**3GPP TSG-RAN WG4 Meeting #102-e *Rev of R4-2205889***

**Electronic Meeting, Feb. 21st – March 3rd, 2021**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **TS38.101-2** | **CR** | **0441** | **rev** | **1** | **Current version:** | **17.4.0** |  |
|  |
| *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:***  | CR to introduce UE RF requirement for FR2 Power Class 6 |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR2-Core |  | ***Date:*** | 2022-02-10 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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 canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | In Rel-17 work item of NR support for high speed train scenario in FR2, FR2 power class 6 UE, which is corresponding to high speed train roof-mounted UE, has been introduced. The corresponding UE RF requirement needs to be specified. |
|  |  |
| ***Summary of change:*** | Based on the endorsed dCR (R4-2202273), the following UE RF requirement for FR2 power class 6 UE are introduced: (1) Power class 6 definition based on the assumption of certain UE type being “High Speed Train Roof-Mounted UE”. (2) Power class 6 UE maximum output power for non-CA case.(3) MPR and A-MPR for power class 6 UE for non-CA case.(4) Beam correspondence requirement: Based on endorsed draftCR (R4-2118223). Updates are provided for clause numbering and power class numbering. Furthermore, similar editorial changes are provided as the revision to PC3 and PC5’s counterpart. (5) Reference sensitivity power level for power class 6 for non-CA case.The following requirement is introduced: (1) Miminum output power requirement for power class 6 UE: the same requirement as PC5. (2) Carrier leakage requirement for power class 6 UE: the same requirement as PC5.(3) In-band emission requirement for power class 6 UE: the same requirement as PC5.(4) RX EIS spherical coverage requirement. (5) UL MIMO requiement for power class 6.Furthermore, the following changes are introduced based on agreement in RAN4#102-e:(1) Tx spherical coverage requirement for single antenna TX and UL-MIMO is specified based on the agreement “For EIRP drop (i.e., x dB lower than min. Peak EIRP requirement), agree 10dB.”(2) Spherical coverage region table with the agreed region for PC6. (3) EIS spherical coverage requirement for PC6 is specified based on the same 10dB performance drop from peak EIS requriement. (4) Side condition for beam correspondence requirement for PC6 is provided based on the EIS spherical coverage requirement. (5) New note is added for TX and RX spherical coverage requirement according to agreement in RAN4#101-bis-e, i.e. “Agreement: network signaling is provided to configure UE to follow enhanced RRM requirement Set 2.”Besides, the following editorial changes are further introduced: 1. Reference [8] for regulatory requirements is added in clause 6.2.1.6.
2. Typo in the section title of 7.3.2.6 is corrected.
3. ΔMBS should be ΔMBS,n in the BC requirement side condition.
4. Band number in spherical coverage Table 6.2.1.6-3 is corrected.
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|  |  |
| ***Consequences if not approved:*** | UE RF requirement for FR2 power class 6 UE is not specified. |
|  |  |
| ***Clauses affected:*** | 6.2, 6.3.1.3, 6.4.2.2, 6.4.2.3, 6.6, 7.3.2, 7.3.4, 6.2D.1, 6.2D.2, 6.2D.3, 6.3D.1.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-2 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**<<< Start of Change-1 >>>**

## 6.2 Transmitter power

### 6.2.1 UE maximum output power

#### 6.2.1.0 General

NOTE: Power classes are specified based on the assumption of certain UE types with specific device architectures. The UE types can be found in Table 6.2.1.0-1.

Table 6.2.1.0-1: Assumption of UE Types

|  |  |
| --- | --- |
| UE Power class | UE type |
| 1 | Fixed wireless access (FWA) UE |
| 2 | Vehicular UE |
| 3 | Handheld UE |
| 4 | High power non-handheld UE |
| 5 | Fixed wireless access (FWA) UE |
| 6 | High Speed Train Roof-Mounted UE |

Power class 3 is default power class.

