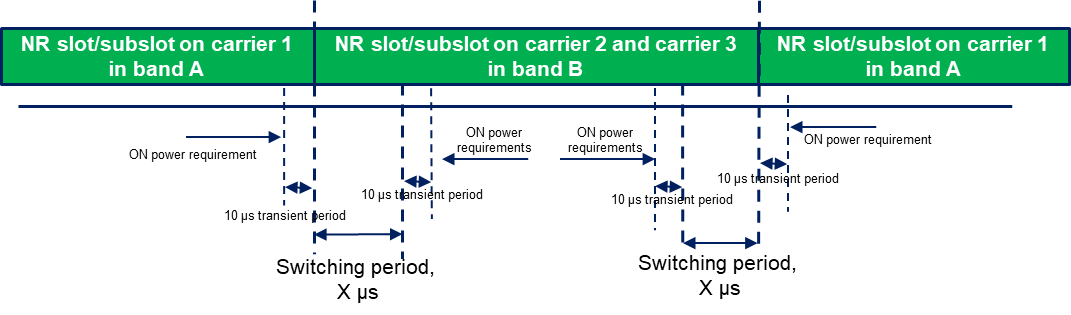


Figure 6.3A.3.3.4-1b: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band B

The following applies for the uplink switching cases specified in clause 6.1.6.2 of [10] with *uplinkTxSwitchingOption* set to either *switchedUL* or *dualUL* when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod*on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of both non-co-located and co-located and synchronized network deployment for the three uplink carriers.

The time mask is applicable to uplink transmissions when configured with *switchedUL* or *dualUL*.

##### 6.3A.3.3.5 Time mask for switching between two uplink bands with two transmit antenna connectors

In addition to the requirements in 6.3A.3.3.1 and the maximum output power requirement specified in Table 6.2A.1.3-1 with uplink assigned to two NR bands, the switching time mask specified in this clause is applicable for an uplink band pair of a inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod2T2T* is present, and is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR UL carrier 1 in band A is capable of two transmit antenna connectors, NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies. The UE shall support the switch between two-layer transmission with two antenna ports and two-layer transmission with two antenna ports on the two uplink bands following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 1, carrier 2 and carrier 3 in the two bands.

The switching periods described in Figure 6.3A.3.3.5-1a and Figure 6.3A.3.3.5-1b are located in either NR band A or band B as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod2T2T*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

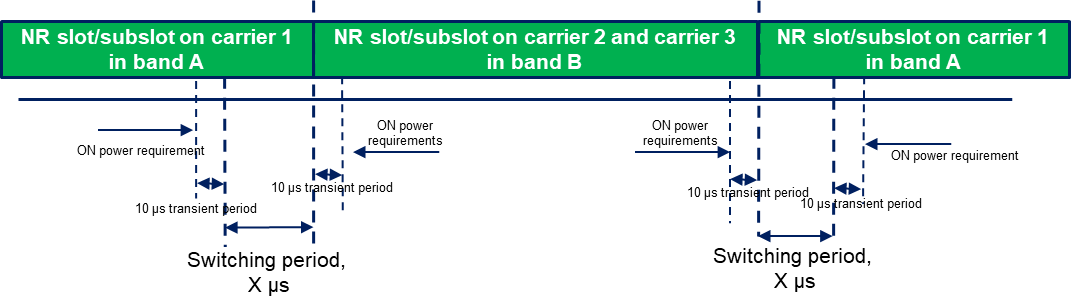


Figure 6.3A.3.3.5-1a: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band A

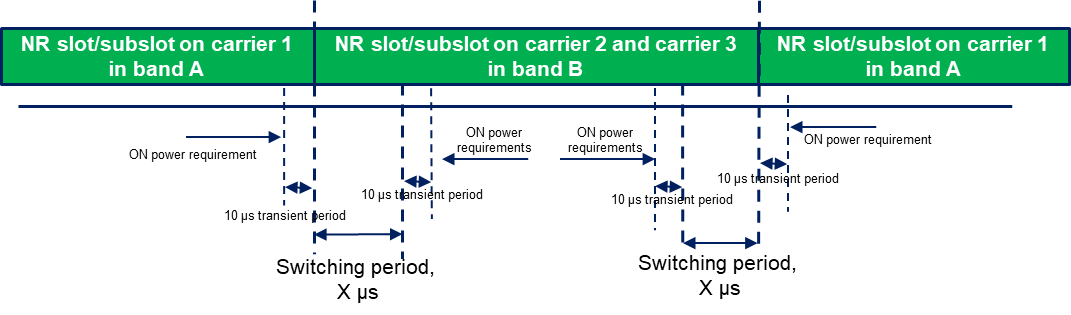


Figure 6.3A.3.3.5-1b: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band B

The following applies for the uplink switching cases specified in clause 6.1.6.2 of [10] with *uplinkTxSwitchingOption* set to either *switchedUL* or *dualUL* when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod2T2T*on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of both non-co-located and co-located and synchronized network deployment for the three uplink carriers.

The time mask is applicable to uplink transmissions when configured with *switchedUL* or *dualUL*.

#### 6.3A.3.4 Void

### 6.3A.4 Power control for CA

#### 6.3A.4.1 Power control for intra-band contiguous CA

##### 6.3A.4.1.1 Absolute power tolerance

The absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms. The requirement can be tested by time aligning any transmission gaps on the component carriers.

6.3A.4.1.1.1 Minimum requirements

For intra-band contiguous carrier aggregation the absolute power control tolerance per component carrier is given in Table 6.3.4.2-1.

##### 6.3A.4.1.2 Relative power tolerance

6.3A.4.1.2.1 Minimum requirements

For intra-band contiguous carrier aggregation, the requirements apply when the power of the target and reference sub-frames on each component carrier exceed the minimum output power as defined in clause 6.3A.1 and the total power is limited by PUMAX as defined in clause 6.2A.4. The UE shall meet the following requirements for transmission on both assigned component carriers when the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame:

a) for all possible combinations of PUSCH and PUCCH transitions per component carrier, the corresponding requirements given in Table 6.3.4.3-1;

b) for SRS transitions on each component carrier, the requirements for combinations of PUSCH/PUCCH and SRS transitions given in Table 6.3.4.2-1 with simultaneous SRS of constant SRS bandwidth allocated in the target and reference subrames;

c) for RACH on the primary component carrier, the requirements given in Table 6.3.4.3-1 for PRACH.

For a) and b) above, the power step P between the reference and target subframes shall be set by a TPC command and/or an uplink scheduling grant transmitted by means of an appropriate DCI Format.

##### 6.3A.4.1.3 Aggregate power control tolerance

For intra-band contiguous carrier aggregation, the aggregate power tolerance per component carrier is given in Table 6.3.4.4-1. The average power per PRB shall be aligned across both assigned carriers before the start of the test. The requirement can be tested with the transmission gaps time aligned between component carriers.

#### 6.3A.4.2 Power control for intra-band non-contiguous CA

#### 6.3A.4.2.1 Absolute power tolerance

The absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms. The requirement can be tested by time aligning any transmission gaps on the component carriers.

##### 6.3A.4.2.1.1 Minimum requirements

For intra-band non-contiguous carrier aggregation the absolute power control tolerance per component carrier is given in Table 6.3.4.2-1.

#### 6.3A.4.2.2 Relative power tolerance

##### 6.3A.4.2.2.1 Minimum requirements

For intra-band non-contiguous carrier aggregation, the requirements apply when the power of the target and reference sub-frames on each component carrier exceed the minimum output power as defined in subclause 6.3A.1 and the total power is limited by PUMAX as defined in subclause 6.2A.4. The UE shall meet the following requirements for transmission on both assigned component carriers when the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame:

a) for all possible combinations of PUSCH and PUCCH transitions per component carrier, the corresponding requirements given in Table 6.3.4.3-1;

b) for SRS transitions on each component carrier, the requirements for combinations of PUSCH/PUCCH and SRS transitions given in Table 6.3.4.3-1 with simultaneous SRS of constant SRS bandwidth allocated in the target and reference subrames;

c) for RACH on the primary component carrier, the requirements given in Table 6.3.4.3-1for PRACH.

For a) and b) above, the power step P between the reference and target subframes shall be set by a TPC command and/or an uplink scheduling grant transmitted by means of an appropriate DCI Format.

#### 6.3A.4.2.3 Aggregate power control tolerance

For intra-band non-contiguous carrier aggregation, the aggregate power tolerance per component carrier is given in Table 6.3.4.4-1. The average power per PRB shall be aligned across both assigned carriers before the start of the test. The requirement can be tested with the transmission gaps time aligned between component carriers.

#### 6.3A.4.3 Power control for inter-band CA

No requirements unique to CA operation are defined.

#### 6.3A.4.4 Void

## 6.3B Output power dynamics for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the output power dynamics for the corresponding inter-band CA configuration as specified in clause 6.3A applies.

## 6.3C Output power dynamics for SUL

### 6.3C.1 Void

### 6.3C.2 Void

### 6.3C.3 Transmit ON/OFF time mask for SUL

Time masks for Tx switching due to switching period are defined in clauses 6.3C.3.5for both single TAG and dual-TAG scenarios. When a UE is configured with dual-TAG, for up to two band pairs with at least two cells corresponding to two TAGs invloved in one switching event, the timing advance difference should be considered additive to the switching period. The UE may omit uplink transmissionon OFDM symbols that partially or fully overlap with the switching period.

#### 6.3C.3.1 Time mask for switching between two uplink carriers

The switching time mask specified in this clause is applicable for an uplink band pair of a SUL configuration when the capability *uplinkTxSwitchingPeriod* is present, is only applicable for uplink switching mechanisms specified in clause 6.16 of TS 38.214 [10], where NR SUL carrier 1 is capable of one transmit antenna connector and NR UL carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2 as specified in [38.306].

The switching periods described in Figure 6.3C.3.1-1a and Figure 6.3C.3.1-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

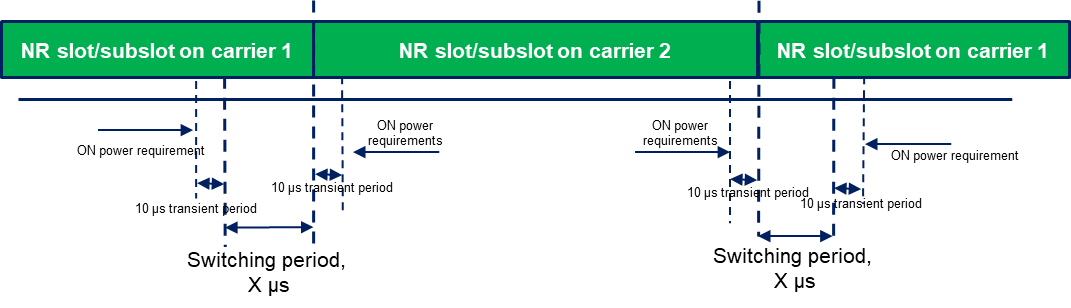


Figure 6.3C.3.1-1a: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1

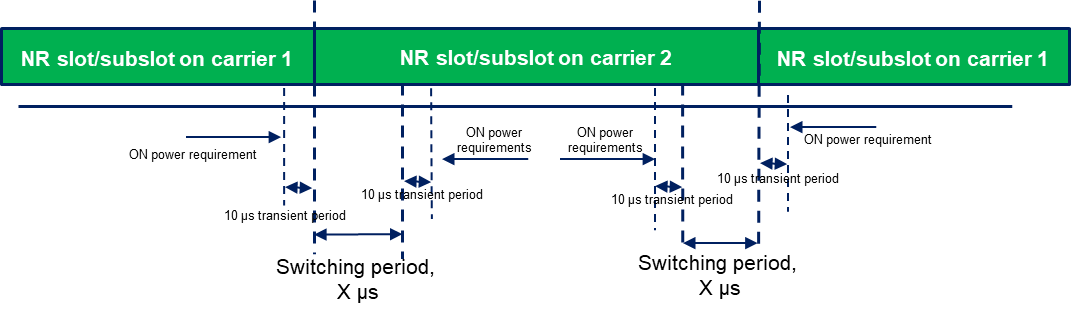


Figure 6.3C.3.1-1b: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The following applies for the uplink switching case specified in clause 6.1.6.3 of [10] when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod* on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of co-located and synchronized network deployment for the two uplink carriers.

The requirements apply for the case of single TAG for the two uplink carriers, i.e., the same uplink timing for the two carriers as described in clause 4.2 of TS 38.213 [8].

#### 6.3C.3.2 Time mask for switching between two uplink carriers with two transmit antenna connectors

The switching time mask specified in this clause is applicable for an uplink band pair of a SUL configuration when the capability *uplinkTxSwitchingPeriod2T2T* is present, is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR SUL carrier 1 is capable of two transmit antenna connectors and NR UL carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between two-layer transmission with two antenna ports and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 1 and carrier 2.

The switching periods described in Figure 6.3C.3.2-1a and Figure 6.3C.3.2-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod2T2T*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

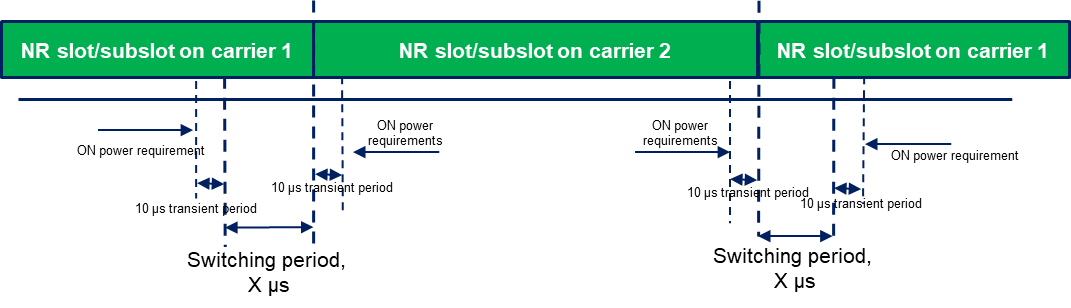


Figure 6.3C.3.2-1a: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1

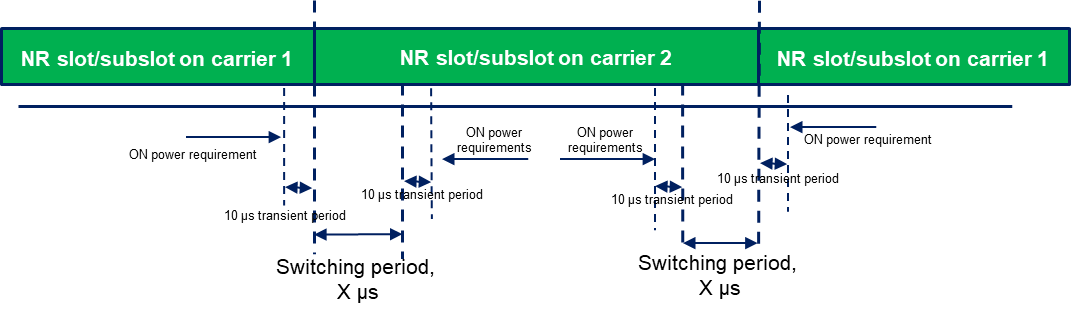


Figure 6.3C.3.2-1b: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The following applies for the uplink switching case specified in clause 6.1.6.3 of [10] when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod2T2T* on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of co-located and synchronized network deployment for the two uplink carriers.

The requirements apply for the case of single TAG for the two uplink carriers, i.e., the same uplink timing for the two carriers as described in clause 4.2 of TS 38.213 [8].

#### 6.3C.3.3 Time mask for switching between one uplink band with one transmit antenna connector and one uplink band with two transmit antenna connectors

The switching time mask specified in this clause is applicable for an uplink band pair of a SUL configuration when the capability *uplinkTxSwitchingPeriod* is present, is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR SUL carrier 1 in band A is capable of one transmit antenna connector and NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink bands following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2 and carrier 3 in band B.

The switching periods described in Figure 6.3C.3.3-1a and Figure 6.3C.3.3-1b are located in either NR band A or band B as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod* .

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

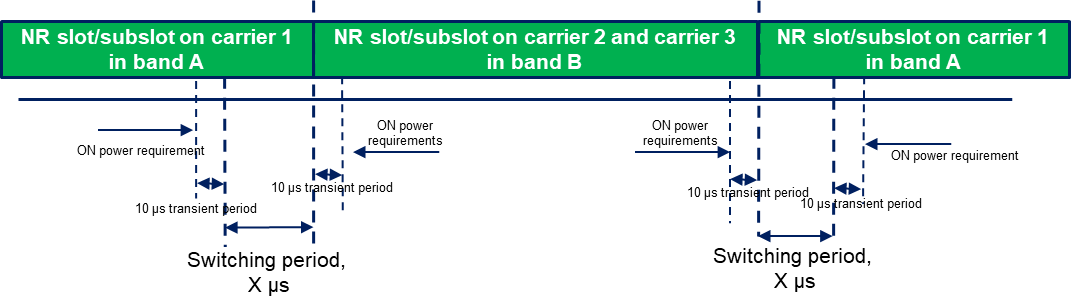


Figure 6.3C.3.3-1a: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band A

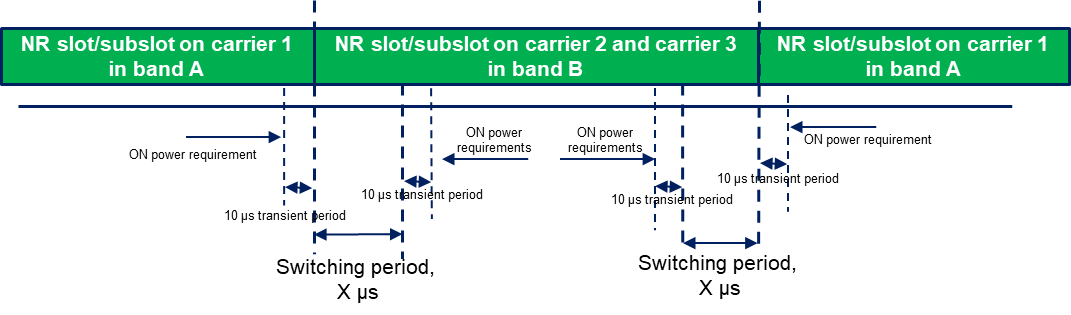


Figure 6.3C.3.3-1b: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band B

The following applies for the uplink switching case specified in clause 6.1.6.3 of [10] when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod* on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of co-located and synchronized network deployment for the three uplink carriers.

The requirements apply for the case of single TAG for the three uplink carriers, i.e., the same uplink timing for the three carriers as described in clause 4.2 of TS 38.213 [8].

#### 6.3C.3.4 Time mask for switching between two uplink bands with two transmit antenna connectors

The switching time mask specified in this clause is applicable for an uplink band pair of a SUL configuration when the capability *uplinkTxSwitchingPeriod2T2T* is present, is only applicable for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], where NR SUL carrier 1 in band A is capable of two transmit antenna connectors and NR UL carrier 2 and carrier 3 in band B are capable of two transmit antenna connectors. NR UL carrier 2 and carrier 3 are two contiguous aggregated carriers, and band A and band B are different bands with different carrier frequencies. The UE shall support the switch between two-layer transmission with two antenna ports and two-layer transmission with two antenna ports on the two uplink bands following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 1, carrier 2 and carrier 3 in the two bands.

The switching periods described in Figure 6.3C.3.4-1a and Figure 6.3C.3.4-1b are located in either NR band A or band B as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod2T2T*.

When switching from one carrier to another, if there is no uplink transmission scheduled or configured on the switch-from carrier for at least the duration of the switching period (X µs) before the point in time the UE is scheduled or configured to start the transmission on the switch-to carrier, the switching period is fully contained in the time period between the end of the transmission on the switch-from carrier and the start of the transmission on the switch-to carrier. In addition, the RRC signalling *uplinkTxSwitchingPeriodLocation* is ignored by the UE and does not take effect in this case.

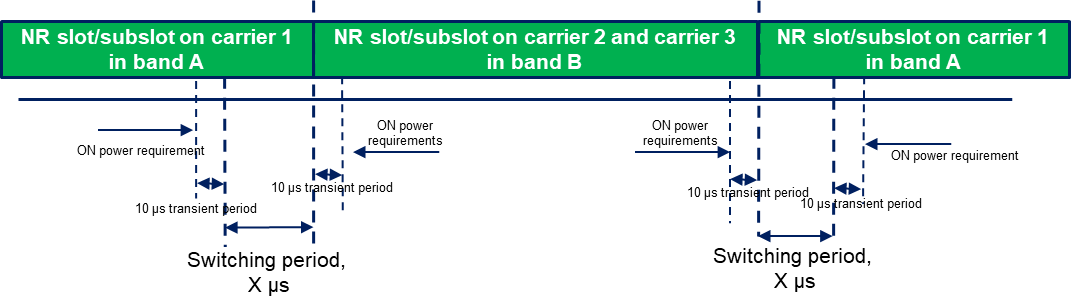


Figure 6.3C.3.4-1a: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band A

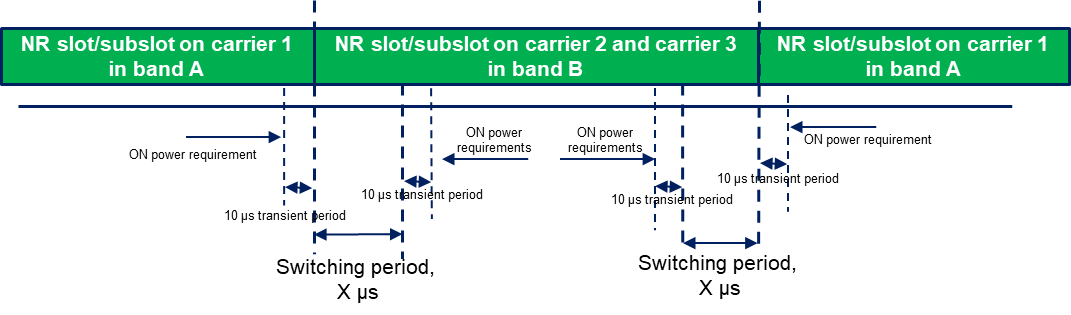


Figure 6.3C.3.4-1b: Time mask for switching between one carrier in band A and two contiguous carriers in band B, where the switching period is located in band B

The following applies for the uplink switching case specified in clause 6.1.6.3 of [10] when the configuration of the location of the switching period by *uplinkTxSwitchingPeriodLocation* is ignored by the UE:

- if an uplink switching is triggered for an uplink transmission starting at *T0* based on higher layer configuration(s) or DCI(s) received before *T0* − *Toffset* as specified in [10] and the UE is not configured or scheduled with uplink transmissions for a duration of at least the uplink switching gap indicated by *uplinkTxSwitchingPeriod2T2T* on any of the carriers before *T0*, transient periods of 10 ms are located at the end of the last symbol(s) configured or scheduled on the carriers before *T0* and at the start of the first symbol(s) configured or scheduled at *T0*.

