**3GPP TSG-RAN4 Meeting #100-e *R4-2112582***

**Online Meeting, Aug 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-2** | **CR** |  | **rev** | **-** | **Current version:** | **15.14.0** |  |
|  |
| *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:***  | CR to 38.101-2: P\_min requirements update |
|  |  |
| ***Source to WG:*** | Qualcomm Incorporated, Apple Inc. |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2021-08-05 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | The Pmin requirement is not consistent across use cases. See R4-2108819. Consistency can be achieved by scaling Pmin requirement with baseband BW |
|  |  |
| ***Summary of change:*** |  Change Pmin 1. D-suffix requirements: Pmin scales by BW \* number of layers
2. Editorial changes to move phrases repeated for every power class to the general section.

Extend clarifications to UE configurations made in agreed R4-2011920 to Pmin requirement also. Referenced CR only addressed peak EIRP and MPR requirements, but neglected to address Pmin:1. Agreed changes in R4-2011920 applied to Pmin section and Tx signal quality section.
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| ***Consequences if not approved:*** | Inconsistent requirements remain. |
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| ***Clauses affected:*** | 6.3D.1, 6.4D |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* Begin Change \*\*\*

## 6.3D Output power dynamics for UL MIMO

### 6.3D.0 General

The requirements in subclause 6.3D shall be met with configurations specified in sub-clause 6.2D.1.x, where ‘x’ depends on power class. Unless otherwise specified, the requirements shall be verified in beam locked mode with the test metric of EIRP (Link=TX beam peak direction, Meas=Link angle).

### 6.3D.1 Minimum output power for UL MIMO

6.3D.1.0 General

The minimum output power is defined as the mean power in at least one sub frame (1ms). The

#### 6.3D.1.1 Minimum output power for UL MIMO for power class 1

For UE supporting UL MIMO, the minimum output power shall not exceed the sum of the value specified in Table 6.3.1.1-1 and the quantity 10\*log10(Number of Layers).

#### 6.3D.1.2 Minimum output power for UL MIMO for power class 2, 3 and 4

For UE supporting UL MIMO, the minimum output power shall not exceed the sum of the value specified in Table 6.3.1.2-1 and the quantity 10\*log10(Number of Layers).

### 6.3D.2 Transmit OFF power for UL MIMO

For UE supporting UL MIMO, the transmit OFF power is defined as the TRP 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. During DTX and measurements gaps, the transmitter is not considered OFF. The minimum output power shall not exceed the values specified in Table 6.3.2-1. The requirement is verified with the test metric of TRP (Link=TX beam peak direction, Meas=TRP grid).

### 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.

\*\*\* End Change \*\*\*

\*\*\* Begin Change \*\*\*

## 6.4D Transmit signal quality for UL MIMO

### 6.4D.0 General

For a UE supporting UL MIMO, the transmit modulation quality requirements in clause 6.4 apply but with all references to sub-clauses 6.3.1.x in clause 6.4 redirected to sub-clauses 6.3D.1.x, where ‘x’ depends on power class. The requirements apply when the UE is configured for 2-layer UL MIMO transmission as specified in Table 6.2D.1.3-3.

The requirement may alternatively be verified in each of the single layer UL MIMO configurations as specified in Table 6.4D.0-1. In this case, the transmit modulation quality requirements in clause 6.4 apply without modification.

Table 6.4D.0-1: Alternative UL MIMO configuration for transmit signal quality tests

|  |  |  |
| --- | --- | --- |
| **Transmission scheme** | **DCI format** | **TPMI Index** |
| Codebook based uplink | DCI format 0\_1 | 0 |
| Codebook based uplink | DCI format 0\_1 | 1 |

### 6.4D.1 Frequency error for UL MIMO

For a UE supporting UL MIMO, the UE basic measurement interval of modulated carrier frequency is 1 UL slot. The mean value of basic measurements of UE modulated carrier frequency at each layer shall be accurate to within ± 0.1 PPM observed over a period of 1ms of cumulated measurement intevals compared to the carrier frequency received from the NR Node B.

### 6.4D.2 Transmit modulation quality for UL MIMO

For UE supporting UL MIMO, the transmit modulation quality requirements are specified at each layer separately.

The transmit modulation quality requirements are 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 [13]), 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.3 Time alignment error for UL MIMO

For a UE with multiple physical antenna ports supporting UL MIMO, this requirement applies to frame timing differences between transmissions on multiple physical antenna ports in the codebook transmission scheme.

The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different physical antenna ports.

For a UE with multiple physical antenna ports, 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 physical antenna ports in any slot within the specified time window from the last transmitted SRS on the same antenna ports, 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 physical antenna port is larger than 0 dBm for SRS transmission and for the duration of time window. The requirement is verified with the test metric of EIRP (Link=TX Beam peak direction, Meas=Link angle).

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 apply when all of 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))

\*\*\* End Change \*\*\*