**<<< End of Change-1 >>>**

**<<< Start of Change-2 >>>**

#### 6.2.1.6 UE maximum output power for power class 6

The following requirements define the maximum output power radiated by the UE for any transmission bandwidth within the channel bandwidth for non-CA configuration, unless otherwise stated. The period of measurement shall be at least one sub frame (1ms). The minimum output power values for EIRP are found in Table 6.2.1.6-1. The requirement is verified with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2.1.6-1: UE minimum peak EIRP for power class 6

|  |  |
| --- | --- |
| Operating band | Min peak EIRP (dBm) |
| n257 | 30 |
| n258 | 30.4 |
| n261 | 30 |
| NOTE 1: Minimum peak EIRP is defined as the lower limit without tolerance |

The maximum output power values for TRP and EIRP are found in Table 6.2.1.6-2 below. The maximum allowed EIRP is derived from regulatory requirements [8]. The requirements are verified with the test metrics of TRP (Link=TX beam peak direction, Meas=TRP grid) in beam locked mode and EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2.1.6-2: UE maximum output power limits for power class 6

|  |  |  |
| --- | --- | --- |
| Operating band | Max TRP (dBm) | Max EIRP (dBm) |
| n257 | 23 | 43 |
| n258 | 23 | 43 |
| n261 | 23 | 43 |

The minimum EIRP measured over the spherical coverage evaluation areas specified below is defined as the spherical coverage requirement and is found in Table 6.2.1.6-3 below. UE spherical coverage evaluation areas are found in Table 6.2.1.6-3a below, by consisting of Area-1 and Area-2, in the reference coordinate system in Annex J.1. The requirement is verified with the test metric of EIRP (Link= Spherical coverage grid, Meas=Link angle).

Table 6.2.1.6-3: UE spherical coverage for power class 6

|  |  |
| --- | --- |
| Operating band | Min EIRP over UE spherical coverage evaluation areas (dBm) |
| n257 | 20 |
| n258 | 20.4 |
| n261 | 20 |
| NOTE 1:   Minimum EIRP over UE spherical coverage evaluation areas is defined as the lower limit without toleranceNOTE 2:   The requirements in this table are verified only under normal temperature conditions as defined in Annex E.2.1.NOTE 3: The requirements in this table are verified for FR2 PC6 UE with the network signalling *[highSpeedMeasFlag-r17]* is configured to *[set1]*. |

Table 6.2.1.6-3a: UE spherical coverage evaluation areas for power class 6

|  |  |  |
| --- | --- | --- |
|  | θ range (degree) | ϕ range (degree) |
| Area-1 | 90 to 60 | - 37.5 to + 37.5 |
| Area-2 | 90 to 60 | 142.5to 217.5 |
| NOTE 1: When testing power class 6 UEs, DUT orientation can be determined according to the UE spherical coverage evaluation areas, not necessarily following default alignment in Figure J.1-2 or positioning guidelines in clause J.3.NOTE 2: High speed train deployment is expected to be w.r.t. the reference coordination system: θ = 90 (degree) corresponds to the ground plane the train is running on, and ϕ= 0 or 180 with θ = 90 are the train track directions. |

For the UEs that support multiple FR2 bands, minimum requirement for peak EIRP and EIRP spherical coverage in Tables 6.2.1.6-1 and 6.2.1.6-3 shall be decreased per band, respectively, by the peak EIRP relaxation parameter MBP,n and EIRP spherical coverage relaxation parameter MBS,n, as defined in Table 6.2.1.6-4..

Table 6.2.1.6-4: UE multi-band relaxation factors for power class 6

|  |  |  |
| --- | --- | --- |
| **Band** | **MBP,n (dB)** | **MBS,n (dB)** |
| n257 | 0.7 | 0.7 |
| n258 | 0.7 | 0.7 |
| n261 | 0.7 | 0.7 |

**<<< End of Change-2 >>>**

**<<< Start of Change-3 >>>**

#### 6.2.2.6 UE maximum output power reduction for power class 6

For power class 6, MPR specified in sub-clause 6.2.2.3 applies.