The requirements apply for the case of co-located and synchronized network deployment for the three uplink carriers.

The requirements apply for the case of single TAG for the three uplink carriers, i.e., the same uplink timing for the three carriers as described in clause 4.2 of TS 38.213 [8].

## 6.3D Output power dynamics for UL MIMO

### 6.3D.1 Minimum output power for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the minimum output power is defined as the sum of the mean power from both transmit connector in one sub-frame (1 ms). The minimum output power shall not exceed the values specified in Table 6.3.1-1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3.1 apply when *TxD* is not indicated, and the requirements in clause 6.3G.1 apply when *TxD* is indicated.

### 6.3D.2 Transmit OFF power for UL MIMO

The transmit OFF power is defined as the mean power at each transmit antenna connector in a duration of at least one sub-frame (1 ms) excluding any transient periods.

The transmit OFF power at each transmit antenna connector shall not exceed the values specified in Table 6.3.2-1.

### 6.3D.3 Transmit ON/OFF time mask for UL MIMO

For UE supporting UL MIMO, the ON/OFF time mask requirements in clause 6.3.3 apply at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the general ON/OFF time mask requirements specified in clause 6.3.3.1 apply to each transmit antenna connector. The requirements shall be met with the UL MIMO configurations described in clause 6.2D.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3.3 apply when *TxD* is not indicated, and the requirements in clause 6.3G.3 apply when *TxD* is indicated.

### 6.3D.4 Power control for UL MIMO

For UE supporting UL MIMO, the power control tolerance applies to the sum of output powers from both transmit antenna connector.

The power control requirements specified in clause 6.3.4 apply to UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3.4 apply when *TxD* is not indicated, and the requirements in clause 6.3G.4 apply when *TxD* is indicated.

## 6.3E Output power dynamics for V2X

### 6.3E.1 Minimum output power for V2X

#### 6.3E.1.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands in Table 5.2E.1-1, the minimum output power is specified in Table 6.3E.1.1-1. The minimum output power is defined as the mean power in at least one sub-frame 1 ms.

Table 6.3E.1.1-1: Minimum output power

|  |  |  |
| --- | --- | --- |
| Channel bandwidth  (MHz) | Minimum output power  (dBm) | Measurement bandwidth  (MHz) |
| 51 | -30 | 4.515 |
| 10 | -30 | 9.375 |
| 20 | -30 | 19.095 |
| 30 | -28.2 | 28.815 |
| 40 | -27 | 38.895 |
| Note 1: The CBW is only applicable to PS UE in n14. | | |

For NR V2X UE with two transmit antenna connectors, the minimum output power is defined as the sum of the mean power at each transmit connector in one sub-frame (1 ms). The minimum output power shall not exceed the values specified for single carrier.

If the UE transmits on one antenna connector at a time, the requirements specified for single carrier shall apply to the active antenna connector.

#### 6.3E.1.2 Minimum output power for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.3.1 shall apply for the uplink in licensed band and the requirements specified in clause 6.3E.1.1 shall apply for the sidelink in licensed band or Band n47.

For intra-band con-current NR V2X operation, the minimum output power is defined per carrier and the requirement for NR uplink is specified in clause 6.3.1 and the requirement for NR sidelink is specified in clause 6.3E.1, respectively.

### 6.3E.2 Transmit OFF power for V2X

#### 6.3E.2.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands in Table 5.2E.1-1, the requirements specified in current clause apply.

Table 6.3E.2.1-1: Transmit OFF power

|  |  |  |
| --- | --- | --- |
| Channel bandwidth  (MHz) | Transmit OFF power  (dBm) | Measurement bandwidth  (MHz) |
| 51 | -50 | 4.515 |
| 10 | -50 | 9.375 |
| 20 | -50 | 19.095 |
| 30 | -50 | 28.815 |
| 40 | -50 | 38.895 |
| Note 1: The CBW is only applicable to PS UE in n14. | | |

For NR V2X UE supporting SL MIMO or Tx Diversity, the transmit OFF power at each transmit antenna connector shall not exceed the values specified in Table 6.3E.2.1-1 for single carrier. Transmit off power is defined as the mean power in at least one sub-frame 1 ms.

#### 6.3E.2.2 Transmit OFF power for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.3.2 shall apply for the uplink in licensed band and the requirements specified in clause 6.3E.2.1 shall apply for the sidelink in licensed band or Band n47.

For intra-band con-current NR V2X operation, the transmit OFF power requirement is defined per carrier and the requirement for NR uplink is specified in clause 6.3.2 and the requirement for NR sidelink is specified in clause 6.3E.2, respectively.

### 6.3E.3 Transmit ON/OFF time mask for V2X

#### 6.3E.3.1 General

For NR V2X UE, additional requirements on ON/OFF time masks for V2X physical channels and signals are specified in this clause.

#### 6.3E.3.2 General time mask

The General ON/OFF time mask defines the observation period between the Transmit OFF and ON power and between Transmit ON and OFF power for PSCCH, and PSSCH transmissions in a slot wherein the last symbol is punctured to create a guard period.



Figure 6.3E.3.2-1: General PSCCH/PSSCH time mask for NR V2X UE

For NR V2X UE supporting SL MIMO or Tx Diversity, the ON/OFF time mask requirements apply at each transmit antenna connector.

For UE with two transmit antenna connectors, the general ON/OFF time mask requirements specified in current subclause apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in subclause 6.2D.1.

If the UE transmits on one antenna connector at a time, the general ON/OFF time mask requirements apply to the active antenna connector.

#### 6.3E.3.3 S-SSB time mask

The S-PSS/S-SSS/PSBCH time mask for NR V2X UE defines the observation period between transmit OFF and ON S-PSS power and between transmit ON PSBCH and OFF power in a slot wherein the last symbol is punctured to create a guard period.

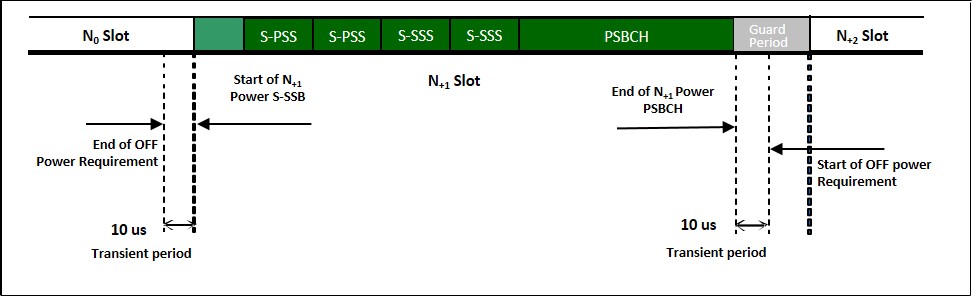


Figure 6.3E.3.3-1: S-SSB time mask for NR V2X UE

For NR V2X UE supporting SL MIMO or Tx Divesity, the ON/OFF time mask requirements apply at each transmit antenna connector.

For UE with two transmit antenna connectors, the S-SSB ON/OFF time mask requirements specified in current subclause apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in subclause 6.2D.1.

If the UE transmits on one antenna connector at a time, the S-SSB ON/OFF time mask requirements apply to the active antenna connector.

#### 6.3E.3.4 Transmit ON/OFF time mask for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.3.3 shall apply for the uplink in licensed band and the requirements specified in clause 6.3E.3.2 and 6.3E.3.3 shall apply for the sidelink in licensed band or Band n47.

For intra-band V2X con-current operation band specified in subclause 5.2.E.2, the general output power ON/OFF time mask is defined per carrier during the ON power period and the transient periods. The ON/OFF time mask specified in clause 6.3.3.1 is applicable for NR uplink and the ON/OFF time mask in 6.3E.3.1 is applicable for NR sidelink. The OFF period as specified in clause 6.3.3.1 shall only be applicable for each component carrier when all the component carriers are OFF.

For the TDM operation in same carrier with same bandwidth, the switching time mask in Figure 6.3E.3.4-1 shall be applied.

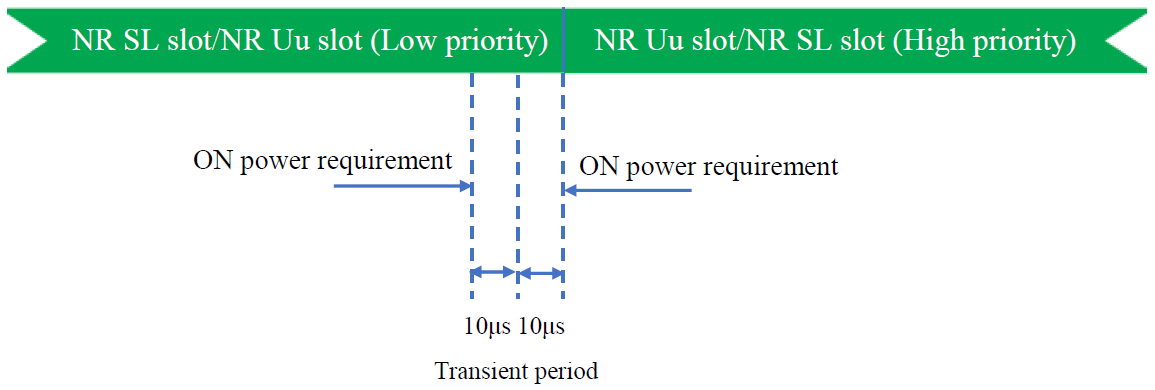


Figure 6.3E.3.4-1: Time mask for switching between Uu and SL for same carrier case with same bandwidth

For intra-band V2X con-current operation band specified in subclause 5.3.E.2, the switching time mask in Figure 6.3E.3.4-2 shall apply for the different carrier case. The switching time shall be located on the RAT of low priority when NR Uu and NR SL have different priorities based on priority information specified in TS 38.321 and TS38.213. It is up to UE implementation when NR Uu and NR SL have the same priority based on priority information specified in TS 38.213.

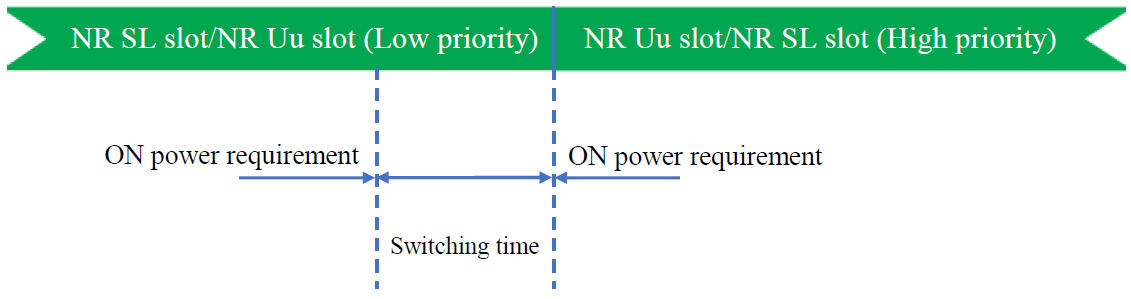


Figure 6.3E.3.4-2: Time mask for switching between Uu and SL for different carrier case

In the real field, there is a timing advance difference, i.e. between NR Uu slot and NR SL slot due to different timing advance of NR Uu and NR SL. The switching time masks do not include timing advance difference but the timing advance difference should be considered with the switching time for same carrier case and different carrier case.

### 6.3E.4 Power control for V2X

#### 6.3E.4.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands in Table 5.2E.1-1, the following requirements are applied for NR V2X sidelink transmission.

For NR V2X UE supporting SL MIMO or Tx Diversity, the power control tolerance for single carrier shall apply to the sum of output power at each transmit antenna connector.

If the UE transmits on one antenna connector at a time, the requirements for single carrier shall apply to the active antenna connector.

#### 6.3E.4.2 Absolute power tolerance

The requirements in clause 6.3.4.2 shall apply for NR V2X transmission.

#### 6.3E.4.3 Power control for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.3.4 shall apply for the uplink in licensed band and the requirements specified in clause 6.3E.4.1 and 6.3E.4.2 shall apply for the sidelink in licensed band or Band n47.

For the intra-band con-current NR V2X operation, the requirements specified in clause 6.3.4 shall apply for the uplink in licensed band and the requirements specified in clause 6.3E.4 shall apply for the sidelink in licensed band.

## 6.3F Output power dynamics for shared spectrum channel access

### 6.3F.1 Minimum output power

The requirements for minimum output power in clause 6.3.1 apply.

### 6.3F.2 Transmit OFF power

The requirements for Transmit OFF power in clause 6.3.2 apply.

### 6.3F.3 Transmit ON/OFF time mask

#### 6.3F.3.1 General

The transmit power time mask defines the transient period(s) allowed between transmit OFF power as defined in clause 6.3F.2 and transmit ON power symbols (transmit ON/OFF). The transmit power ON/OFF time mask specified in clause 6.3F.3.2 supercedes the ON/OFF masks specified in clause 6.3.3; however, between continuous ON-power transmissions the requirements in clause 6.3.3 apply. Unless otherwise stated the requirements in clause 6.5F apply also in transient periods.

#### 6.3F.3.2 General ON/OFF time mask

The general ON/OFF time mask defines the observation period between transmit OFF and ON power and between transmit ON and OFF power for each SCS as illustrated below in Figure 6.3F.3.2-1. ON/OFF scenarios include: contiguous, and non-contiguous transmission, etc.

The OFF power measurement period is defined in a duration of at least one slot excluding any transient periods. The ON power is defined as the mean power over the duration of at least one slot excluding any transient period and non-transmitted symbols. The leading transient period starts 5us before the beginning of the first symbol of transmission and extends 10us into the transmission including the CP extension if applicable. The trailing transient period starts 5us before the end of transmssion and extends 5us beyond the end of transmission.

**Figure 6.3F.3.2-1: General ON/OFF time mask for shared spectrum channel access**

**CP-E**

**End of OFF power**

**5µs**

**5µs**

**Transient period**

**Transient period**

**Start of OFF power**

**Start of ON power**

**requirement**

**Start of transmission**

**End of transmission**

**End of ON power**

**requirement**

**\* The OFF power requirements does not**

**apply for DTX and measurement gaps**

**10µs**

**5µs**

### 6.3F.3A General ON/OFF mask for CA

#### 6.3F.3A.1 General ON/OFF mask for inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the general output power ON/OFF time mask specified in clause 6.3.3.1 is applicable for the NR uplink carrier while the general output power ON/OFF time mask specified in clause 6.3F.3 is applicable for the carrier operating with shared spectrum access. The OFF period as specified in clause 6.3.3.1 and clause 6.3F.3 shall only be applicable for each component carrier when all the component carriers are OFF.

### 6.3F.4 Power control

#### 6.3F.4.1 General

The requirements on power control accuracy apply under normal conditions.

#### 6.3F.4.2 Absolute power tolerance

The absolute power tolerance requirements of clause 6.3.4.2 apply at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 40 ms.

#### 6.3F.4.3 Relative power tolerance

The relative power tolerance requirements of clause 6.3.4.3 apply if the transmission gap between the target sub-frame and the reference sub-frame is less than or equal to 40 ms.

#### 6.3F.4.4 Aggregate power tolerance

The aggregate power tolerance requirements of clause 6.3.4.4 apply during non-contiguous transmissions within 41ms with respect to the first UE transmission.

### 6.3F.4A Power control for inter-band CA

No requirements unique to CA operation are defined.

## 6.3G Output power dynamics for Tx Diversity

### 6.3G.1 Minimum output power for Tx Diversity

For UE supporting Tx diversity, the minimum output power is defined as the sum of the mean power at each transmit connector in one sub-frame (1 ms). The minimum output power shall not exceed the values specified in Table 6.3.1-1.

### 6.3G.2 Transmit OFF power for Tx Diversity

For UE supporting Tx diverstidy, the transmit OFF power is defined as the mean power at each transmit antenna connector in a duration of at least one sub-frame (1 ms) excluding any transient periods.

The transmit OFF power at each transmit antenna connector shall not exceed the values specified in Table 6.3.2-1.

### 6.3G.3 Transmit ON/OFF time mask for Tx Diversity

For UE supporting Tx diversity, the ON/OFF time mask requirements in clause 6.3.3 apply at each transmit antenna connector.

### 6.3G.4 Power control for Tx Diversity

For UE supporting Tx diversity, the power control tolerance applies to the sum of output power at each transmit antenna connector.

The requirements specified in clause 6.3.4 apply.

## 6.3H Output power dynamics for CA with UL MIMO

### 6.3H.1 Output power dynamics for intra-band UL contiguous CA with UL MIMO

#### 6.3H.1.1 Minimum output power for intra-band UL contiguous CA with UL MIMO

For intra-band UL contiguous CA and UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the minimum output power is defined as the sum of the mean power from both transmit connector in one sub-frame (1 ms) on each CC. The minimum output power shall not exceed the values specified in clause 6.3A.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3A.1 apply.

#### 6.3H.1.2 Transmit OFF power for intra-band UL contiguous CA with UL MIMO

The transmit OFF power is defined as the mean power at each transmit antenna connector in a duration of at least one sub-frame (1 ms) excluding any transient periods.

The transmit OFF power at each transmit antenna connector on each CC shall not exceed the values specified in clause 6.3A.2.1.

#### 6.3H.1.3 Transmit ON/OFF time mask for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the ON/OFF time mask requirements in clause 6.3A.3.1 apply at each transmit antenna connector on each CC. The requirements shall be met with the UL MIMO configurations described in clause 6.2H.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3A.3 apply.

#### 6.3H.1.4 Power control for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the power control tolerance in clause 6.3A.4.1 applies to the sum of output powers from both transmit antenna connector on each CC. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.3A.4 apply.

## 6.4 Transmit signal quality

### 6.4.1 Frequency error

The UE basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of 1 ms of cumulated measurement intervals compared to the carrier frequency received from the NR Node B.

### 6.4.2 Transmit modulation quality

#### 6.4.2.0 General

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 the parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrentList* IE (as defined in TS 38.331 [7]), carrier leakage measurement requirement in clause 6.4.2.2 and 6.4.2.3 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.

#### 6.4.2.1 Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further equalised using the channel estimates subjected to the EVM equaliser spectrum flatness requirement specified in clause 6.4.2.4. For DFT-s-OFDM waveforms, the EVM result is defined after the front-end FFT and IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. For CP-OFDM waveforms, the EVM result is defined after the front-end FFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

The basic EVM measurement interval in the time domain is one preamble sequence for the PRACH and one slotfor PUCCH and PUSCH in the time domain. The EVM measurement interval is reduced by any symbols that contains an allowable power transient in the measurement interval, as defined in clause 6.3.3.

The RMS average of the basic EVM measurements over 10 subframes for the average EVM case, and over 60 subframes for the reference signal EVM case, for the different modulation schemes shall not exceed the values specified in Table 6.4.2.1-1 for the parameters defined in Table 6.4.2.1-2. For EVM evaluation purposes, all 13 PRACH preamble formats and all 5 PUCCH formats are considered to have the same EVM requirement as QPSK modulated..

Table 6.4.2.1-1: Requirements for Error Vector Magnitude

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

Table 6.4.2.1-2: Parameters for Error Vector Magnitude

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE Output Power | dBm | ≥ Table 6.3.1-1 |
| UE Output Power for 256 QAM | dBm | ≥ Table 6.3.1-1 + 10 dB |
| Operating conditions |  | Normal conditions |

#### 6.4.2.1a Error Vector Magnitude including symbols with transient period

In 6.4.2.1, EVM has been defined by excluding the symbols which have a transient period. In this section, measurement interval is defined for the symbols with a transient period to include these symbols in the RMS average EVM computation when the UE reports a transient period capability other than the default. Before calculating the EVM, the measured waveform is corrected for sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM. The symbols with transient period should not be used for equalization. Only CP-OFDM waveform is used for conformance testing.

In the case of PUSCH or PUCCH transmissions when the mean power, modulation or RB allocation across slot or subslot boundaries is expected to change the EVM result over the symbols where the transient occurs is calculated according to Table 6.4.2.1a-1.

