**3GPP TSG-RAN WG4 Meeting#103-e *R4-22XXXXX***

**Electronic meeting, 9 – 20 May 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.101-2** | **CR** | **CRNum** | **rev** | **-** | **Current version:** | **15.17.0** |  |
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| *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:***  | Big CR for TS 38.101-2 Maintenance |
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| ***Source to WG:*** | MCC, Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2022-05-24 |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | < the following highlighted list of CRs will be removed >38.101-2 Rel-15R4-2207883 CR for 38.101-2-fh0: Correction for PC3 MPRnarrowR4-2209626 Draft CR to TS 38.101-2 on UE multi-band relaxation factors for PC3 (no Cat-A CR)R4-2211140 Draft CR to add ‘Annex G Difference of relative phase and power errors’ for FR2 UL coherent MIMOR4-2207883:MPRnarrow conditions are not correct for LCRB =2 and SCS=60kHz: this case should be eligible to MPRnarrow since BWalloc,RB =1.44MHz but for this allocation RBstart does not scale correctly.R4-2209626:For supported bands ‘n257+n258+n261’, “NOTE 3” is not applicable to UE multi-band relaxation factors for power class 3 in Table 6.2.1.3-4. In addition, “NOTE 3” with the maximum applicable MBS,n for band n260 should be applied to the supported bands ‘n257+n260’, ‘n258+n260’, ‘n257+n258+n260’, ‘n257+n258+n260+n261‘, ‘n257+n260+n261’ and ‘n258+n260+n261’.R4-2211140: The 6.4D.4 Requirements for coherent UL MIMO specify maximum difference of relative phase and power errors, parameters not yet tested in other sections of 38.101-2 or previous 3GPP RATs. It is then necessary to give further details to RAN5 and TE vendors in an annex as done for the EVM so that what is to be measured is made clear and can be implemented as intended. |
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| ***Summary of change:*** | R4-2207883: Modify equation defining the range of eligible RB allocations to MPRnarrow to BWalloc,RB allocations when 0 ≤ RBstart < Ceil(1/3 NRB) or Ceil((2/3 NRB)-LCRB) < RBstart ≤ NRB-LCRB.R4-2209626: 1. Add a new row in Table 6.2.1.3-4 for supported bands ‘n257+n258+n261’ without “NOTE 3”.
2. Add “NOTE 3” with the maximum applicable MBS,n for the supported bands ‘n257+n260’, ‘n258+n260’, ‘n257+n258+n260’, ‘n257+n258+n260+n261‘, ‘n257+n260+n261’ and ‘n258+n260+n261’.

R4-2211140: Addition of Annex G Difference of relative phase and power errors. |
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| ***Consequences if not approved:*** | R4-2207883:RBstart range does not scale with LCRB for MPRnarrow R4-2209626: The UE multi-band relaxation factors for power class 3 will be inaccurate.R4-2211140:Unclear clause 6.4D.4 leading to misinterpretations. |
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| ***Clauses affected:*** | 6.2.1.3, 6.2.2.3, G (new), G.0 (new), G.1 (new), G.2 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** | **X** |  |  Test specifications | R4-2207883: TS 38.521-2 CR 0727 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
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| ***Other comments:*** | Note to the MCC: Annex G (void) exists in v15.7.0, renumbering may be needed |
|  |  |
| ***This CR's revision history:*** |  |

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*< start of changes >*

#### 6.2.1.3 UE maximum output power for power class 3

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 6.2.1.3-1. The requirement is verified with the test metric of total component of EIRP (Link=TX beam peak direction, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 6.2.1.3-1. The requirement for the UE which supports multiple FR2 bands is specified in both Table 6.2.1.3-1 and Table 6.2.1.3-4.

Table 6.2.1.3-1: UE minimum peak EIRP for power class 3

|  |  |
| --- | --- |
| Operating band | Min peak EIRP (dBm) |
| n257 | 22.4 |
| n258 | 22.4 |
| n260 | 20.6 |
| n261 | 22.4 |
| NOTE 1: Minimum peak EIRP is defined as the lower limit without toleranceNOTE 2: Void |

The maximum output power values for TRP and EIRP are found on the Table 6.2.1.3-2. The max 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 the total component of EIRP (Link=TX beam peak direction, Meas=Link angle).

Table 6.2.1.3-2: UE maximum output power limits for power class 3

|  |  |  |
| --- | --- | --- |
| Operating band | Max TRP (dBm) | Max EIRP (dBm) |
| n257 | 23 | 43 |
| n258 | 23 | 43 |
| n260 | 23 | 43 |
| n261 | 23 | 43 |

The minimum EIRP at the 50th percentile of the distribution of radiated power measured over the full sphere around the UE is defined as the spherical coverage requirement and is found in Table 6.2.1.3-3 below. The requirement is verified with the test metric of the total component of EIRP (Link=Spherical coverage grid, Meas=Link angle). The requirement for the UE which supports a single FR2 band is specified in Table 6.2.1.3-3. The requirement for the UE which supports multiple FR2 bands is specified in both Table 6.2.1.3-3 and Table 6.2.1.3-4.