**<<< End of Change-3 >>>**

**<<< Start of Change-4 >>>**

##### 6.2.3.3.6 A-MPR for NS\_202 for power class 6

For power class 6, A-MPR for NS\_202 specified in clause 6.2.3.3.3 applies.

**<<< End of Change-4 >>>**

**<<< Start of Change-5 >>>**

##### 6.2.3.4.6 A-MPR for NS\_203 for power class 6

For power class 6, AMPR for NS\_203 specified in subclause 6.2.3.4.3 applies.

**<<< End of Change-5 >>>**

**<<< Start of Change-6 >>>**

#### 6.3.1.3 Minimum output power for power class 5 and 6

The minimum output power shall not exceed the values specified in Table 6.3.1.3-1 for each operating band supported. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.3.1.3-1: Minimum output power for power class 5 and 6

|  |  |  |  |
| --- | --- | --- | --- |
| Operating band | Channel bandwidth(MHz) | Minimum output power(dBm) | Measurement bandwidth(MHz) |
| n257, n258, n259, n261 | 50 | -6 | 47.52 |
| 100 | -6 | 95.04 |
| 200 | -6 | 190.08 |
| 400 | -6 | 380.16 |

**<<< End of Change-6 >>>**

**<<< Start of Change-7 >>>**

##### 6.4.2.2.7 Carrier leakage for power class 6

When carrier leakage is contained inside the spectrum occupied by the configured UL CCs and DL CCs, the relative carrier leakage power shall not exceed the values specified in Table 6.4.2.2.7-1 for power class 7.

Table 6.4.2.2.6-1: Minimum requirements for relative carrier leakage power for power class 6

|  |  |
| --- | --- |
| Parameters | Relative Limit (dBc) |
| EIRP > 7 dBm | -25 |
| -6 dBm ≤ EIRP ≤ 7 dBm | -20 |

**<<< End of Change-7 >>>**

**<<< Start of Change-8 >>>**

##### 6.4.2.3.7 In-band emissions for power class 6

The average of the in-band emission measurement over 10 sub-frames shall not exceed the values specified in Table 6.4.2.3.7-1 for power class 7 UEs.

Table 6.4.2.3.7-1: Requirements for in-band emissions for power class 6

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter description | Unit | Limit (NOTE 1) | Applicable Frequencies |
| General | dB |  | Any non-allocated (NOTE 2) |
| IQ Image | dB | -25 | Output power > 17 dBm | Image frequencies (NOTES 2, 3) |
| -20 | Output power ≤ 17 dBm |
| Carrier leakage | dBc | -25 | Output power > 7 dBm  | Carrier frequency (NOTES 4, 5) |
| -20 | -6 dBm ≤ Output power ≤ 7 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 (- 25 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 PSDNOTE 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 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 in the RBs containing the DC 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 s the limit for the modulation format used in the allocated RBs.NOTE 9: RB 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: All powers are EIRP in beam peak direction. |

**<<< End of Change-8 >>>**

**<<< Start of Change-9 >>>**

### 6.6.7 Beam correspondence for power class 6

#### 6.6.7.1 General

The beam correspondence requirement for power class 6 UEs consists of two components: UE minimum peak EIRP (as defined in Clause 6.2.1.6), and UE spherical coverage (as defined in Clause 6.2.1.6).

Power class 6 UE shall mandatorily support *beamCorrespondenceWithoutUL-BeamSweeping* and *beamCorrespondenceSSB-based-r16.* The UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.6-1 and spherical coverage requirement according to Table 6.2.1.6-3 using the side conditions for SSB based enhanced beam correspondence requirements as defined in Clause 6.6.7.3.2.

If the UE also support *beamCorrespondenceCSI-RS-based-r16,* the UE shall also meet the minimum peak EIRP requirement according to Table 6.2.1.6-1 and spherical coverage requirement according to Table 6.2.1.6-3 using the side conditions for CSI-RS based enhanced beam correspondence requirements as defined in Clause 6.6.7.3.3.