Table 6.4.2.1a-1: EVM definition for reported transient period

| Reported transient capability (us) | EVM definition | *tpstart* (µs) | SCS4 |
| --- | --- | --- | --- |
| 2 |  | -0.5 | 15kHz or 30kHz5 |
| 4 |  | -1 | 15kHz |
| 7 |  | -2.7 | 15kHz |
| NOTE 1:   ,,and are defined in Annex F  NOTE 2:   is the EVM for a symbol right after a transition; is the EVM for a symbol right before a transition  NOTE 3: *tpstart* denotes the start position of the EVM exclusion window as shown in Annex F.4  NOTE 4: SCS denotes the SCS that can be used in the conformance test  NOTE 5: 30kHz shall be used in the conformance test unless the UE signals in *supportedSubCarrierSpacingUL* in *FeatureSetPerCC* that it only supports 15kHz in the corresponding band | | | |

The RMS average of the basic EVM measurements over 108 subframes for the symbols where the transient occurs for the different modulation schemes shall not exceed the values specified in Table 6.4.2.1a-2 for the parameters defined in Table 6.4.2.1a-3. This requirement can be verified with 64 QAM and 256 QAM modulation.

Table 6.4.2.1a-2: Requirements for Error Vector Magnitude

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Average EVM Level |
| 64 QAM | % | 10 |
| 256 QAM | % | 8 |

Table 6.4.2.1a-3: Parameters for Error Vector Magnitude

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE Output Power | dBm | ≥ Table 6.3.1-1 |
| UE Output Power for 256 QAM | dBm | ≥ Table 6.3.1-1 + 10 dB |
| Operating conditions |  | Normal conditions |

#### 6.4.2.2 Carrier leakage

Carrier leakage is an additive sinusoid waveform whose frequency is the same as the modulated waveform carrier frequency. The measurement interval is one slot in the time domain.

In the case that uplink sharing, the carrier leakage may have 7.5 kHz shift with the carrier frequency.

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.4.2.2-1.

Table 6.4.2.2-1: Requirements for Carrier Leakage

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

#### 6.4.2.3 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 due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one or more symbols, accordingly.

The average of the basic in-band emission measurement over 10 sub-frames shall not exceed the values specified in Table 6.4.2.3-1.

Table 6.4.2.3-1: 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 leakage 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 - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. 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. For pi/2 BPSK with Spectrum Shaping, the limit is expressed as a ratio of measured power in one non-allocated RB to the measured power in the allocated RB with highest PSD.  NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs.  NOTE 4: 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.  NOTE 5: The applicable frequencies for this limit depend on the parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrent* IE, and are those that are enclosed either in the RB containing the carrier leakage frequency, or in the two RBs immediately adjacent to the carrier leakage frequency but excluding any allocated RB.  NOTE 6: *LCRB* is the Transmission Bandwidth (see clause 5.3).  NOTE 7: *NRB* is the Transmission Bandwidth Configuration (see clause 5.3).  NOTE 8: *EVM* is the limit specified in Table 6.4.2.1-1 for the modulation format used in the allocated RBs.  NOTE 9:  is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. *∆RB*= 1 or *∆RB*= -1 for the first adjacent RB outside of the allocated bandwidth.  NOTE 10:  is an average of the transmitted power over 10 sub-frames normalized by the number of allocated RBs, measured in dBm.  NOTE 11: For almost contiguous allocations defined in clause 6.2.2, *LCRB* = NRB\_alloc + NRB\_gap with no in-gap emission requirement. | | | | |

#### 6.4.2.4 EVM equalizer spectrum flatness

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex F) must meet a spectral flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block. The basic measurement interval is the same as for EVM.

The peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the uplink allocation shall not exceed the maximum ripple specified in Table 6.4.2.4-1 for normal conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 5 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 7 dB (see Figure 6.4.2.4-1).

The EVM equalizer spectral flatness shall not exceed the values specified in Table 6.4.2.4-2 for extreme conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 10 dB (see Figure 6.4.2.4-1).

Table 6.4.2.4-1: Requirements for EVM equalizer spectrum flatness (normal conditions)

|  |  |
| --- | --- |
| Frequency range | Maximum ripple (dB) |
| FUL\_Meas – FUL\_Low ≥ 3 MHz and FUL\_High – FUL\_Meas ≥ 3 MHz  (Range 1) | 4 (p-p) |
| FUL\_Meas – FUL\_Low < 3 MHz or FUL\_High – FUL\_Meas < 3 MHz  (Range 2) | 8 (p-p) |
| NOTE 1: FUL\_Meas refers to the sub-carrier frequency for which the equalizer coefficient is evaluated  NOTE 2: FUL\_Low and FUL\_High refer to each NR frequency band specified in Table 5.2-1 | |

Table 6.4.2.4-2: Minimum requirements for EVM equalizer spectrum flatness (extreme conditions)

|  |  |
| --- | --- |
| Frequency range | Maximum Ripple (dB) |
| FUL\_Meas – FUL\_Low ≥ 5 MHz and FUL\_High – FUL\_Meas ≥ 5 MHz  (Range 1) | 4 (p-p) |
| FUL\_Meas – FUL\_Low < 5 MHz or FUL\_High – FUL\_Meas < 5 MHz  (Range 2) | 12 (p-p) |
| NOTE 1: FUL\_Meas refers to the sub-carrier frequency for which the equalizer coefficient is evaluated  NOTE 2: FUL\_Low and FUL\_High refer to each NR frequency band specified in Table 5.2-1 | |

**f**

**FUL\_High**

**FUL\_High – 3(5) MHz**

**< 4(4) dBp-p**

**Range 1**

**Range 2**

**max(Range 1)-min(Range 2) < 5(6) dB**

**max(Range 2)-min(Range 1) < 7(10) dB**

**< 8(12) dBp-p**

Figure 6.4.2.4-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement are within brackets).

##### 6.4.2.4.1 Requirements for Pi/2 BPSK modulation

These requirements apply if the IE *powerBoostPi2BPSK* is set to 1 for power class 3 capable UE operating in TDD bands n40, n41, n77, n78 and n79 with Pi/2 BPSK modulation and UE indicates support for UE capability *powerBoosting-pi2BPSK* and 40 % or less slots in radio frame are used for UL transmission. These requirements also apply if the IE *dmrs-UplinkTransformPrecoding-r16* is configured and UE indicates support for UE capability *lowPAPR-DMRS-PUSCHwithPrecoding-r16*. Otherwise the requirements for EVM equalizer spectrum flatness defined in clause 6.4.2.4 apply

The EVM equalizer coefficients across the allocated uplink block shall be modified to fit inside the mask specified in Table 6.4.2.4.1-1 for normal conditions, prior to the calculation of EVM. The limiting mask shall be placed to minimize the change in equalizer coefficients in a sum of squares sense.

Table 6.4.2.4.1-1: Mask for EVM equalizer coefficients for Pi/2 BPSK, normal conditions

|  |  |  |
| --- | --- | --- |
| Frequency range | Parameter | Maximum ripple (dB) |
| |FUL\_Meas – Fcenter| ≤ X MHz  (Range 1) | X1 | 6 (p-p) |
| |FUL\_Meas – Fcenter| > X MHz  (Range 2) | X2 | 14 (p-p) |
| NOTE 1: FUL\_Meas refers to the sub-carrier frequency for which the equalizer coefficient is evaluated  NOTE 2: Fcenter refers to the center frequency of an allocated block of PRBs  NOTE 3: X, in MHz, is equal to 25% of the bandwidth of the PRB allocation  NOTE 4: See Figure 6.4.2.4.1-1 for description of X1, X2 | | |



Figure 6.4.2.4.1-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation. .

For Pi/2 BPSK modulation the UE shall be allowed to employ spectral shaping and the shaping filter shall be restricted so that the impulse response of the shaping filter itself shall meet

│*ãt*(*t*,0)│ ≥ │*ãt*(*t*, *τ*)│ ∀*τ* ≠ 0

20*log*10│*ãt*(*t*,*τ*)│< -15 dB 1< *τ* < M - 1,

where│*ãt*(*t*, *τ*)│=*IDFT*{│*ãt*(*t*,*f*)│*ejφ (t*,*f)*}, *f* is the frequency of the *M* allocated subcarriers , *ã*(*t*,*f*) and *φ*(*t*,*f*) are the amplitude and phase response.

0 dB reference is defined as20*log*10│*ãt*(*t*,0)│.

#### 6.4.2.5 Phase continuity requirements for DMRS bundling

For bands that UE indicates the support of DMRS bundling, when the UE is configured with DMRS bundling, the maximum allowable difference between the measured phase value in any slot *p-1* and slot *p*, or slot 0 and any slot *p* for each antenna connector shall satisfy the requirements as listed in Table 6.4.2.5-1 for the measurement conditions defined in Table 6.4.2.5-2, within a measurement time window limited by the UE capability of maximum duration for DMRS bundling [*maxDurationDMRS-Bundling-r17*], and defined for each frequency band separately. The phase value for each slot is measured as shown in Annex F.9. These requirements apply to PUCCH and PUSCH transmissions with DFT-s-OFDM and CP-OFDM waveforms.

Table 6.4.2.5-1: Maximum allowable phase difference for DMRS bundling

|  |  |  |  |
| --- | --- | --- | --- |
| UL channel | Modulation order | Phase difference between any slot *p-1* and slot *p*  (NOTE 2) | Phase difference between slot *0* and any slot *p*  (NOTE 3) |
| PUSCH | Pi/2 BPSK, QPSK | [25] degrees | [30] degrees |
| PUCCH | Pi/2 BPSK, BPSK, QPSK |  |  |
| NOTE 1: The UE capability of the length of maximum duration refers to the maximum time duration during which UE is able to meet the phase continuity requirements, assuming no phase consistency violating events defined in TS 38.214 in between.  NOTE 2: This requirement applies for FDD and TDD bands, for supported DMRS bundling configurations ≤ 8 slots.  NOTE 3: This requirement applies only for FDD bands, for supported DMRS bundling configurations of 16 slots. | | | |

The above requirements are applicable when all the following conditions are met within the measurement time window:

- RB allocation in terms of length and frequency position does not change, and intra-slot and inter-slot frequency hopping is not activated.

- Modulation order does not change.

- No network commanded TA takes effect.

- The TPMI precoder does not change.

- There is no change in UE transmission power level, and no change in the level of P-MPR applied by the UE.

- UE is not scheduled with uplink transmission of other physical channel/signal in-between the PUSCH or PUCCH transmissions.

- For TDD, no downlink slot(s) or downlink symbol(s) or flexible symbol(s) with/without DL monitoring occasion configured in-between the PUSCH or PUCCH transmissions.

Table 6.4.2.5-2: Measurement conditions for the maximum allowable phase difference

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Level |
| UE Output Power | dBm | PCMAX,f,c in clause 6.2.4, P-MPR = 0 |
| UE downlink received power |  | Not change |
| Operating conditions |  | Normal conditions |
| Transmission bandwidth |  | Confined within FUL\_low + [4] MHz and FUL\_high – [4] MHz |
| DL signal frequency |  | Not change before and during the measurement window |
| DL signal timing |  | Maintained constant before and during the measurement window |
| UL slots for testing |  | Tested on consecutive UL slots |
| PUSCH waveform for testing |  | DFT-s-OFDM |

## 6.4A Transmit signal quality for CA

### 6.4A.1 Frequency error for CA

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

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

#### 6.4A.1.2 Frequency error for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation the requirements in Section 6.4.1 applies per component carrier.

#### 6.4A.1.3 Frequency error for inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the frequency error requirements in subclause 6.4.1 apply.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the frequency error requirements in subclause 6.4A.1.2 apply for those carriers.

For inter-band carrier aggregation with uplink assigned to two NR bands, the frequency error requirements defined in clause 6.4.1 shall apply on each component carrier with all component carriers active.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the frequency error requirements specified in subclause 6.4.1 apply for the NR band supporting one component carrier, and for the NR band supporting two contiguous component carriers the requirements specified in subclause 6.4A.1.1 apply.

#### 6.4A.1.4 Void

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

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

##### 6.4A.2.1.0 General

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

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

The Carrier leakage frequency is optionally indicated by the UE via IE *UplinkTxDirectCurrentList ,* IE *UplinkTxDirectCurrentTwoCarrierList-r16* for CA with two component carriers configured for uplink *or* IE *UplinkTxDirectCurrentMoreCarrierList-r17* for CA of any configuration*.*

If the UE does not indicate DC location parameters, the carrier leakage measurement requirement in clauses 6.4A.2.2 and 6.4A.2.3 shall be waived and the UE’s UL signal left uncorrected for carrier leakage. Any requirement relaxation to accommodate the IQ image shall be omitted.

If the UE indicates carrier leakage frequency as 3300 or 3301 with IE *UplinkTxDirectCurrentList or UplinkTxDirectCurrentTwoCarrierList-r16*, or if the carrier leakage frequency is outside the activated UL component carriers, the carrier leakage measurement requirement in clauses 6.4A.2.2 and 6.4A.2.3 shall be waived and the UE’s UL signal left uncorrected for carrier leakage. Any requirement relaxation to accommodate the IQ image shall be omitted.

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

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

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

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

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

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

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Limit | | Applicable Frequencies |
| General | dB |  | | Any non-allocated (NOTE 2) |
| IQ Image | dB | -28 | Output power > 10 dBm | Image frequencies  (NOTE 3) |
|  |  | -25 | 0≤ Output power ≤ 10 dBm |  |
| Carrier leakage | dBc | -28 | Output power > 10 dBm | Carrier leakage frequency (NOTE 4,5) |
|  |  | -25 | 0 dBm ≤ Output power ≤ 10 dBm |  |
|  |  | -20 | -30 dBm ≤ Output power ≤ 0 dBm |  |
|  |  | -10 | -40 dBm ≤ Output power < -30 dBm |  |
| NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. is defined in NOTE 10. The limit is evaluated in each non-allocated RB.  NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs  NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs.  NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.  NOTE 5: The applicable frequencies for this limit are those that are enclosed either in the RB containing the carrier leakage frequency, or in the two RBs immediately adjacent to the carrier leakage frequency but excluding any allocated RB. Carrier leakage frequency is indicated by the UE as described in clause 6.4A.2.1.0. When only one uplink carrier is activated, the applicable LO leakage frequency follow definition in clause 6.4.2.  NOTE 6:  is the Transmission Bandwidth (see clause 5.3) not exceeding  .  NOTE 7:  is the Transmission Bandwidth Configuration (see clause 5.3) of the component carrier with RBs allocated.  NOTE 8:  is the limit specified in Table 6.4.2.1-1 for the modulation format used in the allocated RBs.  NOTE 9:  is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g.  or  for the first adjacent RB outside of the allocated bandwidth).  NOTE 10:  is an average of the transmitted power over 10 sub-frames normalized by the number of allocated RBs, measured in dBm. | | | | |

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Para-meter | Unit | Meas BW  NOTE 1 | Limit | | | remark | Applicable Frequencies |
| General | dB | BW of 1 RB |  | | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier.  The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB | NOTE 2 | | | The reference value is the average power per allocated RB in the allocated component carrier | Image frequencies (NOTES 6,7) If UE does not indicate exact frequency for carrier leakage, this requirement does not apply. |
|  |  |  | -28 | Output power > 10 dBm | |  |  |
|  |  |  | -25 | 0≤ Output power ≤ 10 dBm | |  |  |
| Carrier leakage | dBc | BW of 1 RB | NOTE 3 | | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are indicated with IE *UplinkTxDirectCurrentMoreCarrierList-r17*. If UE does not indicate exact frequency for carrier leakage, this requirement does not apply. |
|  |  |  | -28 | | Output power > 10 dBm |  |  |
|  |  |  | -25 | | 0 dBm ≤ Output power ≤ 10 dBm |  |  |
|  |  |  | -20 | | -30 dBm ≤ Output power ≤ 0 dBm |  |  |
|  |  |  | -10 | | -40 dBm ≤ Output power < -30 dBm |  |  |
| NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.  NOTE 2: Exceptions to the general limit is are allowed for up to +1 RBs within a contiguous width of +1 non-allocated RBs.  NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs  NOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.4A.2.1.1-1 apply for Table 6.4A.2.1.2-2 as well.  NOTE 5:  for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.  NOTE 6: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs  NOTE 7: 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. | | | | | | | |

##### 6.4A.2.1.3 Carrier leakage

Carrier leakage is an additive sinusoid waveform that is confined within the aggregated transmission bandwidth configuration. When only one uplink carrier is activated, the applicable carrier leakage requirement follows definition in clause 6.4.2. The measurement interval is one slot in the time domain.

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. For intra-band contiguous CA, the relative carrier leakage power shall not exceed the values specified in Table 6.4A.2.1.3-1. The requirement does not apply if the indicated location of carrier leakage is outside the activated UL carriers.

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

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

#### 6.4A.2.2 Transmit modulation quality for intra-band non-contiguous CA

##### 6.4A.2.2.0 General

For intra-band non-contiguous carrier aggregation, the requirements in subclauses 6.4A.2.2.1, 6.4A.2.2.2 applies.

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

Carrier leakage frequency is indicated by the UE with IE UplinkTxDirectCurrentMoreCarrierList-r17 or UplinkTxDirectCurrentTwoCarrierList-r16 or UplinkTxDirectCurrentList.

The carrier leakage measurement requirement in clause 6.4A.2.2.2 shall be waived and the UE’s UL signal left uncorrected for carrier leakage when one of the following qualifying conditions apply:

1. UE reports the parameter 3300 or 3301

2. UE doesn’t indicate the DC location parameters

Any requirement relaxation to accommodate the IQ image shall be omitted if the qualifying conditions above are present or if the IQ image frequency is outside the activated UL component carriers.

##### 6.4A.2.2.1 Error Vector Magnitude

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

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

The EVM requirements are according to Table 6.4A.2.2.1-1 if CA is configured in uplink with the parameters defined in Table 6.4.2.1-2.

Table 6.4A.2.2.1-1: Minimum requirements for Error Vector Magnitude

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

##### 6.4A.2.2.2 In-band emissions

For intra-band non-contiguous carrier aggregation the requirements for in-band emissions are defined for each component carrier. Requirements defined in clause 6.4A.2.1.2 only apply with PRB allocation in one of the component carriers.

When signalling for dualPA-Architecture IE is absent, carrier leakage or I/Q image may land inside the gap spectrum between 2 UL CCs.

For intra-band non-contiguous CA, the IQ image requirement is defined with the applicable frequencies based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs.

##### 6.4A.2.2.3 Carrier leakage

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. For intra-band non-contiguous CA,te relative carrier leakage power shall not exceed the values specified in Table 6.4A.2.4.3-1. The requirement does not apply if the indicated location of carrier leakage is outside the activated UL carriers.

#### 6.4A.2.3 Transmit modulation quality for inter-band CA

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the transmit modulation quality requirements in subclause 6.4.2 apply.

For inter-band downlink carrier aggregation with a single uplink carrier assigned to one NR band, DMRS bundling requirements in subclause 6.4.2.5 apply to the uplink carrier when the UE indicates support of [*maxDurationDMRS-Bundling-r17*] for the NR band and is configured for DMRS bundling in the uplink carrier.

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the transmit modulation quality requirements in subclause 6.4A.2.1 apply for those carriers.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the transmit modulation quality requirements in subclause 6.4A.2.2 apply for those carriers.

For inter-band carrier aggregation with uplink assigned to two NR bands, the transmit modulation quality requirements shall apply on each component carrier as defined in clause 6.4.2 with all component carriers active: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured. For DMRS bundling [*maxDurationDMRS-Bundling-r17*], requirements for phase continuity in clause 6.4.2.5 apply when all of the following additional conditions are met:

- During DMRS bundling time window, concurrent transmissions scheduled/configured over multiple carriers [including any channels and/or signals] are not expected by UE

- Only one band is configured with DMRS bundling at a time

- All carriers are on same TAG

When the capability *uplinkTxSwitchingPeriod* is present, the UE indicates support of [*dmrs-BundlingPUCCH-RepPerBC-r17*], and the UE is configured for uplink switching mechanisms specified in clause 6.1.6 of TS 38.214 [10], the phase continuity requirement in clause 6.4.2.5 for DMRS bundling is applicable under the following conditions:

- During the DMRS bundling time window, concurrent transmissions scheduled/configured over multiple carriers, including any channels and/or signals, are not expected by UE

- Only one carrier is configured with DMRS bundling at a time

- All carriers are on the same TAG

- DMRS bundling is not maintained across Tx switching period in the UL carrier configured with DMRS bundling

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band): for the NR band supporting one component carrier the transmit modulation quality requirements specified in subclauses from 6.4.2.1 to 6.4.2.4 apply and for DMRS bundling [*maxDurationDMRS-Bundling-r17*] the DMRS bundling requirements for inter-band carrier aggregation with uplink assigned to two NR bands apply. For the NR band supporting two contiguous component carriers the requirements specified in subclause 6.4A.2.1 apply.

#### 6.4A.2.4 Void

## 6.4B Transmit signal quality for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the transmit signal quality for the corresponding inter-band CA configuration as specified in clause 6.4A applies with the exception of DMRS bundling [*maxDurationDMRS-Bundling-r17*] requirements.

## 6.4C Transmit signal quality for SUL

For the UE which is configured with both NR UL and NR SUL carriers in a serving cell with active transmission either on the UL carrier(s) or SUL carrier, the transmit signal quality requirements specified in clause 6.4.2 are applicable for the UL carrier(s) and the SUL carrier, respectively.

If the UE indicates that it is capable of DMRS bundling [*maxDurationDMRS-Bundling-r17*] on the NR SUL band and UE is configured for DMRS bundling on SUL carrier or the UE indicates that it is capable of DMRS bundling [*maxDurationDMRS-Bundling-r17*] on the NR UL band and UE is configured for DMRS bundling on NR UL carrier, the requirements for phase continuity in clause 6.4.2.5 apply for the corresponding SUL carrier or NR UL carrier, respectively. Only one band can be configured with DMRS bundling at a time.

## 6.4D Transmit signal quality for UL MIMO

### 6.4D.0 General

For a UE supporting UL MIMO, the requirements in this section are defined per layer or as the sum of emissions from both antennas to account for the UL MIMO scheme.

