**3GPP TSG-RAN WG4 Meeting #110R4-2400951**

**Athens, Greece, February 26 – March 1, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **2065** | **rev** | **-** | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *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:*** | TS 38.101-1 big CR for NR\_bands\_UL\_MIMO\_R18 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_bands\_UL\_MIMO\_R18-Core | | | | |  | ***Date:*** | | | 2024-3-4 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Based on the requests before this meeting:   1. To add missing PC2 configuration for NR band n8. 2. To add missing PC3 configuration for NR band n26. 3. To add missing PC3 and PC2 configurations for NR band n104. 4. To add missing PC3 configuration for NR band n105. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This big CR contains the following endorced documents:   1. R4-2400355, “Draft CR to TS38.101-1[R18] Adding n8 PC2 UL MIMO”, China Unicom, Huawei, HiSilicon 2. R4-2400953, “Draft CR for 38.101-1: add PC3 UL-MIMO configurations for n26”, Huawei, HiSilicon, Telstra 3. R4-2400954, “draft CR for TS 38.101-1 add PC3 and PC2 UL-MIMO configurations for n104”, Huawei, HiSilicon, CMCC, China Unicom, China Telecom 4. R4-2400955, “draft CR for TS 38.101-1 add PC3 UL-MIMO configurations for n105”, Huawei, HiSilicon, Spark | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The UL MIMO configurations cannot be supported for aforementioned NR bands accordingly. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2D, 6.2D.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.521-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**< Start of 1st change >**

## 5.2D Operating bands for UL MIMO

NR is designed to support UL MIMO where all of the operating bands are in FR1 defined in Table 5.2D-1.

Table 5.2D-1: NR operating bands for UL MIMO in FR1

|  |
| --- |
| NR operating band |
| n1 |
| n2 |
| n3 |
| n5 |
| n7 |
| n8 |
| n13 |
| n24 |
| n25 |
| n26 |
| n28 |
| n301 |
| n34 |
| n38 |
| n39 |
| n40 |
| n41 |
| n46 |
| n48 |
| n66 |
| n70 |
| n71 |
| n77 |
| n78 |
| n79 |
| n80 |
| n81 |
| n83 |
| n84 |
| n85 |
| n86 |
| n95 |
| n96 |
| n97 |
| n98 |
| n99 |
| n102 |
| n104 |
| n105 |
| NOTE 1: Uplink transmission is not allowed at this band for UE with external vehicle-mounted antennas.  NOTE 2: Void. |

**< unchanged text omitted >**

**< Start of 2nd change >**

## 6.2D Transmitter power for UL MIMO

### 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 4 (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 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 |
| 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 both UE antenna connectors. The period of measurement shall be at least one sub frame (1 ms).

**< unchanged text omitted >**