#### 6.6.7.2 (Void)

*Editor’s note: Not need to define beam correspondence tolerance requirement because power class 6 UE shall mandatorily support beamCorrespondenceWithoutUL-BeamSweeping.*

#### 6.6.7.3 Side Conditions

##### 6.6.7.3.1 (Void)

*Editor’s note: Not need to define the side condition for beam correspondence based on SSB and CSI-RS, because power class 6 UE shall mandatorily support SSB based enhanced beam correspondence.*

##### 6.6.7.3.2 Side Condition for SSB based enhanced Beam Correspondence requirements

The beam correspondence requirements for beam correspondence based on SSB are only applied under the following side conditions:

- The downlink reference signal SSB is provided and CSI-RS is not provided.

- For beam correspondence, conditions for L1-RSRP measurements are fulfilled according to Table 6.6.7.3.2-1.

Table 6.6.7.3.2-1: Conditions for SSB based L1-RSRP measurements for beam correspondence

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2 | SSB Ês/Iot |
|  |  | dBm / SCSSSB | dB |
|  |  | SCSSSB = 120 kHz |  |
| All angles **Note 1** | n257 | -101.4 | ≥6 |
|  | n258 | -101.6 |  |
|  | n261 | -101.4 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum SSB\_RP values for all angles are increased by ΔMBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.6.NOTE 2: Values specified at the radiated requirements reference point to give minimum SSB Ês/Iot, with no applied noise. |

##### 6.6.7.3.3 Side Condition for CSI-RS based enhanced Beam Correspondence requirements

The beam correspondence requirements for beam correspondence based on CSI-RS are only applied under the following side conditions:

- The downlink reference signals including both SSB and CSI-RS are provided.

- The reference measurement channel for beam correspondence are fulfilled according to the CSI-RS configuration in Annex A.3.

- For beam correspondence, conditions for L1-RSRP measurements are fulfilled according to Table 6.6.7.3.3-2 and SSB signal is provided according to Table 6.6.7.3.3-1.

Table 6.6.7.3.3-1: SSB signal conditions for CSI-RS based beam correspondence requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum SSB\_RP Note 2 | SSB Ês/Iot |
|  |  | dBm / SCSSSB | dB |
|  |  | SCSSSB = 120 kHz |  |
| All angles **Note 1** | n257 | -106.4 | ≥1 |
|  | n258 | -106.6 |  |
|  | n261 | -106.4 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum SSB\_RP values for all angles are increased by ΔMBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.6NOTE 2: Values specified at the radiated requirements reference point to give minimum SSB Ês/Iot, with no applied noise. |

Table 6.6.7.3.3-2: Conditions for CSI-RS based L1-RSRP measurements for beam correspondence

|  |  |  |  |
| --- | --- | --- | --- |
| Angle of arrival | NR operating bands | Minimum CSI-RS\_RP Note 2 | CSI-RS Ês/Iot |
|  |  | dBm / SCSCSI-RS | dB |
|  |  | SCSCSI-RS = 120 kHz |  |
| All angles **Note 1** | n257 | -101.4 | ≥6 |
|  | n258 | -101.6 |  |
|  | n261 | -101.4 |  |
| NOTE 1: For UEs that support multiple FR2 bands, the Minimum CSI-RS\_RP values are increased by ΔMBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1.6NOTE 2: Values specified at the radiated requirements reference point to give minimum CSI-RS Ês/Iot, with no applied noise. |

#### 6.6.7.4 Applicability

For UEs supporting more than one type of beam correspondence, the following applicability rules apply:

- If a UE meets enhanced beam correspondence requirements either based on SSB or based on CSI-RS, it is considered to have met the beam correspondence requirements based on SSB and CSI-RS.

- For a UE supporting either SSB based or CSI-RS based enhanced beam correspondence, the UE shall meet the supported enhanced beam correspondence requirements.