Alternatively, when applicable, requirements may be verified per antenna connector using an UL MIMO transmission with codebook of and a configuration defined in Table 6.4D.0-1.

Table 6.4D.0-1: UL MIMO configuration for per connector measurements

|  |  |  |
| --- | --- | --- |
| Transmission scheme | DCI format | Codebook Index |
| Codebook based uplink | DCI format 0\_1 | Codebook index 0 |

### 6.4D.1 Frequency error for UL MIMO

For UE(s) supporting UL MIMO, the basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency per layer shall be accurate to within ± 0.1 PPM observed over a period of 1 ms of cumulated measurement intervals compared to the carrier frequency received from the NR Node B.

### 6.4D.2 Transmit modulation quality for UL MIMO

#### 6.4D.2.0 General

For UE supporting UL MIMO, the transmit modulation quality requirements are specified based on measurements made at each transmit antenna connector.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.4.2 apply when *TxD* is not indicated, and the requirements in clause 6.4G.2 apply when *TxD* is indicated.

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 (caused by IQ offset)

- In-band emissions for the non-allocated RB

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

#### 6.4D.2.1 Error Vector Magnitude

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Error Vector Magnitude requirements specified in clause 6.4.2.1 apply per layer. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2.

#### 6.4D.2.2 Carrier leakage

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Relative Carrier Leakage Power requirements specified in Table 6.4.2.2-1 which is defined in clause 6.4.2.2 apply per layer. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2.

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

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the In-band Emission requirements specified in Table 6.4.2.3-1 which is defined in clause 6.4.2.3 apply at each transmit antenna connector. The requirements shall be met with the uplink MIMO configurations specified in Table 6.2D.1-2

#### 6.4D.2.4 EVM equalizer spectrum flatness for UL MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the EVM Equalizer Spectrum Flatness requirements specified in clause 6.4.2.4 apply per layer. The requirements shall be met with the UL MIMO configurations specified in Table 6.2D.1-2

### 6.4D.3 Time alignment error for UL MIMO

For UE(s) with multiple transmit antenna connectors supporting UL MIMO, this requirement applies to frame timing differences between transmissions on multiple transmit antenna connectors in the closed-loop spatial multiplexing scheme.

The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different transmit antenna connectors.

For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 130 ns.

### 6.4D.4 Requirements for coherent UL MIMO

For coherent UL MIMO, Table 6.4D.4-1 lists the maximum allowable difference between the measured relative power and phase errors between different antenna connectors in any slot within the specified time window from the last transmitted SRS on the same antenna connectors, for the purpose of uplink transmission (codebook or non-codebook usage) and those measured at that last SRS. The requirements in Table 6.4D.4-1 apply when the UL transmission power at each antenna connector is larger than 0 dBm for SRS transmission and for the duration of time window.

Table 6.4D.4-1: Maximum allowable difference of relative phase and power errors in a given slot compared to those measured at last SRS transmitted

|  |  |  |
| --- | --- | --- |
| Difference of relative phase error | Difference of relative power error | Time window |
| 40 degrees | 4 dB | 20 msec |

The above requirements when all the following conditions are met within the specified time window:

- UE is not signaled with a change in number of SRS ports in SRS-config, or a change in PUSCH-config

- UE remains in DRX active time (UE does not enter DRX OFF time)

- No measurement gap occurs

- No instance of SRS transmission with the usage antenna switching occurs

- Active BWP remains the same

- EN-DC and CA configuration is not changed for the UE (UE is not configured or de-configured with PSCell or SCell(s))

- When UE is not configured with uplink switching; or when UE is configured with uplink switching, and ‘fullCoherent’ codebook subset is supported in the corresponding carrier according to the capability *uplinkTxSwitching*-*PUSCH-TransCoherence* and/or *uplinkTxSwitching2T2T-PUSCH-TransCoherence*; or when UE is configured with uplink switching, ‘nonCoherent’ codebook subset is supported in the corresponding carrier according to the capability *uplinkTxSwitching*-*PUSCH-TransCoherence* and/or *uplinkTxSwitching2T2T-PUSCH-TransCoherence*,and uplink switching is not triggered by the switching mechanisms specified in sub-clause 6.1.6 of TS 38.214 [10] between last transmitted SRS and scheduled transmission.

## 6.4E Transmit signal quality for V2X

### 6.4E.1 Frequency error for V2X

#### 6.4E.1.1 General

The UE modulated carrier frequency for NR V2X sidelink transmissions in Table 5.2E.1-1, shall be accurate to within ±0.1 PPM observed over a period of 1 ms compared to the absolute frequency in case of using GNSS synchronization source. The same requirements applied over a period of 1 ms compared to the carrier frequency received from the gNB or V2X synchronization reference UE in case of using the gNB or V2X synchronization reference UE sidelink synchronization signals.

For NR V2X UE supporting SL MIMO or Tx Diversity, the UE modulated carrier frequency at each transmit antenna connector shall be accurate to within ±0.1 PPM observed over a period of 1 ms in case of using GNSS synchronization source. The same requirements apply over a period of 1 ms compared to the relative frequency in case of using the NR gNode B or V2X synchronization reference UE sidelink synchronization signals.

If the UE transmits on one antenna connector at a time, the requirements for single carrier shall apply to the active antenna connector.

#### 6.4E.1.2 Frequency error for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.4.1 shall apply for the uplink in licensed band and the requirements specified in clause 6.4E.1.1 shall apply for the sidelink in licensed band or Band n47.

For the intra-band con-current NR V2X operation, the requirements specified in clause 6.4.1 shall apply for the uplink in licensed band and the requirements specified in clause 6.4E.1 shall apply for the sidelink in licensed band.

### 6.4E.2 Transmit modulation quality for V2X

#### 6.4E.2.1 General

The transmit modulation quality requirements in this clause apply to V2X sidelink transmissions.

For NR V2X UE supporting SL MIMO or Tx Diversity, the transmit modulation quality requirements for single carrier shall apply to each transmit antenna connector.

If V2X UE transmits on one antenna connector at a time, the requirements specified for single carrier apply to the active antenna connector.

#### 6.4E.2.2 Error Vector Magnitude for V2X

For V2X sidelink physical channels PSCCH and PSSCH, the Error Vector Magnitude requirements shall be as specified for PUSCH in Table 6.4.2.1-1 except pi/2-BPSK for NR V2X operating bands in Table 5.2E.1-1. When sidelink transmissions are shortened due to transmission gap of one symbol at the end of the slot, the EVM measurement interval is reduced by one symbol, accordingly.

#### 6.4E.2.3 Carrier leakage for V2X

Carrier leakage of NR V2X sidelink transmission, the requirements for NR PUSCH in Table 6.4.2.2-1 shall be applied.

#### 6.4E.2.4 In-band emissions for V2X

For V2X sidelink physical channels PSCCH, PSSCH and PSBCH, the In-band emissions requirements shall be as specified for PUSCH in subclause 6.4.2.3 for the corresponding modulation and transmission bandwidth. When V2X transmissions are shortened due to transmission gap of one symbol at the end of the subframe, the In-band emissions measurement interval is reduced by one symbol, accordingly.

#### 6.4E.2.5 EVM equalizer spectrum flatness for V2X

For V2X sidelink physical channels PSCCH, PSSCH and PSBCH, the EVM equalizer spectrum flatness requirements shall be as specified for PUSCH in clause 6.4.2.4 for the corresponding modulation and transmission bandwidth.

#### 6.4E.2.6 Transmit modulation quality for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.4.2 shall apply for the uplink in licensed band and the requirements specified in clause 6.4E.2.1 through 6.4E.2.5 shall apply for the sidelink in licensed band or Band n47.

For the intra-band con-current NR V2X operation, the requirements specified in clause 6.4.2 shall apply for the uplink in licensed band and the requirements specified in clause 6.4E.2 shall apply for the sidelink in licensed band.

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

### 6.4F.1 Frequency error

The requirements for frequency error in clause 6.4.1 apply.

### 6.4F.2 Transmit modulation quality

#### 6.4F.2.0 General

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 clause 6.4.2.1 apply.

#### 6.4F.2.2 Carrier leakage

The requirements for carrier leakage in 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,

Instead of the general requirement in clause 6.4.2.3, 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 clause 6.4.2.4 apply.

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

#### 6.4F.2A.1 Transmit modulation quality for inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the transmit modulation quality requirements shall apply on the NR carrier as defined in clause 6.4.2 and on the carrier operating with shared spectrum access as defined in clause 6.4F.2. The requirements apply with all component carrier active: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

## 6.4G Transmit signal quality for Tx Diversity

### 6.4G.1 Frequency error for Tx Diversity

For UE(s) supporting Tx diversity, the basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency at each transmit antenna connector shall be accurate to within ± 0.1 PPM observed over a period of 1 ms of cumulated measurement intervals compared to the carrier frequency received from the NR Node B.

### 6.4G.2 Transmit modulation quality for Tx Diversity

#### 6.4G.2.0 General

For UE supporting Tx diversity, the transmit modulation quality requirements are specified based on measurements made at each transmit antenna connector. 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 (caused by IQ offset)

- In-band emissions for the non-allocated RB

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 6.4.2.2 and 6.4.2.3 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.

6.4G.2.1 Error Vector Magnitude

For UE supporting Tx diversity, the Error Vector Magnitude requirements specified in clause 6.4.2.1. The total EVM requirement is derived based on the measurement at each antenna connector according to Annex F.8.

6.4G.2.2 Carrier leakage

For UE supporting Tx diversity, the Relative Carrier Leakage Power requirements specified in Table 6.4.2.2-1 which is defined in clause 6.4.2.2 apply at each transmit antenna connector.

6.4G.2.3 In-band emissions

For UE supporting Tx diversity, the In-band Emission requirements specified in Table 6.4.2.3-1 which is defined in clause 6.4.2.3 apply at each transmit antenna connector.

6.4G.2.4 EVM equalizer spectrum flatness for Tx Diversity

For UE supporting Tx diversity, the EVM Equalizer Spectrum Flatness requirements specified in Table 6.4.2.4-1 and Table 6.4.2.4-2 which are defined in clause 6.4.2.4. The composite EVM equalizer *EC(f)* is defined as

where

*ECn(f)* represents equalizer coefficient for each antenna connector, ，f is the allocated subcarriers within the transmission bandwidth ((|*F*|=12\*);

*P1* and *P2* denote the linear power measured at each antenna connector respectively.

## 6.4H Transmit signal quality for CA with UL MIMO

### 6.4H.1 Transmit signal quality for intra-band UL contiguous CA with UL MIMO

#### 6.4H.1.1 Frequency error for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency at each transmit antenna connector on each CC shall be accurate to within ± 0.1 PPM observed over a period of 1 ms of cumulated measurement intervals compared to the carrier frequency of primary component carrier received from the NR Node B.

#### 6.4H.1.2 Transmit modulation quality for intra-band UL contiguous CA with UL MIMO

##### 6.4H.1.2.0 General

For UE supporting intra-band UL contiguous CA and UL MIMO, the transmit modulation quality requirements are specified based on measurements made at each transmit antenna connector on each CC.

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

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.4A.2 apply.

The transmit modulation quality requirements listed below shall be met with UL MIMO configurations specified in Table 6.2D.1-2.

For all Transmit modulation quality requirements the Carrier leakage frequency is indicted by the UE with IE *UplinkTxDirectCurrentTwoCarrierList-r16* *or* *UplinkTxDirectCurrentMoreCarrierList-r17 or UplinkTxDirectCurrentList*.

The carrier leakage measurement requirement in clauses 6.4H.1.2.2 and 6.4H.1.2.3 shall be waived and the UE’s UL signal left uncorrected for carrier leakage when one of the following qualifying conditions apply:

1. UE reports the parameter 3300 or 3301

2. UE doesn’t indicate the DC location parameters

Any requirement relaxation to accommodate the IQ image shall be omitted if the qualifying conditions above are present or if the IQ image frequency is outside the activated UL component carriers.

##### 6.4H.1.2.1 Error Vector Magnitude

For intra-band UL contiguous CA and UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Error Vector Magnitude requirements specified in clause 6.4A.2.1.1 apply per layer.

##### 6.4H.1.2.2 Carrier leakage

For UE supporting intra-band UL contiguous CA and UL MIMO, the relative carrier leakage power requirements specified in clause 6.4A.2.1.3 apply at each transmit antenna connector.

##### 6.4H.1.2.3 In-band emissions

For UE supporting intra-band UL contiguous CA and UL MIMO, the In-band emission requirements specified in clause 6.4A.2.1.2 apply at each transmit antenna connector.

#### 6.4H.1.3 Time alignment error for intra-band UL contiguous CA with UL MIMO

For intra-band UL contiguous CA and UE(s) with multiple transmit antenna connectors supporting UL MIMO, this requirement applies as specified in 6.4D.3: The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different transmit antenna connectors for each CC. For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 130 ns.

#### 6.4H.1.4 Coherent UL MIMO requirement for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the coherent UL MIMO requirement are specified on each CC as in 6.4D.4.

## 6.5 Output RF spectrum emissions

### 6.5.1 Occupied bandwidth

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.5.1-1.

Table 6.5.1-1: Occupied channel bandwidth

|  |  |
| --- | --- |
|  | NR channel bandwidth (MHz) |
|  | 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 |
| **Occupied channel bandwidth (MHz)** | Same as NR channel bandwidth |

### 6.5.2 Out of band emission

#### 6.5.2.1 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.

#### 6.5.2.2 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in clause 6.5.3 are applicable.

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.

The power of any UE emission shall not exceed the levels specified in Table 6.5.2.2-1 for the specified channel bandwidth.

Table 6.5.2.2-1: General NR spectrum emission mask

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ΔfOOB  (MHz)** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | | **Measurement bandwidth** |
| **5** | **10, 15, 20, 25, 30, 35, 40, 45** | **50, 60, 70, 80, 90, 100** |
| ± 0-1 | -13 | -13 |  | 1 % of channel BW |
| ± 0-1 |  |  | -24 | 30 kHz |
| ± 1-5 | -10 | -10 | | 1 MHz |
| ± 5-6 | -13 |  | |
| ± 6-10 | -25 |  | |
| ± 5-BWChannel |  | -13 | |
| ± BWChannel-(BWChannel+5) |  | -25 | |

#### 6.5.2.3 Additional spectrum emission mask

##### 6.5.2.3.1 Requirements for network signalling value "NS\_35"

Additional spectrum 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.

When "NS\_35" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.1-1.

Table 6.5.2.3.1-1: Additional requirements for "NS\_35"

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB (MHz) |  |  | | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | | | Measurement bandwidth |
|  | 5 | | 10 | | 15 | 20 | 25 | 30 |  |
| ± 0-0.1 | -15 | | -18 | | -20 | -21 | -22 | -23 | 30 kHz |
| ± 0.1-6 | -13 | | -13 | | -13 | -13 | -13 | -13 | 100 kHz |
| ± 6-10 | -251 | | -13 | | -13 | -13 | -13 | -13 | 100 kHz |
| ± 10-15 |  | | -251 | | -13 | -13 | -13 | -13 | 100 kHz |
| ± 15-20 |  | |  | | -251 | -13 | -13 | -13 | 100 kHz |
| ± 20-25 |  | |  | |  | -25 | -13 | -13 | 100 kHz |
| ± 25-30 |  | |  | |  |  | -251 | -13 | 100 kHz |
| ± 30-35 |  | |  | |  |  |  | -25 | 1 MHz |
| NOTE 1: The measurement bandwidth shall be 1 MHz | | | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

##### 6.5.2.3.2 Requirements for network signalling value "NS\_04"

Additional spectrum 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.

The n41 SEM transition point from -13 dBm/MHz to -25 dBm/MHz is based on the emission bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. Since the 26-dB emission bandwidth is implementation dependent, the maximum transmission bandwidths in MHz (NRB \* SCS \* 12 / 1,000) is used for the SEM.

Table 6.5.2.3.2-1: n41 and n90 maximum transmission bandwidth for CP-OFDM

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | Channel bandwidth (MHz) / Maximum transmission bandwidth (MHz) | | | | | | | | | | | | | | |
|  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
| 15 | 4.50 | 9.36 | 14.22 | 19.08 | 23.94 | 28.80 | 33.84 | 38.88 | 43.56 | 48.6 | N/A | N/A | N/A | N/A | N/A |
| 30 | N/A | 8.64 | 13.68 | 18.36 | 23.40 | 28.08 | 33.12 | 38.16 | 42.84 | 47.88 | 58.32 | 68.04 | 78.12 | 88.02 | 98.28 |
| 60 | N/A | 7.92 | 12.96 | 17.28 | 22.32 | 27.36 | 31.68 | 36.72 | 41.76 | 46.8 | 56.88 | 66.96 | 77.04 | 87.12 | 97.20 |

Table 6.5.2.3.2-2: n41 and n90 maximum transmission bandwidth for DFT-S-OFDM

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | Channel bandwidth (MHz) / Maximum transmission bandwidth (MHz) | | | | | | | | | | | | | | |
|  | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 70 | 80 | 90 | 100 |
| 15 | 4.50 | 9.00 | 13.50 | 18.00 | 23.04 | 28.80 | 32.40 | 38.88 | 43.20 | 48.60 | N/A | N/A | N/A | N/A | N/A |
| 30 | N/A | 8.64 | 12.96 | 18.00 | 23.04 | 27.00 | 32.40 | 36.00 | 38.88 | 46.08 | 58.32 | 64.80 | 77.76 | 87.48 | 97.20 |
| 60 | N/A | 7.20 | 12.96 | 17.28 | 21.60 | 25.92 | 28.80 | 36.00 | 38.88 | 46.08 | 54.00 | 64.80 | 72.00 | 86.40 | 97.20 |

When "NS\_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.2-3.

Table 6.5.2.3.2-3: n41 and n90 SEM with "NS\_04"

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | | | | | | | | | | | | | | | | | | | | | | | | Measurement bandwidth |
|  | 5 | | 10 | | 15 | | | 20 | | 25 | | | 30 | | | 35 | | 40 | 45 | | 50 | 60 | 70 | 80 | 90 | 100 |  |
| ± 0 - 1 | -10 | | | | | | | | | | | | | | | | | | | |  |  | | | | | 2 % channel bandwidth |
|  |  |  | |  | |  | | |  | | |  | | |  | |  | | |  |  | -10 | | | | | 1 MHz |
| ± 1 - 5 |  |  | |  | | |  | | | |  | | | -10 | | | | | | | | | | | | | 1 MHz |
| ± 5 - X |  |  | |  | | |  | | | |  | | | -13 | | | | | | | | | | | | |  |
| ± X - (BWChannel + 5 MHz) |  |  | |  | | |  | | | |  | | | -25 | | | | | | | | | | | | |  |
| NOTE 1: X is defined in Table 6.5.2.3.2-1 for CP-OFDM and 6.5.2.3.2-2 for DFT-S-OFDM | | | | | | | | | | | | | | | | | | | | | | | | | | | |

##### 6.5.2.3.3 Requirements for network signalling values "NS\_03" and “NS\_03U”

Additional spectrum 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.

When "NS\_03" or “NS\_03U” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.3-1.

Table 6.5.2.3.3-1: Additional requirements for "NS\_03" and “NS\_03U”

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10, 15, 20, 25, 30, 35, 40, 45** |  |
| ± 0-1 | -13 | -13 | 1 % of channel BW |
| ± 1-6 | -13 |  | 1 MHz |
| ± 6-10 | -25 |  |
| ± 1-BWChannel |  | -13 |
| ± BWChannel-(BWChannel+5) |  | -25 |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

Table 6.5.2.3.3-2: Void

##### 6.5.2.3.4 Requirements for network signalling value "NS\_06" or “NS\_07”

Additional spectrum 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.

When "NS\_06" or "NS\_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.4-1.

Table 6.5.2.3.4-1: Additional requirements for "NS\_06" or "NS\_07"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ΔfOOB (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | | | Measurement bandwidth |
|  | 5 | 10 | 15 |  |
| ± 0 – 0.1 | -15 | -18 | -20 | 30 kHz |
| ± 0.1 – 1 | -13 | -13 | -13 | 100 kHz |
| ± 1 – 6 | -13 | -13 | -13 | 1 MHz |
| ± 6 – 10 | -25 |  |  |  |
| ± 10 – 15 |  | -25 |  |  |
| ± 15 – 20 |  |  | -25 |  |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

##### 6.5.2.3.5 Void

##### 6.5.2.3.6 Void

##### 6.5.2.3.7 Void

##### 6.5.2.3.8 Requirements for network signalling value "NS\_27"

Additional spectrum 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.

When "NS\_27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.8-1.

Table 6.5.2.3.8-1: Additional requirements for "NS\_27"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ΔfOOB  MHz | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | | | | | | Measurement bandwidth |
| 5 | 10 | 15 | 20 | 30 | 40 |
| ± 0 - 1 | -13 | | | | | | 1 % channel bandwidth |
| ± 1 - X | -13 | | | | | | 1 MHz |
| < – X or > X | -25 | | | | | |
| NOTE 1: X is occupied channel bandwidth as defined in Table 6.5.1-1.  NOTE 2: The requirements apply only at the frequency range from 3540 MHz to 3710 MHz. | | | | | | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

##### 6.5.2.3.9 Requirements for network signalling value "NS\_21"

Additional spectrum 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.

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.2.3.9-1.

Table 6.5.2.3.y-1: Additional requirements for "NS\_21"

|  |  |  |  |
| --- | --- | --- | --- |
| **ΔfOOB  MHz** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | | **Measurement bandwidth** |
|  | **5** | **10** |  |
| ± 0-1 | -13 | -13 | 1 MHz |
| ± 1-6 | -13 | -13 | 1 MHz |
| ± 6-10 | -25 | -13 | 1 MHz |
| ± 10-15 |  | -25 | 1 MHz |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

#### 6.5.2.4 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.

##### 6.5.2.4.1 NR ACLR

NR Adjacent Channel Leakage power Ratio (NRACLR) is the ratio of the filtered mean power centred on the assigned NR channel frequency to the filtered mean power centred on an adjacent NR channel frequency at nominal channel spacing.

