**3GPP TSG-RAN WG4 Meeting # 112 *R4-2411829***

**Maastricht, Netherlands, August 19 – 23, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **2398** | **rev** | **-** | **Current version:** | **17.14.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | (NR\_6GHz\_unlic\_EU-Core) CR for TS 38.101-1 on UE transmitter power for the Pcmax tolerance for NR unlicensed operation (R17) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation, Sanechips | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_6GHz\_unlic\_EU-Core | | | | |  | ***Date:*** | | | 2024-07-25 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In the current spec, the Pcmax lower tolerance in some cases has been corrected due to the rule of the tolerance changes in a monotonic way with the variation of output power. The rule have already been applied to single carrier, intra-band CA, inter-band CA, inter-band NR-DC, UL-MIMO and etc. However, for the Pcmax tolerance requirements for shared spectrum channel access with UL-MIMO, the value of TLOW(PCMAX\_L,*c*) in the case of 17 ≤ PCMAX,c < 18 does not comply with the above mentioned rule. The requirements for TLOW(PCMAX\_L,*c*) in the case of 13 ≤ PCMAX,*c* < 17 are smaller than the case of 17 ≤ PCMAX,c < 18 which should be corrected in a monotonic way. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Correct the TLOW(PCMAX\_L,*c*) value from 6.0 dB to 5.0 dB in the case of 17 ≤ PCMAX,c < 18. 2. Add missing NR band n102 in Table 6.2F.3.1-1 for A-MPR. 3. Other editiorial corrections. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The requirements for UE transmitter power for the Pcmax tolerance for NR unlicensed operation will be incorrect. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2F.1, 6.2F.2, 6.2F.3.1, 6.2F.4D | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS/TR ... CR ... 38.521-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### *<< Start of changes >>*

## 6.2F Transmitter power for shared spectrum channel access

### 6.2F.1 UE maximum output power

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

Table 6.2F.1-1: UE Power Class

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR  band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) |
| n46 |  |  |  |  |  |  | 20 | +2/-3 |
| n96 |  |  |  |  |  |  | 20 | +2/-3 |
| n102 |  |  |  |  |  |  | 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 | 5925 – 7125 | -1 |
|  | NS\_54 | 20, 40, 60, 80 | 5925 – 6425 | 17 |
|  | 6525 – 6875 |  |
|  | NS\_59 | 20, 40, 60, 80 | 5925 – 7125 | 5 |
|  | NS\_60 | 20, 40, 60, 80 | 5925 – 7125 | 2 |
|  | NS\_61 | 20, 40, 60, 80 | 5925 – 6425 | 1 |
| n102 | NS\_58 | 20, 40, 60, 80 | 5945 – 6425 | 10 |

### 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 |  |  |  |  |  |  | 20 | +2/-3 |
| n96 |  |  |  |  |  |  | 20 | +2/-3 |
| n102 |  |  |  |  |  |  | 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.

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. The MPR applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10].  NOTE 2: 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 configuration A in Table 6.2F.2-2.  NOTE 3: Partial RB allocation MPR applies when one or more RB’s in one or more sub-bands are not allocated or when the transmitted sub-bands for wideband operation are transmitted according to configuration B in 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 configuration B in Table 6.2F.2-2. | | | | |

Table 6.2F.2-2 MPR mapping for wideband operation

|  |  |  |
| --- | --- | --- |
| Wideband operation channel bandwidth (MHz) | Sub-band configuration | |
|  | A | B |
| 40 | 11 | 10, 01 |
| 60 | 111, 011, 110, 001, 010, 100 | None |
| 80 | 1111, 0111, 1110, 0110, 0001, 1000 | 1100, 0011, 0100, 0010 |
| 100 | 11111, 01111, 11110, 01110, 00100, 00110, 01100, 01000, 00010, 10000, 00001 | 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. | | |

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.

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. The MPR applies to interlaced allocations with uplink resource allocation type 2 as specified in TS 38.214 [10].  NOTE 2: 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 configuration A in Table 6.2F.2A.2-2.  NOTE 3: Partial RB allocation MPR applies when one or more RB’s in one or more sub-bands are not allocated and sub-bands are transmitted according to configuration A in 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 configuration B in Table 6.2F.2A.2-2. | | | | |

Table 6.2F.2A.2-2 MPR mapping for intra-band CA wideband operation

|  |  |  |
| --- | --- | --- |
| Wideband operation channel bandwidth (MHz) | Sub-band configuration  [CC1-CC2] | |
| A | B |
| 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. 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 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. The NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.

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, n102 | 20, 40, 60, 80 |  | N/A |
| NS\_28 | 6.5F.3.3.1, 6.2F.1 | n46 | 20, 40, 60, 80 |  | 6.2F.3.2 |
| NS\_29 | 6.5F.3.3.2, 6.2F.1 | n46 | 20, 40, 60, 80 |  | 6.2F.3.3 |
| NS\_30 | 6.5F.3.3.3, 6.2F.1 | n46 | 20, 40, 60, 80 |  | 6.2F.3.4 |
| NS\_31 | 6.5F.3.3.4, 6.2F.1 | n46 | 20, 40, 60, 80 |  | 6.2F.3.5 |
| NS\_53 | 6.5F.3.3.5, 6.2F.1 | n96 | 20, 40, 60, 80 |  | 6.2F.3.6 |
| NS\_54 | 6.5F.3.3.5, 6.2F.1 | n96 | 20, 40, 60, 80 |  | 6.2F.3.7 |
| NS\_58 | 6.5F.3.3.6, 6.2F.1 | n102 | 20, 40, 60, 80 |  | 6.2F.3.8 |
| NS\_59 | 6.2F.1 | n96 | 20, 40, 60, 80 |  | 6.2F.3.9 |
| NS\_60 | 6.5F.3.3.5, 6.2F.1 | n96 | 20, 40, 60, 80 |  | 6.2F.3.10 |
| NS\_61 | 6.5F.3.3.7, 6.2F.1 | n96 | 20, 40, 60, 80 |  | 6.2F.3.11 |
| NOTE 1: The A-MPR shall apply to all active 20 MHz sub-bands contiguously allocated in the channel. | | | | | |

Table 6.2F.3.1-1A: Mapping of network signalling 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 |  |  |  |
| n96 | NS\_01 | NS\_53 | NS\_54 | NS\_59 | NS\_60 | NS\_61 |  |  |
| n102 | NS\_01 | NS\_58 |  |  |  |  |  |  |
| NOTE: *additionalSpectrumEmission* corresponds to an information element of the same name defined in clause 6.3.2 of TS 38.331 [7]. | | | | | | | | |

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

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 | QPSK | ≤ 4.0 | ≤ 6.0 | See Table 6.2F.2-1 |
|  | 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. | | | | |

### *<<Unchanged texts are omitted>>*

### 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 | 5.0 | 4.0 |
| 13 ≤ PCMAX,*c* < 17 | 5.0 | |
| 8 ≤ PCMAX,*c* < 13 | 6.0 | |
| -40 ≤ PCMAX,*c* < 8 | 7.0 | |

### *<< End of changes >>*