- For a UE supporting both SSB based and CSI-RS based enhanced beam correspondence UE shall meet the both SSB based and CSI-RS based enhanced beam correspondence requirements and the following applicability rules for verifying the requirements apply:

- The enhanced beam correspondence requirements shall be verified with the SSB based enhanced beam correspondence side conditions in clause 6.6.7.3.2. If the UE meets the SSB based enhanced beam correspondence requirements using the side conditions in clause 6.6.7.3.2 and meets the minimum peak EIRP requirement as defined in clause 6.2.1.6 using the CSI-RS based side conditions in clause 6.6.7.3.3, where the link direction is determined in the SSB based enhanced beam correspondence test, the UE is considered to have met both the SSB based and CSI-RS based enhanced beam correspondence requirements.

- Otherwise, if UE does not meet the minimum peak EIRP requirement as defined in clause 6.2.1.6 using the CSI-RS based side conditions in clause 6.6.7.3.3, the enhanced beam correspondence requirements shall be further verified for the UE with the CSI-RS based enhanced beam correspondence side conditions in clause 6.6.7.3.3.

**<<< End of Change-9 >>>**

**<<< Start of Change-10 >>>**

#### 7.3.2.6 Reference sensitivity power level for power class 6

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.3.2 and A.3.3.2 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1) with peak reference sensitivity specified in Table 7.3.2.6-1. The requirement is verified with the test metric of EIS (Link=RX beam peak direction, Meas=Link Angle).

Table 7.3.2.6-1: Reference sensitivity for power class 6

|  |  |
| --- | --- |
| Operating band | REFSENS (dBm) / Channel bandwidth |
| 50 MHz | 100 MHz | 200 MHz | 400 MHz |
| n257 | -92.6 | -89.6 | -86.6 | -83.6 |
| n258 | -92.8 | -89.8 | -86.8 | -83.8 |
| n261 | -92.6 | -89.6 | -86.6 | -83.6 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4 |

The REFSENS requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.1-2.

Unless given by Table 7.3.2.1-3, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3-1) configured.

**<<< End of Change-10 >>>**

**<<< Start of Change-11 >>>**

7.3.4.6 EIS spherical coverage for power class 6

The reference measurement channels and throughput criterion shall be as specified in clause 7.3.2.6

The maximum EIS measured over the spherical coverage evaluation areas is defined as the spherical coverage requirement and is found in Table 7.3.4.6-1 below. UE spherical coverage evaluation areas are found in Table 6.2.1.6-3a in clause 6.2.1.6, by consisting of Area-1 and Area-2, in the reference coordinate system in Annex J.1. The requirement is verified with the test metric of EIS (Link=Spherical coverage grid, Meas=Link angle).

Table 7.3.4.6-1: EIS spherical coverage for power class 6

|  |  |
| --- | --- |
| **Operating band** | **Max EIS over UE spherical coverage evaluation areas (dBm) / Channel bandwidth** |
| **50 MHz** | **100 MHz** | **200 MHz** | **400 MHz** |
| n257 | -82.6 | -79.6 | -76.6 | -73.6 |
| n258 | -82.8 | -79.8 | -76.8 | -73.8 |
| n261 | -82.6 | -79.6 | -76.6 | -73.6 |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2.4NOTE 2: The EIS spherical coverage requirements are verified only under normal thermal conditions as defined in Annex E.2.1.NOTE 3: The requirements in this table are verified for FR2 PC6 UE with the network signalling *[highSpeedMeasFlag-r17]* is configured to *[set1]*. |

The requirement shall be met for an uplink transmission using QPSK DFT-s-OFDM waveforms and for uplink transmission bandwidth less than or equal to that specified in Table 7.3.2.1-2.

Unless given by Table 7.3.2.1-3, the minimum requirements for reference sensitivity shall be verified with the network signalling value NS\_200 (Table 6.2.3-1) configured.