The assigned NR channel power and adjacent NR 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 –50 dBm then the NRACLR shall be higher than the value specified in Table 6.5.2.4.1-2.

Table 6.5.2.4.1-1: NR ACLR measurement bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Channel bandwidth | (MHz) | 5,10,15,20,25,30,35,40,45,50 | 60,70,80,90,100 |
| REF\_SCS | (kHz) | 15 | 30 |
| NR ACLR measurement bandwidth | (MHz) | MBW=REF\_SCS\*(12\*NRB+1)/1000 | |
| NOTE : “NRB” in the formula is the maximum transmission bandwidth configuration as defined in Table 5.3.2-1. | | | |

Table 6.5.2.4.1-2: NR ACLR requirement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Power class 1 | Power class 1.5 | Power class 2 | Power class 3 |
| NR ACLR | 37 dB | 31 dB | 31 dB | 30 dB |
| NOTE 1: Void | | | | |

##### 6.5.2.4.2 UTRA ACLR

UTRA adjacent channel leakage power ratio (UTRAACLR) is the ratio of the filtered mean power centred on the assigned NR channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRAACLR is specified for the first adjacent UTRA channel (UTRAACLR1) which center frequency is ± 2.5 MHz from NR channel edge and for the 2nd adjacent UTRA channel (UTRAACLR2) which center frequency is ± 7.5 MHz from NR channel edge.

The UTRA channel power is measured with a RRC filter with roll-off factor = 0.22 and bandwidth of 3.84 MHz. The assigned NR channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.5.2.4.1-1.

If the measured adjacent channel power is greater than – 50 dBm then the UTRAACLR1 and UTRAACLR2 shall be higher than the value specified in Table 6.5.2.4.2-1.

UTRAACLR is not applicable to the power class 3 UE operating in Band n12, n14, n17, and n30.

UTRAACLR is not applicable to the power class 1 UE operating in Band n14, n71, n85, n100 and n101.

Table 6.5.2.4.2-1: UTRA ACLR requirement

|  |  |
| --- | --- |
|  | Power class 3 |
| UTRAACLR1 | 33 dB |
| UTRAACLR2 | 36 dB |

UTRA ACLR requirement is applicable when signalled by the network with network signalling value indicated by the field *additionalSpectrumEmission*.

### 6.5.3 Spurious emissions

#### 6.5.3.0 General

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.

#### 6.5.3.1 General spurious emissions

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.5.3.1-2 apply for all transmitter band configurations (NRB) and channel bandwidths.

Table 6.5.3.1-1: Boundary between NR out of band and general spurious emission domain

|  |  |
| --- | --- |
| Channel bandwidth | OOB boundary FOOB (MHz) |
| BWChannel | BWChannel + 5 |

Table 6.5.3.1-2: Requirement for general spurious emissions limits

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | Maximum Level | Measurement bandwidth | NOTE |
| 9 kHz ≤ f < 150 kHz | -36 dBm | 1 kHz |  |
| 150 kHz ≤ f < 30 MHz | -36 dBm | 10 kHz |  |
| 30 MHz ≤ f < 1000 MHz | -36 dBm | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 dBm | 1 MHz | 4 |
| -25 dBm | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 dBm | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 dBm | 1 MHz | 2 |
| NOTE 1: Applies for Band for which the upper frequency edge of the UL Band is greater than 2.55 GHz and less than or equal to 5.2 GHz  NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz  NOTE 3: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled.  NOTE 4: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in subclause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled. | | | |

#### 6.5.3.2 Spurious emissions for UE co-existence

This clause specifies the requirements for NR bands for coexistence with protected bands. Unless otherwise stated, the spurious emission for UE co-existence apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.2-1: Requirements for spurious emissions for UE co-existence

| NR Band | Spurious emission for UE co-existence | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| n1, n84 | E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76,  NR Band n78, n79, n100, n104, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 3, | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 15, 43 |
|  | Frequency range | 1880 | - | 1895 | -40 | 1 | 15, 27 |
|  | Frequency range | 1895 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n2 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 50, 51, 53, 54, 66, 70, 71, 74, 85, 103,  NR Band n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n3, n80 | E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73,74, 75, 76.  NR Band n79, n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 3 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 22, 42, 52,  NR Band n77, n78, n104 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n5, n89 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, , 65, 66, 70, 71, 73, 74, 85, 103  NR Band n79, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 52, 53, 54  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 26 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103,  NR Band n77, n78, n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 2570 | - | 2575 | +1.6 | 5 | 15, 21, 26 |
|  | Frequency range | 2575 | - | 2595 | -15.5 | 5 | 15, 21, 26 |
|  | Frequency range | 2595 | - | 2620 | -40 | 1 | 15, 21 |
| n8, n81, n93, n94 | E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 54, 65, 67, 68, 69, 72, 73, 74, 75, 76  NR Band n101, n104, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA band 3, 7, 22, 41, 42, 43, 52  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA 8 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n12 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 54, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n13 | E-UTRA Band 2, 4, 5,12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 53, 54, 66, 70, 71, 74, 85 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | -UTRA Band 14, 103 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 24, 30  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 15 |
| n14 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 54, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 769 | - | 775 | -35 | 0.00625 | 12, 15 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 11, 12, 15 |
| n18 | E-UTRA Band 1, 3, 11, 21, 34, 40, 42, 65  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| n20, n82, n91, n92 | E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76  NR Band n100, n101, n104 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 20 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 38, 42, 52, 69,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| n24, n99 | E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n25 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 53, 54, 66, 70, 71, 85, 103  NR Band n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 25 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | E-UTRA Band 43, 48  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n26 | E-UTRA Band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 53, 54  NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 26 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
|  | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 15 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n28, n83 | E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 74, 75, 76,  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 1 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 25 |
|  | E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 39, 40, 41, 52, 72, 73  NR Band n79, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 19, 24 |
|  | Frequency range | 470 | - | 694 | -42 | 8 | 15, 35 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 34 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| n30 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 54, 66, 70, 71, 85, 103,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n34 | E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 74, 75, 76,  NR Band n78, n79, n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n38 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 2620 | - | 2645 | -15.5 | 5 | 15, 22, 26 |
|  | Frequency range | 2645 | - | 2690 | -40 | 1 | 15, 22 |
| n39, n98 | E-UTRA Band 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45, 50, 51, 52, 74,  NR Band n79, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1805 | - | 1855 | -40 | 1 | 33 |
|  | Frequency range | 1855 | - | 1880 | -15.5 | 5 | 15, 26, 33 |
| n40, n97 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 | 44 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 8 |
| n47 | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n71, n77, n78, n79, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n50 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 65, 66, 67, 68, 103  NR Band n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n51 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85, 103  NR Band n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n53 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 54, 66, 70, 71, 85, 103  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n54 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 50, 51, 53, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR NTN Band n255, n256 |  |  |  |  |  |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n65 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76,  NR Band n78, n79, n100, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 34 | FDL\_low | - | FDL\_high | -50 | 1 | 43 |
|  | Frequency range | 1900 | - | 1915 | -15.5 | 5 | 15, 26, 27 |
|  | Frequency range | 1915 | - | 1920 | +1.6 | 5 | 15, 26, 27 |
| n66, n86 | E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85, 103  NR Band n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 42, 48,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n70 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 47, 48, 66, 70, 71, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| n71 | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 54, 66, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 25, 41, 70,  NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 15 |
|  | E-UTRA Band 71 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n74 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85  NR Band n77, n78, n100, n101, n103, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 15, 41 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 15, 42 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 15, 45 |
|  | Frequency range | 1475.9 | - | 1510.9 | -35 | 1 | 15, 46 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 15 |
| n77 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 41, 53, 54, 65, 66, 70, 71, 74, 85, 103  NR Band n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n104 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 32, 34, 39, 40, 41, 65, 75, 76  NR Band n100, n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n104 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n79 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65, 74  NR Band n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n85 | E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 54, 70, 71, 74, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 4, 48, 50, 51, 66  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | E-UTRA Band 12, 85 | FDL\_low | - | FDL\_high | -50 | 1 | 15 |
| n95 | E-UTRA Band 1, 3 , 5, 8, 28, 39, 40, 41  NR Band n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 5 |
|  | NR Band n77 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| n100 | E-UTRA Band 1, 3, 8, 20, 28, 31, 32, 33, 34, 38, 40, 43, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n101, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 7, 22, 42  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| n101 | E-UTRA Band 1, 3, 8, 20, 22, 28, 31, 32, 38, 40, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76  NR Band n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 7, 42, 43  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 758 | - | 788 | -50 | 1 |  |
| n104 | E-UTRA Band 1, 3, 7, 8, 20 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| n105 | E-UTRA Band 1, 3, 4, 5, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 38, 39, 40, 43, 50, 51, 65, 66, 72, 73, 74, 75, 76,  NR Band n79, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 7, 22, 25, 34, 41, 42, 52,  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| NOTE 1: FDL\_low and FDL\_high refer to each frequency band specified in Table 5.2-1 in TS 38.101-1 or Table 5.5-1 in TS 36.101  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: 15 kHz SCS is assumed when RB is mentioned in the note when channel bandwidth is less than or equal to 50 MHz, lowest SCS is assumed when channel bandwidth is larger than 50 MHz. The transmission bandwidth in terms of RB position and range is not limited to 15 kHz SCS and shall scale with SCS accordingly.  NOTE 4: Void  NOTE 5: For non-synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band  NOTE 6: N/A  NOTE 7: Void  NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 9: Void  NOTE 10: Void  NOTE 11: Void  NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB  NOTE 13: Void  NOTE 14: Void  NOTE 15: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 16: Void  NOTE 17: Void  NOTE 18: Void  NOTE 19: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 20: Void  NOTE 21: This requirement is applicable for any channel bandwidths up to 20MHz within the range 2500 - 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 22: This requirement is applicable for power class 3 UE for any channel bandwidths up to 20 MHz. For channel bandwidth within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. . For carriers overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 23: Void  NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned NR carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.3.1-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.  NOTE 27: This requirement is applicable for channel bandwidths up to 20 MHz within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when the carrier centre frequency is within the range 1927.5 - 1929.5 MHz and for carriers of 20 MHz bandwidth when the carrier centre frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.  NOTE 28: Void  NOTE 29: Void  NOTE 30: Void  NOTE 31: Void  NOTE 32: Void  NOTE 33: This requirement is only applicable for carriers with bandwidth up to 20MHz and confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 - 1903 MHz. The above restriction is applicable to only power class 3 UEs.  NOTE 34: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.  NOTE 35: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 36: Void  NOTE 37: Void  NOTE 38: Void  NOTE 39: Void  NOTE 40: Void  NOTE 41: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm.  NOTE 42: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1470 MHz for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is more than 1460 MHz and less than or equal to 1465 MHzfor 10 MHz bandwidth.  NOTE 43: This requirement is applicable for UE which is operating in power class 3 and NR channel bandwidths up to 20MHz within frequency range 1920-1980 MHz.  NOTE 44: As exceptions, for 90 and 100 MHz channel bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz.  NOTE 45: Applicable when upper edge of the assigned NR UL channel bandwidth frequency is equal to or less than 1460 MHz.  NOTE 46: Applicable for 5 MHz bandwidth and when the NR carrier is within 1447.9 – 1462.9 MHz.  NOTE\_47: This requirement is applicable for power class 3 and channel bandwidths up to 20MHz | | | | | | | |

NOTE: To simplify Table 6.5.3.2-1, 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.

#### 6.5.3.3 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.

##### 6.5.3.3.1 Requirement for network signalling value "NS\_04"

When "NS 04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.1-1: Additional requirements for "NS\_04"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 MHz |  |
| 2495 ≤ f < 2496 | -13 | 1 % of Channel BW |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

##### 6.5.3.3.2 Requirement for network signalling value "NS\_17"

When "NS\_17" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.2-1: Additional requirements for "NS\_17"

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency range**  **(MHz)** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | **Measurement bandwidth** | **NOTE** |
|  | 5, 10 |  |  |
| 470 ≤ f ≤ 710 | -26.2 | 6 MHz | 1 |
| NOTE 1: Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz. | | | |

##### 6.5.3.3.3 Requirement for network signalling value "NS\_18"

When "NS\_18" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3. 3-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.3-1: Additional requirements for "NS\_18"

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |  |
|  | 5, 10, 15, 20, 30 |  |  |
| 692-698 | -26.2 | 6 MHz |  |

##### 6.5.3.3.4 Requirement for network signalling values "NS\_05" and “NS\_05U”

When "NS\_05" or “NS\_05U” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.4-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.4-1: Additional requirements for "NS\_05" and “NS\_05U”

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency band**  **(MHz)** | **Channel bandwidth (MHz) / Spectrum emission limit (dBm)** | **Measurement bandwidth** |  |
|  | **5, 10, 15, 20** |  |  |
| 1884.5 f 1915.7 | -41 | 300 kHz |  |

##### 6.5.3.3.5 Requirement for network signalling values "NS\_43" and “NS\_43U”

When "NS 43" or “NS\_43U” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.5-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.5-1: Additional requirements for "NS\_43" and “NS\_43U”

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 5, 10, 15 |  |
| 860 ≤ f ≤ 890 | -40 | 1 MHz |
| NOTE 1: Applicable for 5 MHz and 15 MHz channel BW confined between 900 MHz and 915 MHz and for 10 MHz channel BW confined between 905 MHz and 915 MHz | | |

##### 6.5.3.3.6 Requirement for network signalling value "NS\_37"

When "NS\_37" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.6-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.6-1: Additional requirement for "NS\_37"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 5, 10, 15,20 |  |
| 1475.9 ≤ f ≤ 1510.9 | -35 | 1 MHz |

##### 6.5.3.3.7 Requirement for network signalling value "NS\_38"

When "NS\_38" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.7-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.7-1: Additional requirements for NR channels assigned within 1430-1452MHz for "NS\_38"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5, 10, 15 |  |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm. | | |

##### 6.5.3.3.8 Requirement for network signalling value "NS\_39"

When "NS\_39" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.8-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.8-1: Additional requirements for "NS\_39"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5, 10, 15, 20 |  |
| 1475 ≤ f ≤ 1488 | -28 | 1 MHz |

##### 6.5.3.3.9 Requirement for network signalling value "NS\_40"

When "NS\_40" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.9-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.9-1: Additional requirements for NR channels assigned within 1427-1432MHz for "NS\_40"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5 |  |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm. | | |

##### 6.5.3.3.10 Requirement for network signalling value "NS\_41"

When "NS\_41" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.10-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.10-1: Additional requirements for NR channels assigned within 1432-1517 MHz for "NS\_41"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5, 10, 15, 20, 40, 50, 60 |  |
| 1400 ≤ f ≤ 1427 | -32 | 27 MHz |
| NOTE 1: This requirement shall be verified with UE transmission power configured as high as possible but no higher than 15 dBm. | | |

##### 6.5.3.3.11 Requirement for network signalling value "NS\_42"

When "NS\_42" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.11-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.11-1: Additional requirements for NR channels assigned within 1432-1517 MHz for "NS\_42"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5, 10, 15, 20, 40, 50, 60 MHz |  |
| 1518 ≤ f ≤ 1520 | -0.8 | 1 MHz |
| 1520 < f ≤ 1559 | -30 | 1 MHz |

##### 6.5.3.3.12 Requirement for network signalling value "NS\_21"

When "NS\_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.12-1. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.12-1: Additional requirements for "NS\_21"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 5, 10 |  |
| 2200 ≤ f < 2288 | -40 | 1 MHz |
| 2288 ≤ f < 2292 | -37 | 1 MHz |
| 2292 ≤ f < 2296 | -31 | 1 MHz |
| 2296 ≤ f < 2300 | -25 | 1 MHz |
| 2320 ≤ f < 2324 | -25 | 1 MHz |
| 2324 ≤ f < 2328 | -31 | 1 MHz |
| 2328 ≤ f < 2332 | -37 | 1 MHz |
| 2332 ≤ f ≤ 2395 | -40 | 1 MHz |

##### 6.5.3.3.13 Requirement for network signalling value "NS\_24"

When "NS 24" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.13-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.13-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5 MHz, 10 MHz, 15 MHz, 20 MHz |  |
| 2010 ≤ f ≤ 2025 | -50 | 1 MHz |
| NOTE 1:This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band. | | |

##### 6.5.3.3.14 Requirement for network signalling value "NS\_27"

When "NS 27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.14-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.14-1: Additional requirements for "NS\_27"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Channel bandwidth (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 5, 10, 15, 20, 30, 40 |  |
| 9 kHz – 3530 MHz | -40 | 1 MHz |
| 3530 MHz – 3540 MHz | -25 |  |
| 3710 MHz – 3720 MHz | -25 |  |
| 3720 MHz – 12.75 GHz | -40 |  |

##### 6.5.3.3.15 Requirement for network signalling value "NS\_47"

When "NS\_47" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.15-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.15-1: Additional requirements for NR channels assigned within 2545 - 2575 MHz for "NS\_47"

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth (MHz) /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 30 |  |
| 2530 ≤ f ≤ 2535 | -25 | 1 MHz |
| 2505 ≤ f ≤ 2530 | -30 | 1 MHz |

##### 6.5.3.3.16 Requirement for network signalling value "NS\_50"

When "NS\_50" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.16-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.16-1: Additional requirements for "NS\_50"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 1805 | - | 1855 | -40 | 1 | 1 |
| Frequency range | 1855 | - | 1880 | -15.5 | 5 | 1, 2, 3 |
| NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz for ≤ 30MHz channel BWs and confined in 1880-1920 MHz for 40MHz channel BW.  NOTE 2: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 and Table 6.5A.3.1-1 from the edge of the channel bandwidth.  NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5.3.3.17 Requirement for network signalling value "NS\_12"

When "NS\_12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.17-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.17-1: Additional requirements NS\_12

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5 MHz, 10 MHz |  |
| 806 ≤ f ≤ 813.5 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 814 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

##### 6.5.3.3.18 Requirement for network signalling value "NS\_13"

When "NS\_13" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.18-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.18-1: Additional requirements NS\_13

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 5 MHz |  |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 817 MHz.  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

##### 6.5.3.3.19 Requirement for network signalling value "NS\_14"

When "NS\_14" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.19-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.19-1: Additional requirements NS\_14

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 10 MHz, 15 MHz, 20MHz |  |
| 806 ≤ f ≤ 816 | -42 | 6.25 kHz |
| NOTE 1: The requirement applies for NR carriers with lower channel edge at or above 824 MHz  NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

##### 6.5.3.3.20 Requirement for network signalling value "NS\_15"

When "NS\_15" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.20-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.20-1: Additional requirements NS\_15

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | **5 MHz, 10 MHz, 15 MHz, 20 MHz** |  |
| 851 ≤ f ≤ 859 | -53 | 6.25 kHz |
| NOTE 1: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB. | | |

##### 6.5.3.3.21 Requirement for network signalling value "NS\_45"

When "NS\_45" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.21-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.21-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | 5 MHz | 10 MHz |  |
| 0.009 < f ≤ 2473.5 | -25 | -25 | 1 MHz |
| 2473.5 < f ≤ 2477.5 | -25 | -13 | 1 MHz |
| 2477.5 < f ≤ 2478.5 | -13 | -13 | 1 MHz |
| 2478.5< f ≤ 2483.5 | -10 | -10 | 1 MHz |
| 2495 ≤ f < 2496 | -13 | -13 | 1% of Channel Bandwidth |
| 2496 ≤ f < 2501 | -13 | -13 | 1 MHz |
| 2501 < f ≤ 2505 | -25 | -13 | 1 MHz |
| 2505 ≤ f ≤ 5th harmonic of the upper frequency edge of the UL operating band | -25 | -25 | 1 MHz |

##### 6.5.3.3.22 Requirement for network signalling values "NS\_48" and "NS\_51"

When "NS\_48" or "NS\_51" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.22-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.22-1: Additional requirements for "NS\_48"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 –  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1900 | - | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | +1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5.3.3.23 Requirement for network signalling value "NS\_49"

When "NS\_49" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.23-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.23-1: Additional requirements for "NS\_49"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| E-UTRA band 34 -  NR band n34 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| Frequency range | 1880 | - | 1895 | -40 | 1 |  |
| Frequency range | 1895 |  | 1915 | -15.5 | 5 | 1 |
| Frequency range | 1915 | - | 1920 | 1.6 | 5 | 1 |
| NOTE 1: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5.3.3.24 Requirement for network signalling value "NS\_44"

When "NS\_44" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.24-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.24-1: Additional requirements for "NS\_44"

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2620 | - | 2645 | -15.5 | 5 | 1, 2 |
| Frequency range | 2645 | - | 2690 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for carriers confined in 2570-2615 MHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5.3.3.25 Requirement for network signalling value "NS\_46"

When "NS\_46" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.25-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.25-1: Additional requirements for “NS\_46”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 1, 2 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 1, 2 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for all carriers confined in 2500-2570 MHz. Sepcial restrictions apply for channel bandwidths up to 20MHz: For carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 - 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 - 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB with the minimum supported SCS of 15KHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5.3.3.26 Requirement for network signalling value "NS\_07"

When "NS\_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.26-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

**Table** **6.5.3.3.26-1: Additional requirements**

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth |
| 10 MHz |
| 769 ≤ f ≤ 775 | -57 | 6.25 kHz |
| NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard standard deviation < 0.5 dB. | | |

##### 6.5.3.3.27 Requirement for network signalling value “NS\_56”

When "NS\_56" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.27-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.27-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit1 (dBm) | Measurement bandwidth | NOTE |
| 5 MHz, 10MHz |
| 1541 ≤ f ≤ 1559 | -102 | 2kHz | Averaged over any 2 millisecond active transmission interval |
| 1559≤ f ≤ 1608 | -85 | 700Hz |  |
| 1608≤ f ≤ 1610 | -85 +5/2 (f-1608) | 700Hz |  |
| 1610≤ f ≤ 1625 | -80+ 66/15 (f-1610) | 700Hz |  |
| 1541 ≤ f ≤ 1608 | -75 | 1MHz | Averaged over any 2 millisecond active transmission interval |
| 1608≤ f ≤ 1610 | -75 + 5/2 (f-1608) | 1MHz |  |
| 1610≤ f ≤ 1627.5 | -70+ 57/17.5 (f-1610) | 1MHz |  |
| 1627.5 | -37 | 4kHz |  |
| 1638.5 ≤f ≤ 1645.5 | -28 | 4kHz |  |
| 1657.5 ≤f ≤ 1660.5 | -28 | 4kHz |  |
| NOTE 1: The EIRP requirement in regulation is converted to conducted requirement using a 0 dBi antenna. | | | |

##### 6.5.3.3.28 Requirement for network signalling value “NS\_62”

When "NS\_62" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5.3.3.28-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5.3.3.28-1: Additional requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth / Spectrum emission limit (dBm) | Measurement bandwidth | NOTE |
| 5 MHz |
| 1541 ≤ f ≤ 1559 | -102 | 2kHz | Averaged over any 2 millisecond active transmission interval |
| 1559≤ f ≤ 1608 | -85 | 700Hz |  |
| 1608≤ f ≤ 1610 | -85 +5/2 (f-1608) | 700Hz |  |
| 1610≤ f ≤ 1625 | -80+ 66/15 (f-1610) | 700Hz |  |
| 1541 ≤ f ≤ 1608 | -75 | 1MHz | Averaged over any 2 millisecond active transmission interval |
| 1608≤ f ≤ 1610 | -75 + 5/2 (f-1608) | 1MHz |
| 1610≤ f ≤ 1625 | -70+ 66/15 (f-1610) | 1MHz |
| NOTE 1: The EIRP requirement in regulation is converted to conducted requirement using 0 dBi antenna. | | | |

### 6.5.4 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

UE transmit intermodulation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each transmitter antenna port with the other antenna port(s) if any terminated. Both the wanted signal power and the intermodulation product power are measured through NR rectangular filter with measurement bandwidth shown in Table 6.5.4-1.