Table 6.2.1.3-3: UE spherical coverage for power class 3

|  |  |
| --- | --- |
| Operating band | Min EIRP at 50%-tile CDF (dBm) |
| n257 | 11.5 |
| n258 | 11.5 |
| n260 | 8 |
| n261 | 11.5 |
| NOTE 1: Minimum EIRP at 50 %-tile CDF is defined as the lower limit without toleranceNOTE 2: VoidNOTE 3: The requirements in this table are verified only under normal temperature conditions as defined in Annex E.2.1. |

For the UEs that support multiple FR2 bands, minimum requirement for peak EIRP and EIRP spherical coverage in Tables 6.2.1.3-1 and 6.2.1.3-3 shall be decreased per band, respectively, by the peak EIRP relaxation parameter MBP,n and EIRP spherical coverage relaxation parameter MBS,n. For each combination of supported bands ΔMBP,n and ΔMBS,n apply to each supported band *n*, such that the total relaxations, ∑MBP and ∑MBS, across all supported bands shall not exceed the total value indicated in Table 6.2.1.3-4.

Table 6.2.1.3-4: UE multi-band relaxation factors for power class 3

|  |  |  |
| --- | --- | --- |
| Supported bands | ∑MBP (dB) | ∑MBS (dB) |
| n257, n258 | ≤ 1.3 | ≤ 1.25 |
| n257, n260n258, n260 | ≤ 1.03 | ≤ 0.753 |
| n257, n261 | 0.0 | 0.0 |
| n258, n261 | ≤ 1.0 | ≤ 1.25 |
| n260, n261 | 0.0 | ≤ 0.752 |
| n257, n258, n260n257, n258, n260, n261 | ≤ 1.73 | ≤ 1.753 |
| n257, n258, n261 | ≤ 1.7 | ≤ 1.75 |
| n257, n260, n261 | ≤ 0.53 | ≤ 1.253 |
| n258, n260, n261 | ≤ 1.53 | ≤ 1.253 |
| NOTE 1: The requirements in this table are applicable to UEs which support only the indicated bandsNOTE 2: For supported bands n260 + n261, ΔMBS,n is not applied for band n260NOTE 3: For n260, maximum applicable MBS,n is 0.4 dB and MBP,n is 0.75 dBNOTE 4: For all bands except n260, the maximum applicable MBP,n and MBS,n is 0.75 dB |

*< text omitted >*

#### 6.2.2.3 UE maximum output power reduction for power class 3

For power class 3, MPR for contiguous allocations is defined as:

MPR = max(MPRWT, MPRnarrow)

Where,

 MPRnarrow = 2.5 dB, BWalloc,RB≤ 1.44 MHz, and 0 ≤ RBstart < Ceil(1/3 NRB) or Ceil((2/3NRB)-LCRB) ≤ RBstart ≤ NRB-LCRB, where BWalloc,RB is the bandwidth of the RB allocation size.

*< text omitted >*

# Annex G (normative):

Difference of relative phase and power errors

# G.0 General

This annex gives further information needed for understanding and implementing 6.4D.4. The following terms should be understood as follows:

* Relative phase error: refers to the phase difference between signals at different physical antenna ports, which should be ideally 0. It should be understood as for a slot i.e. (slot) relative phase. It is calculated based on DMRS symbols of that slot or on SRS symbols.
* Difference of relative phase error: refers to the difference between the relative phase error determined per slot and the relative phase error determined based on the SRS transmitted.

# G.1 Measurement Point

Figure G.1-1 shows the measurement point for the difference of relative phase and power errors.



Figure G.1-1 - Measurement point for difference of relative phase/power error for UL coherent MIMO

# G.2 Relative Phase Error Measurement

Here are listed the different aspects that may lead to different interpretations.

## G.2.1. Symbols used

Phase error is determined based on DMRS REs (3 DMRS symbols per slot).

## G.2.2. CFO (carrier frequency offset) correction

The TE performs a CFO correction on a slot-by-slot basis using a common frequency correction at the two uplink layers.

## G.2.3. Steps of the measurement method

Below are detailed the steps necessary to obtain the maximum difference of relative phase error during the 20ms time window.

1. Determination for each subcarrier and at each antenna, the SRS relative phase error based on the last SRS transmitted on Ant1 and Ant2, that relative phase error serves as a reference for the calculation of the difference of relative phase error for each slot inside the 20 ms time window.
* The output is the “SRS relative phase error” vector for the last SRS transmitted: .
1. Calculation for the last SRS transmitted, for each RB of the SRS relative phase errors based on the arithmetic mean of the subcarrier SRS relative phase errors determined in previous step.
	* The output is the “SRS relative phase error” vector for the last SRS transmitted: .
2. CFO correction on slot-by-slot basis using a common frequency correction for both antenna outputs.
3. Determination for each subcarrier and at each antenna, the phase over the slot being analyzed. The phase is extracted from the channel estimate derived from the 3 DMRS symbols of the slot using the LSE technique.
* The output is one vector of dimension for each antenna.
1. Calculation for a slot for each subcarrier of the relative phase error (difference between the vectors determined in the previous step).
* The output is subcarrier relative phase errors of a slot: .
1. Calculation for a slot, for each RB of the relative phase errors based on the arithmetic mean of the subcarrier relative phase errors determined in previous step.
* The output is a “slot relative phase error” vector for a slot:.
1. Calculation for a slot of the difference of relative phase errors based on the “SRS relative phase error” (reference) determined in step 2 and the “slot relative phase error” determined in previous step.
* The output is a “difference of relative phase error” vector for a slot:.
1. Calculation for a slot of the arithmetic mean value of the “difference of relative phase error” vector determined in previous step, this value corresponds to an RB.
* The output is a “difference of relative phase error” value for a slot:
1. Perform for each slot of the 20ms time window, steps 3 to 8.
* The output is a “difference of relative phase error” vector: .
1. Calculation of the maximum value of the “difference of relative phase error”.
* The output is the “difference of relative phase error” that should be verified as complying with the 40° maximum allowable difference of relative phase error requirement: .

*< end of changes >*