**3GPP TSG-RAN4 Meeting #116 *R4-2510051***

**Bengaluru, India, 25th Aug 2025 - 29th Aug 2025**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **2940** | **rev** | **-** | **Current version:** | **18.10.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | (NR\_ENDC\_RF\_FR1\_enh2-Core)Correction CR for TS 38.101-1 for 4Tx\_Rel-18 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung, Huawei | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_ENDC\_RF\_FR1\_enh2-Core | | | | |  | ***Date:*** | | | 2025-08-15 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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:*** | | * 2 changes are adding missing requirements * 2 changes are spec improvement (which can also make Rel-19 spec more harmonized with 3 Tx MIMO introduced). These 2 improvement are enlightened by the endorsed 3Tx MIMO dCR(R4-2508115) | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Adding missing Note for UL MIMO TPMI index 2. Adding missing requirements for EVM equalizer spectrum flatness for Tx Diversity 3. Two changes for spec improvement | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There are requirements missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.2D.1, 6.2D.4, 6.4G.2.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **×** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **×** |  | Test specifications | | | | TS/TR ... CR ... TS 38.521 | | |
| ***(show related CRs)*** | |  | **×** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<<< START OF CHANGE >>

6.2D.1 UE maximum output power for UL MIMO

For UE with two or four 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 all 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=*. or 4-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 6.2D.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 5 (dBm)** | **Tolerance (dB)** |
| n1 |  |  | 26 | +2/-31 | 23 | +2/-3 |  |  |
| n2 |  |  |  |  | 23 | +2/-31 |  |  |
| n3 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n5 |  |  |  |  | 23 | +2/-31 |  |  |
| n7 |  |  |  |  | 23 | +2/-31 |  |  |
| n8 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n13 |  |  |  |  | 23 | +2/-3 |  |  |
| n24 |  |  |  |  | 23 | +2/-41 |  |  |
| n25 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| n26 |  |  |  |  | 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 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n70 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n71 |  |  | 26 | +2/-3 | 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 |  |  |
| n81 |  |  |  |  | 23 | +2/-31 |  |  |
| n83 |  |  |  |  | 23 | +2/-31 |  |  |
| n84 |  |  | 26 | +2/-31 | 23 | +2/-3 |  |  |
| n85 |  |  |  |  | 23 | +2/-31 |  |  |
| n86 |  |  | 26 | +2/-31 | 23 | +2/-31 |  |  |
| 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 |  |  |
| n104 |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| n105 |  |  |  |  | 23 | +2/-3 |  |  |
| 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 state. | | | | | | | | |

**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 | 01 |
| Codebook based uplink | DCI format 0\_1 | 4 | 02 |
| NOTE 1: The UE is configured with one SRS resource with the parameter *nrofSRS-Ports* set to 2.  NOTE 2: The UE is configured with one SRS resource with the parameter *nrofSRS-Ports* set to 4. | | | |

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 all 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 NOTE1 | 2 |
|  |  |  |  |  | 4 NOTE4 | 13 |
|  |  |  | CP-OFDM NOTE3 | 2 | 4 | 6 |
| Mode-2 | Codebook based uplink | DCI format 0\_1 | DFT-s-OFDM, CP-OFDM | 1 | 2 NOTE1 | 0 or 1NOTE2 |
|  |  |  |  |  | 4 NOTE4 | 4, 5, 6 ,7 or 4, 5, 6 ,7, 8, 9, 10, 11NOTE2 |
|  |  |  | CP-OFDM | 2 | 4 | 1 or 0, 1, 2, 3, 4 ,5NOTE2 |
| Mode-full power | Codebook based uplink | DCI format 0\_1 | DFT-s-OFDM, CP-OFDM | 1 | 2 NOTE1 | 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 or 4-layer UL MIMO according to Table 6.2D.1-2 has been verified.  NOTE 4: The UE is configured with one SRS resource with the parameter *nrofSRS-Ports* set to 4. | | | | | | |

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 Tx diversity capability, the requirements in clause 6.2G for the power class indicated by the *ue-PowerClass*.

A UE with 2Tx 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].

<<< NEXT CHANGES >>>

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 , ΔPPowerBoost 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. For UE with four transmit antenna connectors in closed-loop spatial multiplexing scheme, the tolerance is specified in Table 6.2D.4-2. 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 for 2Tx**

|  |  |  |
| --- | --- | --- |
| **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 | 5.0 | 4.0 |
| 16 ≤ PCMAX,*c* < 20 | 5.0 | |
| 11 ≤ PCMAX,*c* < 16 | 6.0 | |
| -40 ≤ PCMAX,*c* < 11 | 7.0 | |

**Table 6.2D.4-2: PCMAX,*c* tolerance in closed-loop spatial multiplexing scheme for 4Tx**

|  |  |  |
| --- | --- | --- |
| **PCMAX,*c*(dBm)** | **Tolerance TLOW(PCMAX\_L,*c*) (dB)** | **Tolerance THIGH(PCMAX\_H,*c*) (dB)** |
| 24.5 ≤ PCMAX,*c* ≤ 29 | 3.0 | 2.0 |
| 23.5 ≤ PCMAX,*c* < 24.5 | 5.0 | 2.0 |
| 22.5 ≤ PCMAX,*c* < 23.5 | 5.0 | 3.0 |
| 21.5 ≤ PCMAX,*c* < 22.5 | 5.0 | 4.0 |
| 18 ≤ PCMAX,*c* < 21.5 | 5.0 | |
| 13 ≤ PCMAX,*c* < 18 | 6.0 | |
| -40 ≤ PCMAX,*c* < 13 | 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.

<<< NEXT CHANGES >>>

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

=2, 4

*ECn(f)* represents equalizer coefficient for each antenna connector, ，f is the allocated subcarriers within the transmission bandwidth ((|*F*|=12\*);

*Pn* denotes the linear power measured at the antenna connector n.

<<< END OF CHANGES >>>