The requirement of transmit intermodulation is specified in Table 6.5.4-1.

Table 6.5.4-1: Transmit Intermodulation

|  |  |  |
| --- | --- | --- |
| Wanted signal  channel bandwidth | BWChannel | |
| Interference signal  frequency offset from channel center | BWChannel | 2\*BWChannel |
| Interference CW signal level | -40 dBc | |
| Intermodulation product | < -29 dBc | < -35 dBc |
| Measurement bandwidth | The maximum transmission bandwidth configuration among the different SCS's for the channel BW as defined in Table 6.5.2.4.1-1 | |
| Measurement offset from channel center | BWChannel and 2\*BWChannel | 2\*BWChannel and 4\*BWChannel |

## 6.5A Output RF spectrum emissions for CA

### 6.5A.0 General

For inter-band carrier aggregation with one uplink carrier assigned to one NR band, the output RF spectrum emissions requirements in clause 6.5 apply.

### 6.5A.1 Occupied bandwidth for CA

#### 6.5A.1.1 Void

#### 6.5A.1.1a Occupied bandwidth for Intra-band contiguous CA

For intra-band contiguous carrier aggregation the occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum. The occupied bandwidth shall be less than the aggregated channel bandwidth defined in clause 5.3A.3.

#### 6.5A.1.2 Occupied bandwidth for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, the OBW requirement is met when the ratio of the transmitted power in all sub-blocks of the uplink CA configuration to the total integrated power of the transmitted spectrum is greater than 99%.

#### 6.5A.1.3 Occupied bandwidth for Inter-band CA

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the occupied bandwidth requirements in subclause 6.5A.1.1a apply for that band.

For inter-band carrier aggregation with uplink assigned to two NR bands, the occupied bandwidth is defined per component carrier. Occupied bandwidth is the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on assigned channel bandwidth on the component carrier. The occupied bandwidth shall be less than the channel bandwidth specified in Table 6.5.1-1.

### 6.5A.2 Out of band emission for CA

#### 6.5A.2.1 General

This clause contains requirements for out of band emissions for UE configured of carrier aggregation.

#### 6.5A.2.2 Spectrum emission mask

##### 6.5A.2.2.1 Spectrum emission mask for intra-band contiguous CA

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the aggregated channel bandwidth. For intra-band contiguous carrier aggregation, the power of any UE emission shall not exceed the levels specified in Table 6.5A.2.2.1-1 for the specified channel bandwidth.

For power class 2 intra-band contiguous carrier aggregation, the spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.2.2.1-1: General NR CA spectrum emission mask

|  |  |  |
| --- | --- | --- |
| ΔfOOB  (MHz) | Spectrum emission limit(dBm) | MBW(MHz) |
| ± 0 - 1 | -13 | Min(0.01\*BWchannel\_CA, 0.4) |
| ± 1 - 5 | -10 | 1MHz |
| ± 5 – BWchannel\_CA | -13 | 1MHz |
| ±BWchannel\_CA- BWchannel\_CA+5 | -25 | 1MHz |

##### 6.5A.2.2.2 Spectrum emission mask for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation the spectrum emission mask requirement is defined as a composite spectrum emissions mask. Composite spectrum emission mask applies to frequencies up to ΔfOOB starting from the edges of the sub-blocks. Composite spectrum emission mask is defined as follows

a) Composite spectrum emission mask is a combination of individual sub-block spectrum emissions masks

b) In case the sub-block consist of one component carrier the sub-lock general spectrum emission mask is defined in subclause 6.5.2.1

c) If for some frequency sub-block spectrum emission masks overlap then spectrum emission mask allowing higher power spectral density applies for that frequency

d) If for some frequency a sub-block spectrum emission mask overlaps with the sub-block bandwidth of another sub-block, then the emission mask does not apply for that frequency.

For intra-band non-contiguous carrier aggregation, the spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

##### 6.5A.2.2.3 Spectrum emission mask for Inter-band CA

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the spectrum emission mask requirements in subclause 6.5A.2.2.1 apply for that band.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the spectrum emission mask requirements in subclause 6.5A.2.2.2 apply for that band.

For inter-band carrier aggregation with uplink assigned to two NR bands, the spectrum emission mask of the UE is defined per component carrier while both component carriers are active and the requirements are specified in clauses 6.5.2.1 and 6.5.2.2. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the spectrum emission mask of the UE is defined per NR band while all component carriers are active. For the NR band supporting one component carrier the requirements in subclauses 6.5.2.1 and 6.5.2.2 apply. For the NR band supporting two contiguous component carriers the requirements specified in subclause 6.5A.2.2.1apply. If for some frequency spectrum emission masks of single component carrier and two contiguous component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency spectrum emission masks of single component carrier or two contiguous component carriers overlap then the emission mask does not apply for that frequency.

##### 6.5.A.2.2.4 Void

#### 6.5A.2.3 Additional spectrum emission mask for CA

##### 6.5A.2.3.1 Additional spectrum emission mask for intra-band contiguous CA

6.5A.2.3.1.1 Requirements for network signalling value "CA\_NS\_04"

When "CA\_NS\_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.2.3.1.1-1. For power class 2 intra-band contiguous carrier aggregation, the additional spectrum emission mask is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.2.3.1.1-1: Additional requirements for "CA\_NS\_04"

|  |  |  |  |
| --- | --- | --- | --- |
| ΔfOOB  MHz | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | | Measurement bandwidth |
|  | ≤50 | >50 |  |
| ± 0 – 1 | -10 |  | 2 % of BWChannel\_CA |
|  |  | -10 | 1 MHz |
| ± 1 – 5 | -10 | | 1 MHz |
| ± 5 – X | -13 | |  |
| ± X - (BWChannel\_CA + 5 MHz) | -25 | |  |
| NOTE: X is aggregated bandwidth | | | |

6.5A.2.3.1.2 Requirements for network signalling value "CA\_NS\_27"

When "CA\_NS\_27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.2A.2.3.2.1.-1.

Table 6.2A.2.3.2.1-1: Additional requirements for "CA\_NS\_27"

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBm) / measurement bandwidth  for each aggregated channel bandwidth | | |
| ΔfOOB  MHz | Aggregated channel bandwidth of  max 40 MHz | Measurement bandwidth |
| ± 0 – 1 | -13 | 1 % of X |
| ± 1 – X | -13 | 1 MHz |
| < – X or > X | -25 |  |
| NOTE 1: X is the aggregated channel bandwidth  NOTE 2: The requirements apply only at the frequency range from 3540 MHz to 3710 MHz. | | |

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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.

##### 6.5A.2.3.2 Additional spectrum emission mask for Intra-band non-contiguous CA

6.5A.2.3.2.1 Minimum requirement (network signalling value “CA\_NC\_NS\_04”)

For intra-band non-cotiguous CA\_n41(2A), the additional SEM requirements in subclause 6.5.2.3.2 (indicated by NS\_04) applies in each uplink CC.

##### 6.5A.2.3.3 Additional spectrum emission mask for Inter-band CA

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

##### 6.5A.2.4.1 NR ACLR

6.5A.2.4.1.1 NR ACLR for intra-band contiguous CA

For intra-band contiguous carrier aggregation the carrier aggregation the Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in Table 6.5A.2.4.1.1-1 and 6.5A.2.4.1.1-2. If the measured adjacent channel power is greater than –50dBm then the NRACLR shall be higher than the value specified in Table 6.5A.2.4.1.1-1 and 6.5A.2.4.1.1-2.

Table 6.5A.2.4.1.1-1: General requirements for intra-band contiguous CA ACLR

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1, respectively. | |

Table 6.5A.2.4.1.1-2: requirements for intra-band contiguous CA ACLR power class 2

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 31 dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1, respectively. | |

6.5A.2.4.1.2 NR ACLR for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, CA Adjacent Channel Leakage power Ratio(CAACLR) is the ratio of the sum of the filtered mean power centred on each assigned channel frequency to the filtered mean power centred on an adjacent NR channel frequency at nominal channel spacing. In case the gap bandwidth Wgap between 2 uplink CCs is smaller than maximum of the 2 uplink channel bandwidths then no CAACLR requirement is set for the gap. Each assigned NR channel power and adjacent NR 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 –50dBm then the ACLR shall be higher than the value specified in Table 6.5A.2.4.1.2-1.

Table 6.5A.2.4.1.2-1: General requirements for intra-band non-contiguous CA ACLR

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 dB |
| CA Measurement bandwidth for each sub block  (NOTE 1) | MBWACLR |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel  /  - BWChannel |
| NOTE 1: MBWACLR is the single-channel ACLR measurement bandwidths specified in 6.5.2.4.1. | |

6.5A.2.4.1.3 NR ACLR for Inter-band CA

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the NR Adjacent Channel Leakage power Ratio (NRACLR) requirements in subclause 6.5A.2.4.1.1apply for that band. For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the NR Adjacent Channel Leakage power Ratio (NRACLR) requirements in subclause 6.5A.2.4.1.2 apply for that band.

For inter-band carrier aggregation with uplink assigned to two NR bands, the NR Adjacent Channel Leakage power Ratio (NRACLR) is defined per component carrier while both component carriers are active and the requirement is specified in clause 6.5.2.4.1.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the NR ACLR is defined as follows. For the NR band supporting one component carrier, the NR ACLR is the ratio of the filtered mean power centred on the assigned channel bandwidth of the component carrier to the filtered mean power centred on an adjacent channel frequency and the requirements in subclause 6.5.2.4.1 apply. For the NR band supporting two contiguous component carriers the NR ACLR is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) aggregated channel bandwidth at nominal channel spacing and the requirements of CA ACLR specified in subclause 6.5A.2.4.1.1apply.

6.5A.2.4.1.4 Void

##### 6.5A.2.4.2 UTRA ACLR

6.5A.2.4.2.1 Void

6.5A.2.4.2.2 Void

6.5A.2.4.2.3 UTRA ACLR for Inter-band CA

For inter-band carrier aggregation with uplink assigned to two NR bands, the UTRA Adjacent Channel Leakage power Ratio (UTRAACLR) is defined per component carrier while both component carrier are active and the requirement is specified in clause 6.5.2.4.2.

### 6.5A.3 Spurious emission for CA

#### 6.5A.3.1 General spurious emissions

For inter-band carrier aggregation with uplink assigned to two NR bands, the spurious emission requirement Table 6.5.3.1-2 apply for the frequency ranges that are more than FOOB as defined in Table 6.5.3.1-1 away from edges of the assigned channel bandwidth on a component carrier. If for some frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier then it does not apply.

NOTE: For inter-band carrier aggregation with uplink assigned to two NR bands the requirements in Table 6.5.3.1-2 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.5.3.1-2 would be considered to be verified by the measurements verifying the one uplink inter-band CA spurious emission requirement.

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth. For frequencies ΔfOOB greater than FOOB as specified in Table 6.5A.3.1-1 the spurious emission requirements in Table 6.5.3.1-2 are applicable. For power class 2 intra-band contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.3.1-1: Boundary between out of band and spurious emission domain for intra-band contiguous carrier aggregation

|  |  |
| --- | --- |
| Aggregated Channel bandwidth | OOB boundary FOOB (MHz) |
| BWChannel\_CA | BWChannel\_CA + 5 |

For intra-band non-contiguous carrier aggregation transmission the spurious emission requirement is defined as a composite spurious emission requirement. Composite spurious emission requirement applies to frequency ranges that are more than FOOB away from the edges of each carrier in the gap and out of the gap. Composite spurious emission requirement is defined as follows

a) Composite spurious emission requirement is a combination of individual sub-block spurious emission requirements

b) In case the sub-block consist of one component carrier the sub-lock spurious emission requirement and FOOB are defined in subclause 6.5.3.1

c) If for some frequency an individual sub-block spurious emission requirement overlaps with the general spectrum emission mask or the sub-block bandwidth of another sub-block then it does not apply

For intra-band non-contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band), the spurious emission requirement is defined as follows. For the NR band supporting one component carrier the requirements in Table 6.5.3.1-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned channel bandwidth as defined in Table 6.5.3.1-1. For the NR band supporting two contiguous component carriers the requirements in Table 6.5.3.1-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned aggregated channel bandwidth as defined in Table 6.5A.3.1-1. If for some frequency a spurious emission requirement of a single component carrier or two contiguous component carriers overlap with the spurious emission requirement or channel bandwidth of another component carrier or two contiguously aggregated carriers then it does not apply.

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

##### 6.5A.3.2.0 General

Unless otherwise stated, the spurious emission for UE co-existence apply for the frequency ranges that are more than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth configured on each component carrier.

##### 6.5A.3.2.1 Spurious emissions for UE co-existence for intra-band contiguous CA

This clause specifies the requirements for the specified intra-band contiguous carrier aggregation configurations for coexistence with protected bands, the requirements in Table 6.5A.3.2.1-1 apply. For power class 2 intra-band contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

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.

Table 6.5A.3.2.1-1: Requirements for uplink intra-band contiguous carrier aggregation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n5 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n79, n105 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 41, 52, 53  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 4 |
|  | E-UTRA Band 11, 21 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 26 | FDL\_low | - | FDL\_high | -50 | 1 | 8 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 9 |
| CA\_n7 | E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 103  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n40 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 74, 75, 76,  NR Band n77, n78, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 | 7 |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 2, 4 |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 6 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 5, 6 |
| CA\_n48 | E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 54, 66, 70, 71, 74, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 54, 65, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| CA\_n79 | E-UTRA Band 1, 3, 5, 8, 11, 18, 19, 21, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 5 |
| NOTE 1: Void  NOTE 2: Void  NOTE 3: Void  NOTE 4: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 5: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz.  NOTE 6: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz  NOTE 7: As exceptions, for 90 and 100 MHz aggregated bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz.  NOTE 8: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the aggregated uplink channel bandwidth.  NOTE 9: Applicable when co-existence with PHS system operating in 1884.5 - 1915.7 MHz. | | | | | | | |

##### 6.5A.3.2.2 Spurious emissions for UE co-existence for intra-band non-contiguous CA

This clause specifies the requirements for the specified intra-band non-contiguous carrier aggregation configurations for coexistence with protected bands, the requirements in Table 6.5A.3.2.2-1 apply. For intra-band non-contiguous carrier aggregation, the spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

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.

Table 6.5A.3.2.2-1: Requirements for uplink intra-band non-contiguous carrier aggregation

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n41 | E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 42, 44, 45, 48, 50, 51, 52, 54, 65, 66, 70, 71, 73, 74, 85, 103  NR Band n77, n78, n100 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1, 2 |
|  | E-UTRA Band 40 | FDL\_low | - | FDL\_high | -40 | 1 |  |
|  | E-UTRA Band 9, 11, 18, 19, 21 | FDL\_low | - | FDL\_high | -50 | 1 | 2 |
| CA\_n77 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 54, 65  NR Band n100, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |
| CA\_n78 | E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 26, 28, 34, 39, 40, 41, 65, n101 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  |
| NOTE 1: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x RBsize kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 2: This requirement applies when the NR carrier is confined within 2545 – 2575 MHz or 2595 – 2645 MHz and the channel bandwidth is 10 or 20 MHz | | | | | | | |

##### 6.5A.3.2.3 Spurious emissions for UE co-existence for Inter-band CA

This clause specifies the requirements for inter-band carrier aggregation configurations with the uplink assigned to two NR bands for coexistence with protected bands. When both constituent bands have common coexistence band protection requirements as specified in clause 6.5.3.2, the requirements are also applied to the carrier aggregation configuration

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the requirements in subclause 6.5A.3.2.1 apply for that band.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the spurious emissions for UE co-existence requirements in subclause 6.5A.3.2.2 apply for that band.

For inter-band carrier aggregation with the uplink assigned to two NR bands, the requirements in Table 6.5A.3.2.3-1 apply on each component carrier with all component carriers are active.

NOTE: For inter-band carrier aggregation with uplink assigned to two NR bands the requirements in Table 6.5A.3.2.3-1 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.5A.3.2.3-1 would be considered to be verified by the measurements verifying the one uplink inter-band CA UE to UE co-existence requirements.