**<<< End of Change-11 >>>**

**<<< Start of Change-12 >>>**

#### 6.2D.1.6 UE maximum output power for UL MIMO for power class 6

The following requirements define the maximum output power radiated by the PC6 UE. Requirements apply to UEs configured for 2-layer transmission as well as UEs configured for single layer uplink full power transmission (ULFPTx), with configuration per clause 6.2D.1.0.

The minimum peak EIRP requirements are found in Table 6.2D.1.6-1 below. The period of measurement shall be at least one sub frame (1ms). The requirement is verified with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2D.1.6-1: UE minimum peak EIRP for UL MIMO for power class 6

|  |  |
| --- | --- |
| Operating band | Min peak EIRP (dBm) |
| n257 | 30 |
| n258 | 30.4 |
| n261 | 30 |
| NOTE 1: Minimum peak EIRP is defined as the lower limit without tolerance |

The maximum output power values for TRP and EIRP are found in Table 6.2D.1.5-2 below for UE with UL MIMO. The maximum allowed EIRP is derived from regulatory requirements [8]. The requirements are verified with the test metrics of TRP (Link=TX beam peak direction, Meas=TRP grid) in beam locked mode and EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2D.1.6-2: UE maximum output power limits for UL MIMO for power class 6

|  |  |  |
| --- | --- | --- |
| Operating band | Max TRP (dBm) | Max EIRP (dBm) |
| n257 | 23 | 43 |
| n258 | 23 | 43 |
| n261 | 23 | 43 |

The minimum EIRP measured over the spherical coverage evaluation areas is defined as the spherical coverage requirement and is found in Table 6.2D.1.6-3 below. UE spherical coverage evaluation areas are found in Table 6.2.1.6-3a in clause 6.2.1.6, by consisting of Area-1 and Area-2, in the reference coordinate system in Annex J.1. The requirement is verified with the test metric of EIRP (Link= Spherical coverage grid, Meas=Link angle).

Table 6.2D.1.6-3: UE spherical coverage for UL MIMO for power class 6

|  |  |
| --- | --- |
| Operating band | Min EIRP over UE spherical coverage evaluation areas (dBm) |
| n257 | 20 |
| n258 | 20.4 |
| n261 | 20 |
| NOTE 1:   Minimum EIRP over UE spherical coverage evaluation areas is defined as the lower limit without toleranceNOTE 2:   The requirements in this table are verified only under normal temperature conditions as defined in Annex E.2.1.NOTE 3: The requirements in this table are verified for FR2 PC6 UE with the network signalling *[highSpeedMeasFlag-r17]* is configured to *[set1]*. |

**<<< End of Change-12 >>>**

**<<< Start of Change-13 >>>**

#### 6.2D.2.6 UE maximum output power reduction for modulation / channel bandwidth for UL MIMO for power class 6

For UEs configured for 2-layer transmission as well as UEs configured for single layer uplink full power transmission (ULFPTx), the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2D.1.6-1 is specified in sub-clause 6.2.2.6. The requirements shall be met with configurations specified in sub-clause 6.2D.1.0.

For the UE maximum output power modified by MPR, the power limits specified in clause 6.2D.6 apply.

**<<< End of Change-13 >>>**

**<<< Start of Change-14 >>>**

#### 6.2D.3.6 UE maximum output power reduction with additional requirements for UL MIMO for power class 6

For UEs configured for 2-layer transmission as well as UEs configured for single layer uplink full power transmission (ULFPTx), the A-MPR values specified in clause 6.2.3 shall apply to the maximum output power specified in Table 6.2D.1.6-1. The requirements shall be met with the configurations specified in clause 6.2D.1.0.

**<<< End of Change-14 >>>**

**<<< Start of Change-15 >>>**

#### 6.3D.1.3 Minimum output power for UL MIMO for power class 5 and 6

For UE supporting UL MIMO, the minimum controlled output power is defined as the EIRP, i.e. the sum of the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the UE power is set to a minimum value. The minimum output power shall not exceed the values specified in Table 6.3.1.3-1. The minimum power is verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

**<<< End of Change-15 >>>**