Table 6.5A.3.2.3-1: Requirements for uplink inter-band carrier aggregation (two bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA combination | Spurious emission | | | | | | |
|  | Protected Band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| CA\_n1-n18 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n1-n20 | Frequency range | 758 | - | 788 | -50 | 1 |  |
| CA\_n1-n26 | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
| CA\_n1-n28 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -30 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
| CA\_n1-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n1-n74 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4 |
| CA\_n2-n14 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n3-n5 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n8 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n18 | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n3-n20 | Frequency range | 758 | - | 788 | -50 | 1 |  |
| CA\_n3-n26 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
| CA\_n3-n34 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n28 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -30 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 1839.9 | - | 1879.9 | -50 | 1 | 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n3-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n74 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4 |
| CA\_n3-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n3-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n7 | Frequency range | 859 | - | 869 | -27 | 1 |  |
| CA\_n5-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n48 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n5-n66 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n5-n78 | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 | 2 |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n5-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n7-n26 | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n7-n28 | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
| CA\_n8-n34 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n8-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n12-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n13-n25 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n13-n66 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n13-n77 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n30 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n66 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4 |
| CA\_n14-n77 | Frequency range | 769 | - | 775 | -35 | 0.00625 | 4, 20 |
|  | Frequency range | 799 | - | 805 | -35 | 0.00625 | 4, 20 |
| CA\_n18-n28 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 | 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n18-n40 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n18-n41 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n18-n74 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4 |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n18-n77 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n18-n78 | Frequency range | 758 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 |  |
|  | Frequency range | 860 | - | 890 | -40 | 1 |  |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 2545 | - | 2575 | -50 | 1 |  |
|  | Frequency range | 2595 | - | 2645 | -50 | 1 |  |
| CA\_n20-n28 | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
| CA\_n26-n66 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n26-n70 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n26-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n26-n78 | Frequency range | 703 | - | 799 | -50 | 1 |  |
|  | Frequency range | 799 | - | 803 | -40 | 1 | 4 |
|  | Frequency range | 945 | - | 960 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n34 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n39 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
| CA\_n28-n40 | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n28-n41 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n46 | Frequency range | 470 | - | 694 | -42 | 8 | 15 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 |  |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 15 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 15 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8, 19 |
| CA\_n28-n50 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n77 | Frequency range | 758 | - | 773 | -32 | 1 |  |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n74 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20, 2 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21, 2 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22, 2 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23, 2 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4, 2 |
| CA\_n28-n78 | Frequency range | 758 | - | 773 | -32 | 1 |  |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n28-n79 | Frequency range | 470 | - | 694 | -42 | 8 | 4, 14 |
|  | Frequency range | 470 | - | 710 | -26.2 | 6 | 13 |
|  | Frequency range | 662 | - | 694 | -26.2 | 6 | 4 |
|  | Frequency range | 758 | - | 773 | -32 | 1 | 4 |
|  | Frequency range | 773 | - | 803 | -50 | 1 |  |
|  | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3, 11 |
| CA\_n34-n40 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n34-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n34-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n40-n41 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n40-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n40-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n40-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n41-n74 | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4 |
| CA\_n41-n77 | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 3 |
| CA\_n41-n78 | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 3 |
| CA\_n41-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n46-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n46-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 8 |
| CA\_n70-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n71-n77 | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 3 |
| CA\_n74-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 21 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
| CA\_n74-n78 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
|  | Frequency range | 1400 | - | 1427 | -32 | 27 | 4, 20 |
|  | Frequency range | 1475 | - | 1488 | -28 | 1 | 4, 21 |
|  | Frequency range | 1475 | - | 1488 | -50 | 1 | 4, 22 |
|  | Frequency range | 1488 | - | 1510.9 | -35 | 1 | 4, 23 |
|  | Frequency range | 1488 | - | 1518 | -50 | 1 | 4 |
| CA\_n77-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| CA\_n77-n85 | Frequency range | 1884.5 |  | 1915.7 | -41 | 0.3 | 3 |
| CA\_n78-n79 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| NOTE 1: Void.  NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.5.3.1-2 are permitted for each assigned NR carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N x LCRB x 180kHz), where N is 2, 3, 4, 5 for the 2nd, 3rd, 4th or 5th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7 MHz  NOTE 4: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.  NOTE 5: Void.  NOTE 6: Void.  NOTE 7: Void.  NOTE 8: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 - 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 - 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 - 1903 MHz.  NOTE 9: Void.  NOTE 10: Void.  NOTE 11:Applicable when the assigned NR carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.  NOTE 12: Void.  NOTE 13: This requirement is applicable for 5 and 10 MHz NR channel bandwidth allocated within 718 - 728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and Rbstart < 48.  NOTE 14: This requirement is applicable in the case of a 10 MHz NR carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.  NOTE 15: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).  NOTE 17: Void.  NOTE 18: Void.  NOTE 19: This requirement is applicable for power class 3 UE for any channel bandwidths within the range 2570 - 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 - 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 - 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For power class 2 UE for any channel bandwidths within the range 2570 - 2615 MHz, NS\_44 shall apply. For power class 2 or 3 UE for carriers with channel bandwidth overlapping the frequency range 2615 - 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.  NOTE 20: Applicable for cases and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1427 MHz + the channel BW assigned for 5 and 10 MHz bandwidth, and when the lower edge of the assigned NR UL channel bandwidth frequency is greater than or equal to 1440 MHz for 15 and 20 MHz bandwidth.  NOTE 21: Applicable for 5 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1467 MHz assigned for 10 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth frequency is less than or equal to 1463.8 MHz for 15 MHz bandwidth, and when the upper edge of the assigned NR UL channel bandwidth.  NOTE 22: As exceptions, for 90 and 100 MHz channel bandwidth, -40 dBm/MHz is applicable in the frequency range of 2496 – 2505 MHz.  NOTE 23: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval. | | | | | | | |

##### 6.5A.3.2.4 Void

##### 6.5A.3.2.5 Void

##### 6.5A.3.2.6 Void

#### 6.5A.3.3 Additional spurious emissions for CA

##### 6.5A.3.3.1 Additional spurious emissions for intra-band contiguous CA

6.5A.3.3.1.1 Requirement for network signalling value "CA\_ NS\_04"

When "CA\_NS04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.3.3.1.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth. For power class 2 intra-band contiguous carrier aggregation, the additional spurious emissions is measured as the sum from both UE transmit antenna connectors when UE indicates support for *dualPA-Architecture* IE.

Table 6.5A.3.3.1.1-1: Additional requirements for "CA\_ NS\_04"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | BWChannel\_CA (MHz) / Spectrum emission limit (dBm) | Measurement bandwidth |
|  | 20 to 190 MHz |  |
| 2495 ≤ f < 2496 | -13 | Max(1 % of BWChannel\_CA, 1 MHz) |
| 2490.5 ≤ f < 2495 | -13 | 1 MHz |
| 0.009 < f < 2490.5 | -25 | 1 MHz |

6.5A.3.3.1.2 Requirement for network signalling value "CA\_NS\_27"

When "CA\_NS 27" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.3.3.1.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth.

Table 6.5A.3.3.1.2-1: Additional requirements for "CA\_NS\_27"

|  |  |  |
| --- | --- | --- |
| Frequency range  (MHz) | Spectrum emission limit (dBm) for aggregated channel bandwidth of  max 40 MHz | Measurement bandwidth |
| 9 kHz – 3530 MHz | -40 | 1 MHz |
| 3530 MHz – 3540 MHz | -25 |  |
| 3710 MHz – 3720 MHz | -25 |  |
| 3720 MHz – 12.75 GHz | -40 |  |

6.5A.3.3.1.3 Requirement for network signalling value "CA\_NS\_46"

When "CA\_NS 46" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5A.3.3.1.3-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.5A.3.1-1 from the edge of the aggregated channel bandwidth.

Table 6.5A.3.3.1.3-1: Additional requirements for “CA\_NS\_46”

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| Frequency range | 2570 | - | 2575 | +1.6 | 5 | 1, 2 |
| Frequency range | 2575 | - | 2595 | -15.5 | 5 | 1, 2 |
| Frequency range | 2595 | - | 2620 | -40 | 1 | 1 |
| NOTE 1: This requirement is applicable for carriers confined in 2500-2570 MHz.  NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. | | | | | | |

##### 6.5A.3.3.2 Additional spurious emissions for intra-band non-contiguous CA

6.5A.3.3.2.1 Requirement for network signalling value "CA\_NC\_NS\_04"

For intra-band non-cotiguous CA\_n41(2A), the spurious emission requirements in subclause 6.5.3.3.1 (indicated by NS\_04) applies in each uplink CC.

### 6.5A.4 Transmit intermodulation for CA

##### 6.5A.4.2.1 Transmit intermodulation for intra-band contiguous CA

For intra-band contiguous carrier aggregation the requirement of transmitting intermodulation is specified in Table 6.5A.4.2.1-1.

Table 6.5A.4.2.1-1: Transmit Intermodulation

|  |  |  |  |
| --- | --- | --- | --- |
| CA bandwidth class(UL) | B and C | | |
| Interference Signal  Frequency Offset | BWChannel\_CA | 2\*BWChannel\_CA | |
| Interference CW Signal Level | -40dBc | | |
| Intermodulation Product | -29dBc | -35dBc | |
| Measurement bandwidth  (NOTE1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 | | |
| Measurement offset from channel center | BWChannel\_CA and 2\*BWChannel\_CA | | 2\*BWChannel\_CA and 4\*BWChannel\_CA |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1, respectively. | | | |

##### 6.5A.4.2.2 Void

6.5A.4.2.3 Transmit intermodulation for Inter-band CA

For inter-band carrier aggregation with two contiguous carriers assigned to one NR band, the transmit intermodulation requirements in subclause 6.5A.4.2.1apply for that band.

For inter-band carrier aggregation with two uplink non-contiguous carrier assigned to one NR band, the transmit intermodulation requirements in subclause 6.5A.4.2.2 apply for that band.

For inter-band carrier aggregation with uplink assigned to two NR bands, the transmit intermodulation requirement is specified in Table 6.5.4-1 which shall apply on each component carrier with both component carriers active.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band) transmit intermodulation is defined as follows. For the NR band supporting one component carrier the requirement specified in Table 6.5.4-1 apply. For the NR band supporting two contiguous component carriers the requirements specified in Table 6.5A.4.2.1-1 apply.

## 6.5B Output RF spectrum emissions for NR-DC

For inter-band NR-DC with one uplink carrier assigned per NR band, the output RF spectrum emissions for the corresponding inter-band CA configuration as specified in clause 6.5A applies.

## 6.5D Output RF spectrum emissions for UL MIMO

### 6.5D.1 Occupied bandwidth for UL MIMO

For UE supporting UL MIMO, the requirements for occupied bandwidth apply to the sum of the powers from both UE transmit antenna connectors. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the occupied bandwidth shall be less than the channel bandwidth specified in table 6.5.1-1. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5.1 apply when *TxD* is not indicated, and the requirements in clause 6.5G.1 apply when *TxD* is indicated.

### 6.5D.2 Out of band emission for UL MIMO

For UE supporting UL MIMO or uplink full power transmission (ULFPTx) for UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.5.2 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2D.1.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the requirements in clause 6.5.2 shall apply. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5.2 apply when *TxD* is not indicated, and the requirements in clause 6.5G.2 apply when *TxD* is indicated.

### 6.5D.3 Spurious emission for UL MIMO

For UE supporting UL MIMO or uplink full power transmission (ULFPTx) for UL MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products is defined as the sum of the emissions from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements specified in subclause 6.5.3 apply. The requirements shall be met with the UL MIMO configurations described in clause 6.2D.1.

For UE support uplink full power transmission (ULFPTx) for UL MIMO, the requirements in clause 6.5.3 shall apply. The requirements shall be met with the PUSCH configurations specified in Table 6.2D.1-3, based upon UE’s support of uplink full power transmission mode.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5.3 apply when *TxD* is not indicated, and the requirements in clause 6.5G.3 apply when *TxD* is indicated.

### 6.5D.4 Transmit intermodulation for UL MIMO

For UE supporting UL MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output powers from both UE transmit antenna connectors.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements specified in clause 6.5.4 apply to each transmit antenna connector. The requirements shall be met with the UL MIMO configurations described in clause 6.2D.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5.4 apply when *TxD* is not indicated, and the requirements in clause 6.5G.4 apply when *TxD* is indicated.

## 6.5E Output RF spectrum emissions for V2X

### 6.5E.1 Occupied bandwidth for V2X

#### 6.5E.1.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5.1 shall apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the occupied bandwidth at each transmitter antenna shall be less than the channel bandwidth specified in Table 6.5.1-1. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

If V2X UE transmits on one antenna connector at a time, the requirements specified for single carrier shall apply to the active antenna connector.

#### 6.5E.1.2 Occupied bandwidth for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.5.1 shall apply for the uplink in licensed band and the requirements specified in clause 6.5E.1.1 shall apply for the sidelink in licensed band or Band n47.

For the intra-band con-current NR V2X operation, the requirements specified in clause 6.5.1 shall apply for the uplink in licensed band and the requirements specified in clause 6.5E.1 shall apply for the sidelink in licensed band.

### 6.5E.2 Out of band emission for V2X

#### 6.5E.2.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5E.2.2.1, 6.5E.2.3 and 6.5E.2.4.1 apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

#### 6.5E.2.2 Spectrum emission mask

##### 6.5E.2.2.1 General

For NR V2X UE, the existing NR general spectrum emission mask in subclause 6.5.2.2 applies for all supporting NR V2X channel bandwidths. The spectrum emission mask of the UE applies to frequencies (ΔfOOB) starting from the ± edge of the assigned NR channel bandwidth. For frequencies greater than (ΔfOOB), the power of any UE emission shall not exceed the levels specified in Table 6.5.2.2-1 for the specified channel bandwidth for NR V2X operating bands in Table 5.2E.1-1.

##### 6.5E.2.2.2 Spectrum emission mask for V2X con-current operation

For the inter-band con-current NR V2X operation, the general/additional SEM requirements specified in clause 6.5.2 shall apply for the uplink in licensed band and the general/additional SEM requirements specified in clause 6.5E.2.2.1 shall apply for the sidelink in licensed band or Band n47.

For intra-band NR V2X transmission with bandwidth class B where Uu and SL overlap in time the specifications in section 6.5A.2.2.1 and 6.5A.2.2.2 apply.

#### 6.5E.2.3 Additional Spectrum emission mask

##### 6.5E.2.3.1 Requirements for network signalling value "NS\_33"

The additional spectrum mask in Table 6.5E.2.3.1-1 applies for NR V2X UE within 5 855 MHz to 5 950 MHz according to ETSI EN 302 571. Additional spectrum 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.

When "NS\_33" is indicated in the cell or pre-configured radio parameters, the power of any V2X UE emission shall not exceed the levels specified in Table 6.5E.2.3.1-1.

Table 6.5E.2.3.1-1: Additional spectrum mask requirements for 10MHz channel bandwidth

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBm EIRP)/ Channel bandwidth | | |
| ΔfOOB  (MHz) | 10 MHz | Measurement bandwidth |
| ± 0-0.5 | [] | 100 kHz |
| ± 0.5-5 | [] | 100 kHz |
| ± 5-10 | [] | 100 kHz |

NOTE 1: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, 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 2: Additional SEM for NR V2X overrides any other requirements in frequency range 5855-5950MHz.

NOTE 3: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11].

##### 6.5E.2.3.2 Requirements for network signalling value "NS\_52"

The additional spectrum mask in Table 6.5E.2.3.2-1 applies for NR V2X UE within 5 765 MHz to 6 005 MHz according to FCC regulation. Additional spectrum 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.

When "NS\_52" is indicated in the cell or pre-configured radio parameters, the power of any V2X UE emission shall not exceed the levels specified in Table 6.5E.2.3.2-1.

Table 6.5E.2.3.2-1: Additional spectrum mask requirements for 40MHz channel bandwidth (fc = 5885MHz)

|  |  |  |
| --- | --- | --- |
| ΔfOOB (MHz) | Emission Limit (dBm) | Measurement Bandwidth |
| ±0-2 | -32 | 100kHz |
| ±2-10 | -36 | 100kHz |
| ±10-20 | -38 | 100kHz |
| ±20-40 | -43 | 100kHz |
| ±40-100 | -50 | 100kHz |

NOTE: The ASE requirements for NS\_52 will not be verified until the corresponding regulation release a formal rule for C-V2X emission limits.

##### 6.5E.2.3.3 Requirements for network signalling value "NS\_06"

The additional spectrum mask are signalled by the network to indicate that the public safety (PS) UE in NR band n14 shall meet an additional for a specific deployement scenarios.

When "NS\_06" is indicated by serving cell or pre-configured radio parameters, the power of any PS UE emission shall not exceed the levels specified in Table 6.5.2.3.4-1.

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

##### 6.5E.2.4.1 General

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.

For NR V2X UE, the existing ACLR requirement for NR uplink transmission in clause 6.5.2.4 are applied for NR V2X UE for NR V2X operating bands in 5.2E.1-1.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with SL MIMO configurations described in clause 6.2D.1.

If V2X UE transmits on one antenna connector at a time, the requirements specified for single carrier shall apply to the active antenna connector.

##### 6.5E.2.4.2 ACLR for V2X con-current operation

For the inter-band con-current NR V2X operation, the ACLR requirement specified in clause 6.5.2.4 shall apply for the uplink in licensed band and the ACLR requirement specified in clause 6.5E.2.4.1 shall apply for the sidelink in licensed band or Band n47.

For the intra-band NR V2X operation with bandwidth classes B where Uu and SL transmission overlaps in time, the ACLR requirement specified in clause 6.5A.2.4.1 shall apply for the both uplink and sidelink transmission in licensed band.

### 6.5E.3 Spurious emissions for V2X

#### 6.5E.3.1 General spurious emissions

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the general spurious emission requirements in clause 6.5.3.1 shall apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in clause 6.2D.1.

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

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5.3.2 shall apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in clause 6.2D.1.

#### 6.5E.3.3 Spurious emissions for UE co-existence for V2X con-current operation

For the inter-band con-current NR V2X operation, the UE-coexistence requirements in Table 6.5E.3.3-1 apply for the corresponding inter-band con-current operation with transmission assigned to both uplink in licensed band and sidelink in Band n47.

**Table 6.5E.3.3-1: Requirements for inter-band con-current V2X operation**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| V2X | Spurious emission | | | | | | |
| con-current operating band configuration | Protected band | Frequency range (MHz) | | | Maximum Level (dBm) | MBW (MHz) | NOTE |
| V2X\_n1A-n47A | E-UTRA Band 1, 3, 5, 7, 8, 22 26, 28, 34, 40, 41, 42, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n3A-n47A | E-UTRA Band 1, 3, 5, 7, 8, 26, 28, 34, 39, 40, 41, 44, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n5A-n47A | E-UTRA Band 1, 3, 5, 7, 8, 26, 28, 34, 40, 42, 45, 65, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
| V2X\_n8A-n47A | E-UTRA Band 1, 3, 7, 8, 22, 28, 34, 39, 40, 41, 42, 45, 65, 68, 72, 73 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n34A-n47A | E-UTRA Band 1, 3, 7, 8, 22, 26, 28, 39, 40, 41, 42, 44, 45, 65, 72 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78, n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n39A-n47A | E-UTRA Band 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45  NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n40A-n47A | E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 42, 44, 45, 68, 72  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n41A-n47A | E-UTRA Band 1, 3, 5, 8, 26, 28, 34, 39, 42, 44, 45, 65, 73  NR Band n77, n78 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | NR Band n79 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n71A-n47A | E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 66, 85, 103 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | E-UTRA Band 2, 25, 41, 70 | FDL\_low | - | FDL\_high | -50 | 1 | 1 |
|  | E-UTRA Band 29 | FDL\_low | - | FDL\_high | -38 | 1 | 2 |
|  | NR Band n71 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n78A-n47A | E-UTRA Band 1, 3, 5, 7, 8, 26 28, 34, 39, 40, 41, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
|  | Frequency range | 5925 | - | 5950 | -30 | 1 | 3, 4 |
|  | Frequency range | 5815 | - | 5855 | -30 | 1 | 3 |
| V2X\_n79A-n47A | E-UTRA Band 1, 3, 5, 8, 28, 34, 39, 40, 41, 42, 65 | FDL\_low | - | FDL\_high | -50 | 1 |  |
| NOTE 1: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th or 5th harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x LCRB x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.  NOTE 2: These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.  NOTE 3: Applicable when NS\_33 is configured by the pre-configured radio parameters for power class 3 V2X UE.  NOTE 4: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency. | | | | | | | |

For the intra-band NR V2X transmission where Uu and SLoverlap in time , the UE-coexistence requirements in Table 6.5A.3.2.1-1 apply for the corresponding intra-band con-current operation for the both uplink and sidelink transmission in licensed band.

#### 6.5E.3.4 Additional spurious emissions requirements for V2X

##### 6.5E.3.4.1 General

This clause specifies additional spurious emission requirements for V2X operation

##### 6.5E.3.4.2 Requirements for network signalling value "NS\_33"

Table 6.5E.3.4.2-1: Additional requirements for "NS\_33"

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Protected band | | Frequency range (MHz) | | | Maximum Level (EIRP2) | MBW (MHz) | NOTE |
| Frequency range | 5925 | | - | 5950 | -30 | 1 | 1 |
| Frequency range | 5815 | | - | 5855 | -30 | 1 | 3 |
| NOTE 1: In the frequency range x-5950MHz, SE requirement of -30dBm/MHz should be applied; where x = max (5925, fc + 15), where fc is the channel centre frequency.  NOTE 2: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11].  NOTE 3: Resolution BW is 10% of the measurement BW and the result should be integrated to achieve the measurement bandwidth. The sweep time shall be set larger than (symbol length)\*(number of points in sweep) to improve the measurement accuracy. | | | | | | | |

When "NS\_33" is configured from pre-configured radio parameters or the cell, and the indication from upper layers has indicated that the UE is within the protection zone of CEN DSRC devices or HDR DSRC devices, the power of any NR V2X UE emission shall fulfil either one of the two sets of conditions.

Table 6.5E.3.4.2-2: Requirements for spurious emissions to protect CEN DSRC for V2X UE

|  |  |  |
| --- | --- | --- |
|  | Maximum Transmission Power (dBm EIRP1) | Emission Limit in Frequency Range 5795-5815 (dBm/MHz EIRP1) |
| Condition 1 | 10 | -65 |
| Condition 2 | 10 | -45 |
| NOTE 1: The EIRP requirement is converted to conducted requirement depend on the supported post antenna connector gain Gpost connector declared by the UE following the principle described in annex I in [11]. | | |

##### 6.5E.3.4.3 Void

### 6.5E.4 Transmit intermodulation

#### 6.5E.4.1 General

When UE is configured for NR V2X sidelink transmissions non-concurrent with NR uplink transmissions for NR V2X operating bands specified in Table 5.2E.1-1, the requirements in clause 6.5.4 apply for NR V2X sidelink transmission.

For NR V2X UE with two transmit antenna connectors, the requirements specified for single carrier shall apply to each transmit antenna connector. The requirements shall be met with the SL MIMO configurations described in clause 6.2D.1.

#### 6.5E.4.2 Transmit intermodulation for V2X con-current operation

For the inter-band con-current NR V2X operation, the requirements specified in clause 6.5.4 shall apply for the uplink in licensed band and the requirements specified in clause 6.5E.4.1 shall apply for the sidelink in licensed band or Band n47.

For the intra-band NR V2X operation where Uu and SLtransmission overlaps in time, the requirements specified in clause 6.5A.4 shall apply for both uplink and sidelink in licensed band

## 6.5F Output RF spectrum emissions for shared spectrum channel access

### 6.5F.1 Occupied bandwidth

The requirements for occupied bandwidth in 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 for operation with shared spectrum channel access

##### 6.5F.2.2.0 General

Instead of the general spectrum emission mask requirement in clause 6.5.2.2, when operating with shared spectrum channel access the relative power of any UE emission shall not exceed the levels specified in Table 6.5F.2.2.0-1 for the specified channel bandwidth or -30 dBm/MHz whichever is the greatest. The spectrum emission mask for operation with shared spectrum channel access is defined relative to the maximum power density in a 1 MHz measurement bandwidth within the channel bandwidth.

The spectrum emission mask for operation with shared spectrum channel access applies to frequencies (ΔfOOB) starting from the ± edge of the assigned channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in clause 6.5.3 are applicable.

Table 6.5F.2.2.0-1: Spectrum emission mask for operation with shared spectrum channel access

|  |  |  |
| --- | --- | --- |
| Spectrum emission limit (dBr) / Channel bandwidth | | |
| ΔfOOB  (MHz) | 10, 20, 40, 60, 80, 100 MHz | Measurement bandwidth (MBW) |
| ± 0-1 |  | [100kHz]3 |
| ± 1-(BWChannel / 2) | – 20 – (8 / A) |ΔfOOB – 1| where A = (BWChannel / 2) – 1 | 1 MHz |
| ± (BWChannel / 2)-BWChannel | – 16 – (24 / BWChannel) |ΔfOOB| |  |
| < - BWChannel or > BWChannel | -40 |  |
| NOTE 1: Void  NOTE 2: Void  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 4: The carrier leakage exceptions from Table 6.4F.2.3-1 apply and carrier leakage contribution shall be removed prior to setting the 0dBr level of the mask, the reported carrier frequency location in *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP* can be used to cancel the carrier leakage contribution. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, a carrier frequency location at the center of the channel shall be assumed. | | |

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.

##### 6.5F.2.2.1 Spectrum emission mask for non-transmitted channels

In the case of non-transmitted 20 MHz channel(s) on the edges of an assigned channel bandwidth the spectrum emission mask for operation with shared spectrum channel access, specified in Table 6.5F.2.2.0-1, is applied by using the total bandwidth of the remaining transmitted channels. The spectrum emission mask for non-transmitted channels is floored at -28dBr.

The relative power of any UE emission shall not exceed the most stringent levels given by the spectrum emission mask for operation with shared spectrum channel access with full channel bandwidth and the spectrum emission mask for non-transmitted channels with the channel bandwidth of the transmitted channels in the case of non-transmitted channels at the edge of an assigned channel bandwidth.

An exception to the spectrum emission mask for non-transmitted channels allows a single [2] MHz bandwidth to extend to [-28] dBc relative to total transmit power, or [-20] dBm, whichever is the greatest.

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

There are no additional spectrum emission mask requirements in this version of the specification.

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

##### 6.5F.2.4.0 General

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.

Instead of the general ACLR requirement in clause 6.5.2.4, 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 access ACLR requirement

|  |  |  |
| --- | --- | --- |
|  | Power class 5 | Power class 3 |
| ACLR | 27 dB | 27 dB |

##### 6.5F.2.4.2 Additional requirement for network signalled value "NS\_29"

When "NS\_29" is indicated in the cell, the UE emission shall meet the additional requirements specified in Table 6.5F.2.4.2-1 for shared spectrum channels assigned within 5150 – 5350 MHz and 5470 – 5730 MHz.

Table 6.5F.2.4.2-1: ACLR2 requirement for "NS\_29"

|  |  |  |  |
| --- | --- | --- | --- |
| **Power class 5** | 20 MHz | 40 MHz | 60, 80 MHz |
| ACLR2 | 40 dB | 40 dB | N/A |
| Measurement bandwidth | 20 MHz | 40 MHz | N/A |
| Adjacent channel center frequency offset (MHz) | +40 / -40 | +80 / -80 | N/A |

### 6.5F.2A Out of band emission for CA

#### 6.5F.2A.1 Spectrum emission mask for CA

##### 6.5F.2A.1.1 Spectrum emission mask for Inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the spectrum emission mask requirements in clause 6.5.2.1 and 6.5.2.2 apply for the NR uplink carrier and clause 6.5F.2.1 and 6.5F.2.2 for the carrier operating with shared spectrum access.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band and including one of the bands listed in Table 6.2F.1-1), the spectrum emission mask of the UE is defined per band while all component carriers are active. For the NR band supporting two contiguous component carriers the requirements specified in subclause 6.5A.2.2.1 apply. For the shared spectrum defined band supporting one component carrier the requirements in subclauses 6.5F.2.2 apply.

##### 6.5F.2A.1.2 Spectrum emission mask for Intra-band contiguous CA

###### 6.5F.2A.1.2.1 General

For intra-band contiguous carrier aggregation operation with shared spectrum channel access, the relative power of any UE emission shall not exceed the levels specified in Table 6.5F.2A.1.1-1 for the specified aggregated channel bandwidth or -30 dBm/MHz whichever is the greatest. The spectrum emission mask for operation with shared spectrum channel access is defined relative to the maximum power density in a 1 MHz measurement bandwidth within the aggregated channel bandwidth.

The spectrum emission mask for operation with shared spectrum channel access applies to frequencies (ΔfOOB) starting from the ± edge of the assigned aggregated channel bandwidth. For frequencies offset greater than ΔfOOB, the spurious requirements in clause 6.5.3 are applicable.

Table 6.5F.2A.1.2-1: Spectrum emission mask for intra-band contiguous CA operation with shared spectrum channel access

|  |  |  |  |
| --- | --- | --- | --- |
| Spectrum emission limit (dBr) / Channel bandwidth | | | |
| ΔfOOB  (MHz) | 10, 20, 40, 60, 80, 100 MHz | Measurement bandwidth (MBW) |
| ± 0-1 |  | [100kHz]3 |
| ± 1-(BWChannel\_CA / 2) | – 20 – (8 / A) |ΔfOOB – 1| where A = (BWChannel\_CA / 2) – 1 | 1 MHz |
| ± (BWChannel\_CA / 2)-BWChannel\_CA | – 16 – (6 / BWChannel\_CA) |ΔfOOB| |  |
| < - BWChannel\_CA or > BWChannel\_CA | -40 |  |
| NOTE 1: Void  NOTE 2: Void  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 4: The carrier leakage exceptions from Table 6.4F.2.3-1 apply and carrier leakage contribution shall be removed prior to setting the 0dBr level of the mask, the reported carrier frequency location in *txDirectCurrentLocation* field of the *UplinkTxDirectCurrentBWP* can be used to cancel the carrier leakage contribution. If *txDirectCurrentLocation* is not available or is reported with value 3300 or 3301, a carrier frequency location at the center of the channel shall be assumed. | | | |

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.

###### 6.5F.2A.1.2.2 Intra-band contiguous CA spectrum emission mask for non-transmitted channels

In the case of non-transmitted 20 MHz channel(s) on the edges of an assigned aggregated channel bandwidth, the spectrum emission mask for operation with shared spectrum channel access specified in Table 6.5F.2A.1.2-1 is applied by using the total bandwidth of the remaining transmitted channels. The spectrum emission mask for non-transmitted channels is floored at -28dBr.

The relative power of any UE emission shall not exceed the most stringent levels given by the spectrum emission mask for operation with shared spectrum channel access with full aggregated channel bandwidth, and the spectrum emission mask for non-transmitted channels with the channel bandwidth of the transmitted channels in the case of non-transmitted channels at the edge of an assigned aggregated channel bandwidth.

An exception to the spectrum emission mask for non-transmitted channels allows a single [2] MHz bandwidth to extend to [-28] dBc relative to total transmit power, or [-20] dBm, whichever is the greatest.

#### 6.5F.2A.2 Adjacent channel leakage ratio for CA

##### 6.5F.2A.2.1 Adjacent channel leakage ratio for inter-band CA

For inter-band carrier aggregation with uplink assigned to two bands and including one of the bands listed in Table 6.2F.1-1, the ACLR requirements in clause 6.5.2.4 apply for the NR uplink carrier and clause 6.5F.2.4 for the carrier operating with shared spectrum access.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per operating band and including one of the bands listed in Table 6.2F.1-1). For the NR band supporting two contiguous component carriers, the requirements in subclause 6.5A.2.4.1.1 apply. For the shared spectrum defined band supporting one component carrier, the requirements in subclause 6.5F.2.4.1 apply.

##### 6.5F.2A.2.2 Adjacent channel leakage ratio for intra-band contiguous CA

For intra-band contiguous carrier aggregation, the Carrier Aggregation Adjacent Channel Leakage Power Ratio (CAACLR) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in Table 6.5F.2A.2.2-1. If the measured adjacent channel power is greater than -47dBm then the ACLR shall be higher than the value specified in Table 6.5F.2A.2.2-1.

Table 6.5F.2A.2.2-1: General requirements for intra-band contiguous CA ACLR power class 5

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 27 dB |
| CA Measurement bandwidth  (NOTE 1) | Nominal channel space+MBWACLR,low/2+ MBWACLR,high/2 |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel\_CA  /  - BWChannel\_CA |
| Difference between ACLR MBW center and Fc,low | MBWshift= (MBWACLR\_CA-MBWACLR,low)/2 |
| NOTE 1: MBWACLR,low and MBWACLR,high are the single-channel ACLR measurement bandwidths specified for channel bandwidths BWchannel(low) and BWchannel(high) in 6.5.2.4.1, respectively. | |

### 6.5F.3 Spurious emissions

#### 6.5F.3.0 General

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 clause 6.5.3.1 apply.

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

Spurious emissions requirements for UE coexistence are not applicable to bands restricted to stand-alone operation with shared spectrum channel access as identified in Table 5.2-1.

#### 6.5F.3.3 Additional spurious emissions

##### 6.5F.3.3.0 General

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 signalling value "NS\_28"

When "NS\_28" 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.3.3.1-1. 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.3.3.1-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80, [100] MHz |  |
| 47 ≤ f ≤ 74 | -54 | 100 kHz |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 862 | -54 | 100 kHz |
| 1000 ≤ f ≤ 5150 | -30 | 1 MHz |
| 5350 ≤ f ≤ 5470 | -30 | 1 MHz |
| 5725 ≤ f ≤ 26000 | -30 | 1 MHz |

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

When "NS\_29" is indicated in the cell, the power of any UE emission for channels assigned within 5150-5350 and 5470-5730 MHz shall not exceed the levels specified in Table 6.5F.3.3.2-1, Table 6.5F.3.3.2-2, and Table 6.F.3.3.2-3. 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 for 20 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5179.98 ≤ Fc ≤ 5239.98 | 5135 ≤ f ≤ 5142 | -26 | 1 MHz |
|  | 5142 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5250.2 | 3 to -2 |  |
|  | 5250.2 ≤ f < 5251 | -2 to -10 |  |
|  | 5251 ≤ f < 5260 | -10 to -18 |  |
|  | 5260 ≤ f < 5266.7 | -18 to -26 |  |
|  | 5266.7 ≤ f ≤ 5365 | -26 |  |
| 5260.02 ≤ Fc ≤ 5320.02 | 5135 ≤ f ≤ 5233.3 | -26 |  |
|  | 5233.3 < f ≤ 5240 | -26 to -18 |  |
|  | 5240 < f ≤ 5249 | -18 to -10 |  |
|  | 5249 < f ≤ 5249.8 | -10 to -2 |  |
|  | 5249.8 < f ≤ 5250 | -2 to 3 |  |
|  | 5350 ≤ f ≤ 5365 | -26 |  |
| 5500.02 ≤ Fc ≤ 5719.98 | 5420 ≤ f ≤ 5460 | -26 |  |
|  | 5460 < f ≤ 5470 | -19 |  |
|  | 5745 ≤ f < 5765 | -19 |  |
|  | 5765 ≤ f ≤ 5800 | -26 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

Table 6.5F.3.3.2-2: Additional requirements for 40 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5190 ≤ Fc ≤ 5230.02 | 5100 ≤ f ≤ 5141.6 | -26 | 1 MHz |
|  | 5141.6 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -3 to -13 |  |
|  | 5251 ≤ f < 5270 | -13 to -21 |  |
|  | 5270 ≤ f < 5278.4 | -21 to -26 |  |
|  | 5278.4 ≤ f ≤ 5400 | -26 |  |
| 5269.98 ≤ Fc ≤ 5310 | 5210 < f ≤ 5221.6 | -26 |  |
|  | 5221.6 < f ≤ 5230 | -26 to -21 |  |
|  | 5230 < f ≤ 5249 | -21 to -13 |  |
|  | 5249 ≤ f ≤ 5250 | -13 to -3 |  |
|  | 5350 ≤ f ≤ 5358.4 | -18 |  |
|  | 5358.4 < f ≤ 5400 | -26 |  |
| 5509.98 ≤ Fc ≤ 5670 | 5420 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

Table 6.5F.3.3.2-3: Additional requirements for 60 and 80 MHz channel bandwidth

|  |  |  |  |
| --- | --- | --- | --- |
| Center  Frequency Fc  [MHz] | Protected range  [MHz] | Minimum requirement  [dBm] | Measurement bandwidth |
| 5200.02 ≤ Fc ≤ 5220 | 5020 ≤ f ≤ 5123.2 | -26 | 1 MHz |
|  | 5123.2 < f ≤ 5150 | -18 |  |
|  | 5250 ≤ f < 5251 | -6 to -16 |  |
|  | 5251 ≤ f < 5290 | -16 to -24 |  |
|  | 5290 ≤ f < 5296.7 | -24 to -26 |  |
|  | 5296.7 ≤ f ≤ 5480 | -26 |  |
| 5280 ≤ Fc ≤ 5299.98 | 5020 ≤ f ≤ 5203.3 | -26 |  |
|  | 5203.3 < f ≤ 5210 | -26 to -24 |  |
|  | 5210 < f ≤ 5249 | -24 to -16 |  |
|  | 5249 < f ≤ 5250 | -16 to -6 |  |
|  | 5350 ≤ f < 5376.8 | -18 |  |
|  | 5376.8 ≤ f ≤ 5480 | -26 |  |
| 5520 ≤ Fc ≤ 5689.98 | 5340 ≤ f ≤ 5460 | -19 |  |
|  | 5460 < f ≤ 5469.5 | -13 |  |
|  | 5469.5 < f ≤ 5470 | -13 |  |
|  | 5770 ≤ f ≤ 5800 | -19 |  |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | | |

##### 6.5F.3.3.3 Requirement for network signalling 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 shared access channels assigned within 5150-5350 MHz

|  |  |  |
| --- | --- | --- |
| Protected range  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80 MHz |  |
| 4500 ≤ f ≤ 5150 | -41 | 1 MHz |
| 5350 ≤ f ≤ 5460 | -41 |

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

|  |  |  |
| --- | --- | --- |
| Protected range  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80 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 shared access channels assigned within 5725-5850 MHz

|  |  |  |
| --- | --- | --- |
| Protected range  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
|  | 20, 40, 60, 80, [100] MHz |  |
| f < 5650 | -27 | 1 MHz |
| 5650 ≤ f < 5700 | -27 to 10 |
| 5700 ≤ f < 5720 | 10 to 15.6 |
| 5720 < f ≤ 5725 | 15.6 to 27 |
| 5850 ≤ f ≤ 5855 | 27 to 15.6 |
| 5855 < f ≤ 5875 | 15.6 to 10 |
| 5875 < f ≤ 5925 | 10 to -27 |
| 5925 < f | -27 |
| NOTE: The minimum requirement when specified as a range denotes the emission requirement at the end points of the protected range. The requirement within the protected range is obtained by linear interpolation between the requirements at the end points. | | |

##### 6.5F.3.3.4 Requirement for network signalling 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, 40, 60, 80 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, 40, 60, 80 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, 40, 60, 80 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, 40, 60, 80 MHz |  |
| f ≤ 5725 | -27 | 1 MHz |
| f ≥ 5850 | -27 |
|  |  |  |

##### 6.5F.3.3.5 Requirements for network signalling value "NS\_53" or "NS\_54" or "NS\_60" or “NS\_66” or “NS\_67”

When "NS\_53" or "NS\_54" or "NS\_60" or “NS\_66” or “NS\_67” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5F.3.3.5-1. 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.3.3.5-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Spectrum emission limit  (dBm) | Measurement bandwidth |
| f ≤ 5925 | -27 | 1 MHz |
| f ≥ 7125 | -27 |  |

##### 6.5F.3.3.6 Requirements for network signalling value "NS\_58"

When "NS\_58" is indicated in the cell, the power of any UE emission for channels assigned within 5945-6425 MHz shall not exceed the levels specified in Table 6.5F.3.3.6-1. These requirements also apply for frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.6-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 694 | -54 | 100 kHz |
| f ≤ 5935 | -22 | 1 MHz |

##### 6.5F.3.3.7 Requirements for network signalling value "NS\_61"

When "NS\_61" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.5F.3.3.7-1. These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.7-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| f ≤ 5925 | -34 | 1 MHz |
| f ≥ 6445 | -34 |  |

##### 6.5F.3.3.8 Requirements for network signalling value “NS\_63” or “NS\_69”

When "NS\_63" or “NS\_69” is indicated in the cell, the power of any UE emission for channels assigned within 5945-6425 MHz shall not exceed the levels specified in Table 6.5F.3.3.8-1. These requirements also apply for frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.8-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| f ≤ 5925 | -27 | 1 MHz |
| 6425 ≤ f ≤ X | -13 | 1 MHz |
| f ≥ X | -19 | 1 MHz |
| Note 1: In case of NS\_63 the parameter X is defined as 6435.9MHz for 20MHz channel, 6440.1MHz for 40MHz channel, and 6440.4MHz for 80MHz.  Note 2: In case of NS\_69 the parameter X is defined as 6425.5MHz for 20MHz channel, 6425.4MHz for 40MHz channel, and 6425.2MHz for 80MHz. | | |

ACLR is specified for the first adjacent channel (ACLR1) which centre frequency is ±CBW from assigned channel centre and for the 2nd adjacent channel (ACLR2) which centre frequency is ±2\*CBW from assigned channel centre. The assigned channel power and ACLR1/ACLR2 are measured with rectangular filters with measurement bandwidth of CBW.

Instead of the general ACLR requirement in clause 6.5.2.4 and 6.5F.2.4.1, 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.3.3.10-2.

Table 6.5F.3.3.10-2: Shared spectrum channel access ACLR requirement

|  |  |  |
| --- | --- | --- |
|  | ACLR1 | ACLR2 |
| Spectrum emission limit (dB) | 25 | 40 |

##### 6.5F.3.3.9 Requirements for network signalling value “NS\_64”

When "NS\_64" is indicated in the cell, the power of any UE emission for channels assigned within 5945-6425 MHz shall not exceed the levels specified in Table 6.5F.3.3.9-1. These requirements also apply for frequency ranges that are less than FOOB (MHz) in Table 6.5.3.1-1 from the edge of the channel bandwidth.

Table 6.5F.3.3.9-1: Additional requirements

|  |  |  |
| --- | --- | --- |
| Frequency band  (MHz) | Channel bandwidth /  Spectrum emission limit  (dBm) | Measurement bandwidth |
| 87.5 ≤ f ≤ 118 | -54 | 100 kHz |
| 174 ≤ f ≤ 230 | -54 | 100 kHz |
| 470 ≤ f ≤ 694 | -54 | 100 kHz |
| f ≤ 5935 | -45 | 1 MHz |

### 6.5F.4 Transmit intermodulation

The requirements for transmit intermodulation in clause 6.5F.4 apply.

## 6.5G Output RF spectrum emissions for Tx Diversity

### 6.5G.1 Occupied bandwidth for Tx Diversity

For UE supporting Tx diversity, the requirements for occupied bandwidth apply to the transmitted spectrum as measured as the sum of the power from all UE transmit antenna connectors. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

### 6.5G.2 Out of band emission for Tx Diversity

For UE supporting Tx diversity, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters apply to the sum of the emissions from all UE transmit antenna connectors.

If UE indicates IE *txDiversity-r16*, Adjacent Channel Leakage power Ratio (ACLR) is defined as the ratio of sum of the filtered mean power at each antenna connector centred on the assigned channel frequency to sum of the filtered mean power at each antenna connector centred on an adjacent channel frequency.

The requirements specified in clause 6.5.2 apply.

### 6.5G.3 Spurious emission for Tx Diversity

For UE supporting Tx diversity, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products apply to the sum of the emissions from all UE transmit antenna connectors.

The requirements specified in clause 6.5.3 apply.

### 6.5G.4 Transmit intermodulation for Tx Diversity

For UE supporting Tx diversity, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power from all UE transmit antenna connectors.

The requirements specified in clause 6.5.4 apply.

## 6.5H Output RF spectrum emissions for CA with UL MIMO

### 6.5H.1 Output RF spectrum emissions for intra-band UL contiguous CA with UL MIMO

#### 6.5H.1.1 Occupied bandwidth for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for occupied bandwidth specified in clause 6.5A.1.1a apply to the sum of the powers from both UE transmit antenna connectors and all UL CCs. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.1.1.1a apply.

#### 6.5H.1.2 Out of band emission for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters is defined as the sum of the emissions from both UE transmit antenna connectors and all UL CCs, the requirements in subclasuse 6.5A.2.2.1, 6.5A.2.3.1 and 6.5A.2.4.1.1 apply. The requirements shall be met with UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.2.2.1, 6.5A.2.3.1 and 6.5A.2.4.1.1 apply.

#### 6.5H.1.3 Spurious emission for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the requirements for Spurious emissions is defined as the sum of the emissions from both UE transmit antenna connectors and all UL CCs, the requirements specified in subclasuse 6.5A.3.1, 6.5A.3.2.1 and 6.5A.3.3.1 apply. The requirements shall be met with the UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.3.1, 6.5A.3.2.1 and 6.5A.3.3.1 apply.

#### 6.5H.1.4 Transmit intermodulation for intra-band UL contiguous CA with UL MIMO

For UE supporting intra-band UL contiguous CA and UL MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output powers from both UE transmit antenna connectors, the requirements specified in clause 6.5A.4.2.1 apply. The requirements shall be met with the UL MIMO configurations described in clause 6.2H.1.1.

If UE is scheduled for single antenna-port PUSCH transmission by DCI format 0\_0 or by DCI format 0\_1 for single antenna port codebook based transmission with precoding matrix *W*=1 [6.3.1.5 TS 38.211], the requirements in clause 6.5A.4.2.1 apply.

## 6.6 Void

## 6.6E Time alignment error

For V2X UE(s) with two transmit antenna connectors in SL MIMO, this requirement applies to slot timing differences between transmissions on two transmit antenna connectors.The Time Alignment Error (TAE) shall not exceed 260 ns.